(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
6 April 2006 (06.04.2006)

PCT

(10) International Publication Number
WO 2006/036730 A2

(51) International Patent Classification:
B65B 5/02 (2006.01) *B65B 21/24* (2006.01)

(21) International Application Number:
PCT/US2005/033944

(22) International Filing Date:
22 September 2005 (22.09.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0421075.3 22 September 2004 (22.09.2004) GB

(71) Applicant *(for all designated States except US)*: **MEAD-WESTVACO PACKAGING SYSTEMS LLC** [US/US]; One High Ridge Park, Stamford, CT 06905 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **LEBRAS, Philippe** [FR/FR]; 13, rue de la Bievre, F-36000 Chateauroux (FR).

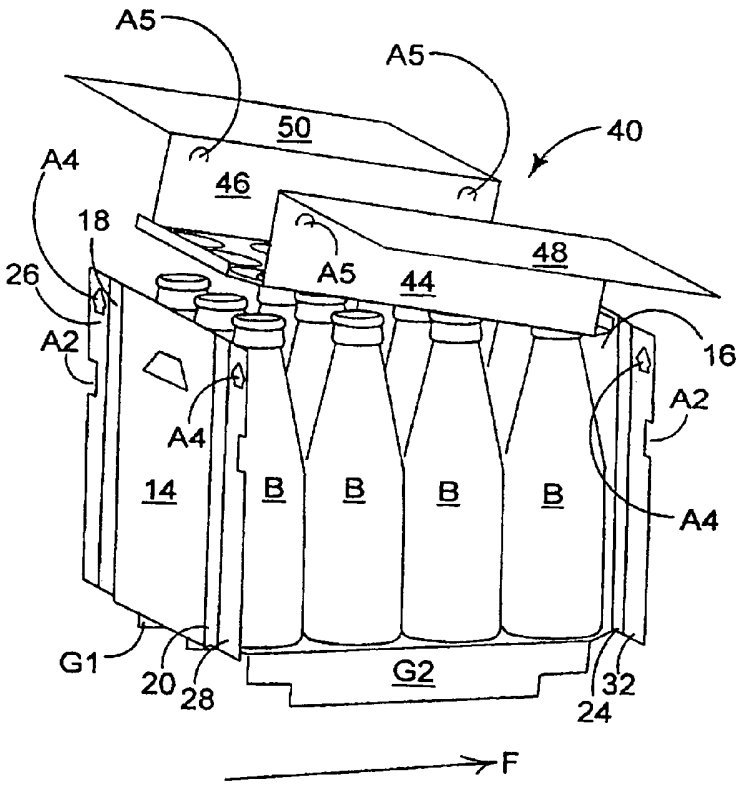
(74) Agents: **SUZUKI, Tsugihiko** et al.; The Mead Corporation, 4850D North Church Lane, Smyrna, GA 30080 (US).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: PACKAGING METHOD FOR MULTI-PIECE CARTON FORMATION AND APPARATUS FOR CARRYING OUT THE SAME



(57) Abstract: A method for continuous loading and set-up of cartons, each for holding an array of articles such as bottles (B), each carton comprising a top part (40) which includes one or more top panels (42) and one or more side panels (48, 50), and further comprising a carton base (10) which carton base includes a main base panel (12) and one or more wall panels (14, 16). The method comprises the steps of: a. continuous loading of one or more articles onto the carton base (10), b. offering up the top part (40) in alignment with the carton base (10), c. maintaining secure alignment of the top part (40) with the carton base (10), while d. securing together the or each side panel (48, 50) of the top part to the carton base (10) so as to complete the carton base and so that the array of articles is substantially encased in the set-up, loaded carton.

WO 2006/036730 A2

Published:

— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

PACKAGING METHOD FOR MULTI-PIECE CARTON FORMATION AND APPARATUS FOR CARRYING OUT THE SAME

Background of the Invention

The present invention relates to a packaging method for formation of cartons constructed to accommodate a plurality of articles such as beverage bottles and to apparatus for carrying out such a method.

In particular, the invention relates to a carton formed from a plurality of blank integers which are each to be aligned and secured to one another in a finished package. An example of such a carton is found in UK Patent Application Number GB0408054.5 and is further shown loaded and assembled as a package in the final figure of the accompanying drawings of the present specification. Cartons comprised of multiple integers, for example two-part cartons present many advantages to the user. For example, such a construction often imparts extra strength to the carton whilst providing large areas to be printed with advertising graphics if desired. A two-part construction may also, for example, present advantages with respect to the ease of access to the articles contained in such a carton.

Consequently, a method for rapid and continuous loading and construction of such cartons presents many benefits to the user. It is an object of the present invention to provide such a method for loading and formation of a multi-part carton.

US Patent No 5 495 943, to Bienaime, discloses a two-part carton whose general order of assembly is shown at Fig. 5 in that specification. An advantage of the present invention over this prior art carton assembly lies in the fact that the application of the top part co-operates with completion and formation of the carton base. In contradistinction, Bienaime discloses a system wherein the carton base is fully assembled *before* application of the top part.

US Patent No 4 848 061, to Le Bras, discloses a method and mechanism for application of a top gripping carrier carton to a plurality of articles such as bottles disposed within a crate. A

disadvantage of this method and mechanism relative to those of the present invention lies in the fact that it is not applicable to a carton having a carton base which is formed during the loading and carton assembly process. In the present prior art specification, there is disclosed a system wherein the crate is fully formed well before the top gripping carrier is applied. It is a further objective of the present invention to provide a method of carton formation which may be applied to a carton which supports the articles contained in it on at least a pair of opposite upper and lower faces.

International Patent No 99-06280, to The Mead Corporation, discloses a packaging machine and method for continuous loading and formation of a carton for a plurality of articles such as bottles. However, this latter method and mechanism are not applicable to a carton comprising a plurality of integers. Accordingly, the advantages associated with a multi-part carton - as discussed above – are not imparted by this latter international application.

Summary of the Invention

In contradistinction, the present application discloses a packaging method and apparatus which offer these benefits and which seek to overcome – or at least to mitigate – the problems presented by the prior art.

To this end, a first aspect of the present invention provides a method for continuous loading and set-up of cartons, each for holding an array of articles such as bottles, each said carton comprising a top part which includes one or more top panels and one or more side panels, and further comprising a carton base which carton base includes a main base panel and one or more wall panels;

said method comprising the steps of:

(a) continuous loading of one or more articles onto said carton base,

(b) offering up the top part in alignment with said carton base,

(c) maintaining secure alignment of said top part with said carton base, while

(d) securing together the or each said side panel of said top part to said carton

base so as to complete the carton base and so that the array of articles is substantially encased in the set-up, loaded carton.

Preferably, said method further comprises a preliminary step of unfolding of the said carton base from a collapsed, folded condition.

According to an optional feature of this aspect of the present invention, said step of maintaining secure alignment of said top part with said base is achieved by engagement of a securement portion attached to one of said top part and said carton base, with a complimentary securement aperture which complimentary securement aperture is defined in the other one of said top part and said carton base.

A further optional feature of the present invention provides said step of securing together said top part and said carton base is achieved by the application of an adhesive material to at least a part of one or both of said top part and said carton base.

Preferably, said step of securing together said top part and said carton base further comprises the process of applying pressure to said top part and said carton base, after application of adhesive material, on one or more of those panels to which said adhesive material has been applied.

According to an optional feature of this aspect of the present invention, said method is adapted to be applied to cartons wherein said top part includes a series of apertures adapted to receive said articles.

According to a further optional feature of this aspect of the invention, said step of offering up of the top part in alignment with said carton base is achieved by lowering the top part onto the carton base at an angle of approach which is acute to the horizontal.

Preferably, said angle of approach is in the region of 10°.

According to an optional feature of this aspect of the present invention, said step of offering up said top part in alignment with said carton base is followed by subsequent application of forming means, which forming means is so constructed and arranged as to engage one or more of said articles, thereby holding said carton and articles in careful alignment preceding the step of securing together of said top part and said carton base.

Preferably, said forming means is constructed from a resilient material, with a series of apertures defined therein, said apertures being complimentary to the shape and configuration of said articles.

More preferably, said resilient material may be any one of wood, paperboard, metal or a plastics material.

According to a further optional feature of the present invention, said step of unfolding said carton base is preceded by disposition of one or more guide flaps defined within said carton base into a set of planes substantially perpendicular to that of the folded, collapsed carton base, and pointing downwardly with respect to said carton base.

Preferably, after said step of loading of said articles onto said carton base, said guide flaps are then passed through an angle of approximately 180° so as to engage the edges of said articles within said carton base.

According to an optional feature of this aspect of the present invention, said process of disposition of the one or more guide flaps into said set of planes substantially perpendicular to said carton base comprises the engagement of said one or more guide flaps by a rotationally motile series of laminas through one or more guide flap engagement apertures defined in one or more panels of said carton base.

A further optional feature of this aspect of the present invention provides that the carton blank is supplied in a folded, collapsed condition, such that the area occupied by the carton remains substantially constant throughout the process of the carton's construction.

According to a second aspect of the present invention, there is provided an apparatus for continuous loading and set-up of cartons, each for holding an array of articles such as bottles, each said carton comprising a top part which includes one or more top panels and one or more side panels, and further comprising a carton base which carton base includes a main base panel and one or more wall panels;

said apparatus comprising:

(a) means for continuous loading of one or more articles onto said carton base

(b) means for offering up the top part in alignment with said carton base

(c) means for maintenance of secure alignment of said top part with said carton base

(d) means for securing together the or each said side panel of said top part to said base so as to complete the carton base and so that the array of articles is substantially encased in the set-up, loaded carton.

Preferably, there is further provided means for unfolding of the carton base from a collapsed, folded condition.

According to a further feature of this aspect of the present invention, said means for maintenance of secure alignment of said top part with said carton base further comprises means to engage a securement portion provided in one of said top part and said carton base, with a complimentary securement aperture in the other.

Preferably, said means for securing together said top part and said carton base further comprises means for the application of an adhesive material to at least part of one or both of said top part and said carton base.

More preferably, said means for securing together said top part and said carton base still further comprises means for applying pressure to said top part and said carton base together, after the application of adhesive material, upon one or more of those panels where adhesive material has been applied.

According to a further feature of this second aspect of the present invention, said apparatus is further adapted to accommodate cartons wherein said top part includes a series of apertures adapted to receive said articles.

A still further feature of this aspect of the present invention provides that said means for offering up said top part in alignment with said carton base is adapted to ensure that the angle of approach of said top part towards said carton base is acute to the horizontal.

Preferably, said means for offering up said top part in alignment with said carton base is further adapted to ensure that said angle of approach is in the region of 10°.

According to another feature of this aspect of the present invention, there further comprises forming means, which forming means is so constructed and arranged as to engage one or more of said articles, thereby holding the carton and articles in careful alignment preceding the step of securing together said top part and said carton base.

Preferably, said forming means is constructed from a resilient material, with a series of apertures defined therein, said apertures being complimentary to the shape and configuration of said articles.

More preferably, said resilient material is chosen from wood, paperboard, metal or a plastics material.

According to a further feature of this aspect of the present invention, there is further provided means for the disposition of one or more guide flaps defined within said carton base into a set of planes substantially perpendicular to that of the folded, collapsed carton base, and pointing downwardly with respect to said carton base.

Preferably, there is further provided means to fold said guide flaps through a further angle of approximately 180°, so that said guide flaps may engage the edges of said articles.

More preferably, there is further provided a series of guide tracks complimentary to the form of said guide flaps, so constructed and arranged as to engage the said guide flaps as the carton base is progressed through the apparatus, in order to maintain alignment of said carton base.

According to a further feature of this aspect of the present invention, said means for disposition of said guide flaps takes the form of a rotationally-motile series of one or more laminas so constructed and arranged as to engage one or more panels of said carton base.

According to a still further feature of this aspect of the present invention, the apparatus is so constructed and arranged as to allow the carton blank to be supplied to the apparatus in a folded condition such that the area occupied by the carton remains substantially constant throughout the process of the carton's construction.

According to a third aspect a continuous loading and set-up of cartons, each carton for containing a group of similar articles, such as bottles, arranged in rows, the carton being formed from first and second parts of a two part blank, the first part comprising a bottom panel and opposing end walls for forming a carton base and the second part comprising a top panel containing apertures and opposing side walls for forming a top part, said method comprising the steps of:

(a) forming the carton base by forming the first part into a U-shaped structure;

(b) side-loading the base with the group of articles;

(c) lowering the top part over the loaded group of articles, an upper portion of each article being received in each aperture of the top part; and

(d) securing the top part to the carton base thereby completing construction of the carton.

According to a fourth aspect an apparatus for continuous loading and set-up of cartons, each carton for containing a group of similar articles, such as bottles, arranged in rows, the carton being formed from first and second parts of a two part blank, the first part comprising a bottom panel and opposing end walls for forming a carton base and the second part

comprising a top panel containing apertures and opposing side walls for forming a top part, said apparatus comprising:

(a) means for forming the carton base by forming the first part into a U-shaped structure;

(b) means for side-loading the base with the group of articles;

(c) means for lowering the top part over the loaded group of articles, an upper portion of each article being received in each aperture of the top part; and

(d) means for securing the top part to the carton base thereby completing construction of the carton.

Brief Description of the Drawings

An exemplary, non limiting embodiment of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

FIGURE 1a is a perspective view, showing a carton base, in a collapsed, folded condition, of a carton constructed by a packaging method according to a first embodiment of the present invention;

FIGURE 1b is a perspective view of the carton base of Figure 1a, showing guide panels in an outwardly folded and engaged condition;

FIGURE 1c is a perspective view of the carton base of Figures 1a and 1b but in an unfolded open condition ready to receive the plurality of articles;

FIGURE 2 is a perspective view of a completed loaded carton, constructed by application of a method according to the present embodiment;

FIGURE 3 is a top and side perspective view of an in-feed means of a packaging apparatus according to the present invention and of part of an unfolding means for preparing the carton base of Fig. 1a for loading;

FIGURE 3a shows a top and side perspective view of the unfolding means for preparing the carton base of Fig 1a for loading;

FIGURE 4 shows a perspective view of a series of unfolded carton bases such as that shown in Figures 1c being passed through a loading apparatus and each being loaded with a plurality of articles;

FIGURE 5 is a perspective view showing the loaded carton bases of Figure 4 passing through a carton top part application means;

FIGURE 5a is a perspective view of the loaded carton base of FIGURE 4 with a pre-folded top part, showing the top part being lowered onto the loaded carton base;

FIGURE 6 is a perspective view showing a series of sequential pre-folding operations which are applied to the top part of a carton using a method of the first embodiment of the present invention;

FIGURE 7 is a perspective view, showing a secure alignment means and a series of loaded two-part cartons being passed through the alignment means; and

FIGURE 8 is a perspective view of the loaded carton base with pre-folded top part of FIGURE 5a securely aligned in a set up condition ready for securing each side panel of the top part to the carton base to complete the construction of the carton base; and

FIGURE 9 shows a means for securing each side panel of the top part to the carton base.

Detailed Description of the Preferred Embodiment

The present embodiment provides a method and a packaging machine for carrying out the method for constructing and loading a two part carton to contain articles such as bottles.

Figures 1a, 1b and 1c show a series of views of an exemplary carton base for constructing a carton using the method of the present embodiment; it will be recognized that the scope of the present invention is not limited to application to cartons such as that detailed in these figures. Turning to Figure 1c, there is shown a carton base 10 having a main base panel 12 foldably connected to respective wall panels 14 and 16 by respective fold line 13 and 15. Preferably, these respective wall panels 14 and 16 are connected by fold lines 17, 19, 21, and 23 in a direction substantially perpendicular to that of parallel fold lines 13 and 15 to corner panels 18, 20, 22 and 24. These respective corner panels are in turn foldably connected to securement panels 26, 28, 30 and 32. The carton base 10 is so constructed and arranged that the wall panels 14 and 16 are connected to the main base panel 12 on opposite edges; similarly, corner panels 18 and 20 are foldably connected to wall panel 14 on opposing edges. In analogous fashion, wall panel 16 is foldably connected by fold line 21 and 23 to respective corner panels 22 and 24 on opposite edges in this preferred embodiment. Main base panel 12 is further foldably connected by fold lines 11a and 11b along opposite edges substantially perpendicular to fold lines 13 and 15, to respective guide panels G1 and G2. Optionally, there is further provided within the wall panels 14 and 16 a handle aperture A1. Guide panel notches A2 are provided in the securement panels 26, 28, 30 and 32 to aide unfolding of the carton from the collapsed condition. Further securement tabs A4 are also provided within the securement panels 26, 28, 30 and 32. The securement tabs A4 can engage a complementary aperture A5 provided in the top part of the carton.

According to a preferred execution of the present method, the blank of the carton base is first supplied in a folded collapsed condition substantially as shown in Figure 1a. The carton base blank is folded such that the area occupied on the conveyor means remains substantially constant throughout the process of constructing the carton. Further, supplying the carton base blank in such a condition minimizes the pitch between subsequent carton bases on the apparatus on which the present method is carried out, as well as keeping that pitch substantially constant throughout the process of construction of the carton. It also allows for more convenient and compact storage of the carton bases before construction of the cartons. This presents the advantage of maximizing utilization of space throughout the entire length of the machine.

The carton constructed by the method and apparatus of the present embodiment further comprises a top part 40, which is illustrated in Figure 6. The carton top part 40 comprises a top panel 42, which is foldably connected along opposed edges to first and second side panels 48, 50; the top panel further comprises apertures A3. The first and second side panels 48, 50 each comprise an additional reinforcing panel 44, 46 which comprises a securement aperture A5. These securement apertures A5 are structured and arranged in complementary fashion to the securement tabs A4 provided in the carton base side walls 14, 16, so that the tabs A4 can engage the apertures A5 during assembly of the complete carton. The securement tabs A4 are struck from and hinged to the first and second side panels 48, 50 and together with the substantially 'U'-shaped securement apertures A5 form a complementary locking mechanism. Other locking mechanisms employing a male tab and female aperture may be used such as a 'punch-lock' which is known in the art.

It is envisaged that the carton base and top part blanks 10, 40 can vary depending upon the shape and/or quantity of articles to be packaged and consequently, a machine in accordance with one or more aspects of the present invention is adjustable in numerous respects, so that it can process a wide variety of such blanks and is not limited to the specific example above. Indeed, a machine of the present invention may be used to package cartons containing articles other than bottles, and the top part may not necessarily comprise apertures for accommodating bottle necks. It is therefore envisaged that the method employed by the present invention may also be adjustable in order to accommodate a variety of carton arrangements.

Turning to the construction of the carton, there is shown in Figure 3 an upstream end of a packaging machine for processing the blanks 10, 40 of the type outlined above. The upstream end of the machine includes a means 8 for storing a multiplicity of carton bases 10 in a folded, collapsed condition ready for processing. The carton base blanks 10 are sequentially removed from the storage means 8 by an infeed means 80 which preferably comprises a suction in-feed device such as is well known in the art; however, it will be recognized that in-feed means 80 is not limited to such a construction, and may take any form

constructed and arranged to facilitate reception of a series of carton bases 10 in the folded collapsed condition into the apparatus for construction of the carton.

The folded carton bases 10 are each fed onto a track and a conveyor means 64 is used to progress the folded carton bases 10 through the packaging machine in a forward direction F. The track is provided with a pair of guide tracks 54, which are also shown in Fig 3a. The guide tracks 54 are arranged to engage guide panels G1 and G2 of the carton base 10. The guide panels, G1 and G2 are folded out of the plane of the carton base 10, by an engaging wheel 63 which is positioned downstream of the infeed means 80. The engaging wheel 63 comprises a finger or protrusion which displaces a guide panel G1 or G2 by directly contacting the guide panels G1, G2 through the guide panel notches A2 provided in the securement panel 26, 28, 30 and 32 of the carton base 10. As the guide panels G1, G2 are displaced and separated from contacting the securement panels 26, 28, 30, 32, the guide tracks 54, which are tapered at one end and which contain a slot for accommodating the guide panels G1, G2 further increase the separation of the guide panels G1, G2 from the securement panels 26, 28, 30, 32 until the guide panels G1, G2 are housed within the guide tracks 54. In this way the guide panels G1, G2 are disposed in an arrangement substantially perpendicular to the plane of the unfolded carton base 10 as shown in Fig. 1b. Subsequent engagement of the guide panels G1 and G2 with the guide track 54 maintains the carton base 10 in the correct alignment with respect to the construction apparatus.

After passing through infeed means 80, the carton base 10 is progressed through the construction apparatus preferably, though not necessarily exclusively, by use of a conveyor means 64. After progression through the infeed means 80, carton base 10 moves through carton base unfolding means 82. Carton base unfolding means 82 is so constructed and arranged as to facilitate unfolding of the carton base 10 from the folded collapsed condition as shown in Figure 1a to a condition ready for loading wherein the wall panels 14 and 16 are held substantially perpendicular to the main base panel 12 to give a substantially "U" shaped carton base 10. This latter arrangement of the carton base 10 is illustrated in Figure 1c. According to a preferred embodiment of the carton unfolding means 82, there is provided a rotating system 58 of laminas 60 engaged by, and rotating about, a pin 62; the laminas 60 are

so constructed and arranged as to rotate in the plane substantially perpendicular to that of the unfolded carton base 10 progressing along the carton base unfolding means 82. As the laminas 60 rotate, they engage progressive panels of the carton base 10 until said carton base 10 is placed in a substantially "U" shaped configuration. A rotating lamina 60 first engages the first side wall panel 14. As the lamina 60 rotates, a rear portion of the lamina also engages the second side wall panel 16 thereby causing each of the side wall panels to be simultaneously unfolded above the plane of the main base panel 12. This is illustrated in Fig. 3a. Optionally there is further provided along the conveyor means 64, means 52 for maintenance of the wall panels 14 and 16 in a configuration substantially perpendicular to that of the conveyor means 64. The means 52 for maintaining the wall panels 14, 16 in an upright position may optionally comprise suction means.

In the preferred embodiment of the present invention, an article buffer means 66 [as described hereinafter] also fulfils this latter function of maintaining the wall panels 14 and 16 in a configuration substantially perpendicular to the conveyor means 64.

After progression through the carton base unfolding means 82, the carton base 10, held in the substantially U-shaped configuration, as illustrated in Figure 1c, is in a condition ready for the loading of a series of articles. In this embodiment the articles are bottles and are arranged in four rows of three bottles each. Preferably, the process of loading bottles into the carton base 10 is achieved by an arrangement substantially as shown in Figure 4 of the accompanying drawings. The bottles to be loaded are progressed in the general direction X, which is at an angle acute to the forward direction F of progression of the carton through the construction apparatus. A series of article buffer means 66 are also provided, to receive the array of bottles being progressed in the direction X through the article in-feed means 70. Each article buffer means 66 is retracted in the general direction Y as the carton bases 10 are progressed in the general direction F, whilst the bottles are conveyed along the article in-feed means in the general direction X. This co-operative series of operations is so arranged to facilitate careful loading of each substantially U-shaped carton base 10 with an array of bottles B.

The article buffer means 66 support the incoming bottles as they are loaded into the open carton base 10. The article buffer means 66 are housed on a working/return reach 65 which conveys the article buffer means 66 synchronously with the moving carton bases 10. Once a carton base 10 is fully loaded with bottles, the article buffer means 66 is fully retracted and returned back upstream in the direction R, by the working/return reach 65, in preparation of engaging bottles being loaded into a subsequent carton base 10. The article buffer means 66 also ensures that the loaded cartons are aligned and correctly positioned on the main base panel 12 of the carton base 10. The article buffer means 66 further exerts a stabilizing influence on the articles, so as to seek to prevent them from falling over within the carton base 10 as it is being formed.

A similar storage and delivery means is provided for the top parts 40 in the packaging machine. The infeed of the carton top parts 40 is positioned upstream of the delivery of the carton bases 10 and is positioned above the track upon which the carton bases 10 are conveyed. Before application of the top part 40 of the carton to the loaded carton base 10, said top part 40 preferably undergoes a series of pre-folding operations. This series of sequential pre-folding operations is illustrated in Figure 6. The pre-folding of the top part 40 is achieved by conveying the top part 40 between two belts 77, 79 which support and convey the main panel 42 of the top part 40. A series of static guide panels 181 are provided, which are arranged in alignment with the fold lines between the top panel 42 and adjacent side panels 48, 50 of the top part 40. Folding wheels 83 are provided adjacent the conveyed top part 40 to contact the side panels 48, 50 forcing them upward against the static guide panels 181, thereby breaking the aligned fold against the static guide panel 181. The series of static guide panels 181 are shaped such that the conveyed and folded top part 40 becomes aligned with the fold between the top wall panel 42 and adjacent reinforcing panels 44, 46 and in a similar method as before this fold is broken in order to prepare the top part 40 for insertion into the opened and loaded carton base 10. The delivery and pre-folding means are timed and positioned so that the delivery of a pre-folded top part 40 is synchronized with the progress of the loaded carton bases 10. The pre-folding operation prepares the top part 40 for insertion into the loaded carton.

The delivery of the pre-folded top-part into the loaded carton base 10, precedes folding of the corner panels 18, 20, 22, 24 and securement panels 26, 28, 30, 32 inwardly of the carton base 10 by folding wheels 130 as shown in Figure 5.

After pre-folding, the top part 40 is progressed through top part alignment means 72 which maintains each said top part 40 in substantial alignment with a loaded carton base 10 progressing in the forward direction F; this is done in such a way that each top part 40 is lowered onto a loaded carton base 10 as shown in Figures 5 and 5a. Preferably, each top part 40 approaches the loaded carton base 10 at an angle acute to the direction of travel of the loaded carton bases 10. More preferably, this angle of approach is approximately 10°. According to a further optional feature of the present invention, each top part 40 is so constructed and arranged as to engage at least one of the bottles B loaded in carton base 10. The leading edge of the top part 40 engages the leading one or ones of the array of bottles B loaded into the carton base 10, such that the bottles B provide a drive means for the top part 40 as the carton is progressed through the apparatus. In this way the top panel 42 of the top part 40 comes to rest inside the loaded carton base 10 and the apertures A3 are each brought into registry with a bottle B. At the outfeed end of the top part alignment means 72, the folding wheels 130 fold the corner panels 18, 20, 22, 24 and securement panels 26, 28, 30, 32 inwardly of the loaded carton base 10. The corner panels 18, 20, 22, 24 are brought into flat face contact with part of the reinforcing panels 44, 46, thereby aligning the securement apertures A5 with the securement tabs A4.

In this embodiment of the invention a forming means 67, is provided which engages one or more of the bottles B being loaded onto the carton base 10. The application of the forming means 67 is shown in Figure 7. During the process of aligning the top part 40 and the carton base 10, the forming means 67 engages the array of articles B in the correct configuration for application of the top part 40, so as to hold the uncompleted carton in or close to the correct shape for finally securing the top part 40 and the carton base 10 together in a finished state. Additionally, the application of such forming means 67 carries the added advantage that it may act as a spacer means between the opposite pair of wall panels 14, 16, thereby holding the carton base 10 in a substantially U-shaped configuration, and with each of the two wall

panels 14, 16 and the base panel 12 foldably connected to the next in a largely perpendicular arrangement. Accordingly, the application of such a forming means 67 may greatly assist the set-up of the carton after loading of the articles B.

The forming means 67 is preferably constructed of a resilient material such as wood, metal or a plastics material, though it need not be limited to one of these specific materials, and may be constructed of any resilient material without implying departure from the scope of the present invention.

The top part 40 and the carton base 10 is secured in the mutually aligned position by securement means 76, substantially as is illustrated in Figure 7 of the accompanying drawings. As the cartons are progressed along in the forward direction F, the forming means 67 is applied to engage the articles B. A securement wheel 69 is provided to lock the securement tabs A4 within the securement apertures A5, the securement wheel 69 is therefore provided with protrusions or teeth. The teeth of the securement wheel 69 engage the securement tabs A4, pressing them into the securement apertures A5 and thereby maintaining a secure alignment of the loaded carton base 10 with the top part 40. The securement means 76 is so constructed and arranged as to maintain the cartons correctly lined up on the apparatus before secured alignment is effected on the carton.

The securement wheel 69 may optionally be first used to move the corner panels 18, 20, 22 and 24 and securement panels 26, 28, 30 and 32 in such a way so as to substantially engage the outer edge of the articles B. At this stage the side panels 48 and 50 are maintained out of contact with the edges of said articles B and, more preferably, are maintained at an angle substantially perpendicular. Secured alignment of said top part 40 and said carton base 10 is now achieved by engagement of securement tabs A4 defined in securement panels 26, 28, 30 and 32 with the securement apertures A5 in the reinforcing panels 44, 46,. The security of this alignment is advantageous as it prevents loss of form of the carton should it need to be accelerated through the construction apparatus before permanent securement of said top part 40 to said carton base 10. Subsequently, the partially constructed package 100 is progressed through permanent securement means 78. In other embodiments of the invention where the

carton structure differs from that herein described it is envisaged that the locking mechanism employed may be omitted from the carton design and the forming means 67 may be employed to maintain the carton formation before completing the construction of the carton.

To complete the construction of the carton, the guide panels G1 and G2 are moved through an angle of approximately 180° such that they can act as a barrier to outward movement of the articles B loaded in the carton base 10. Once the carton base has been loaded and the top part 40 secured in place the guide tracks 54 are no longer required to hold the guide panels G1 and G2 in a downward folded position. The guide tracks 54 therefore terminate and a means such as a folding wheel or static guide is provided to cause the guide panels G1 and G2 to be folded upward as the carton base 10 is conveyed within the packaging machine. The guide panels G1, G2 are moved approximately 180°, such that they may contact the bottles in the outer rows, held within the loaded carton base 10, in preparation of being glued to the side panels 48, 50. The side panels 48, 50 are then released from being held substantially parallel to the main base panel 12 and a permanent securement means 78 is used to fold down the side panels 48, 50 to adhere the side panels 48, 50 to the securement panels 26, 28, 30 and 32 as well as to the guide panels G1, G2.

In this embodiment the permanent securement means 78 takes the form of gluing apparatus. More preferably, adhesive is applied to the securement panels 26, 28, 30 and 32 as well as to the guide panels G1, G2, and the side panels 48, 50 are folded down into abutment with them. Compression and then smoothing of the first and second side panels 48, 50 is then preferably applied to achieve permanent securement of said top part 40 to said carton base 10 giving the finished package 100.

Gluing apparatus in accordance with this embodiment of the present invention is illustrated in Figure 9 of the accompanying drawings. As the loaded cartons are progressed through the permanent securement means 78 in the forward direction F, adhesive is applied by the glue gun 79 to the guide panels G1 and G2, and to the securement panels 26, 28, 30 and 32. Side panel moving means 81 then brings the first and second side panels 48 and 50 into abutment with their respective guide panels G1 and G2 and with their respective securement panels, 28

and 32; and 26 and 30. In this way the construction of a carton loaded with bottles and formed from a two-part blank is completed.

It should be understood that various changes may be made within the scope of the present invention, for example, the size and shape of different components being adjusted to accommodate articles or cartons of differing size or shape. The carton may be adapted to accommodate more than one article in a different array, and the method and apparatus of the present invention may be adapted accordingly.

It will be obvious to one skilled in the art that various changes may be made without departing from the scope of the present invention. For example articles other than bottles may be loaded into the cartons and therefore apertures provided in the top panel may be omitted or sized to accommodate the different articles. The buffering means used to control the loading of bottles into the carton base may not be required if other articles are loaded or indeed other means of ensuring that the loaded articles are aligned within the carton base may be employed instead, for example are restricting bar aligned with the carton edge may be used to prevent the articles from moving outside the carton base perimeter

It will be recognized that as used herein directional references such as "top", "base", "end", and "side", do not limit their respective components to such orientation but serve merely to distinguish these panels one from another. Any reference to foldable connection should not necessarily be construed as referring to a single fold line only; indeed, it is envisaged that hinged connection may be formed from one or more of the following: a score line, a frangible line or a fold line. Any of these options may be chosen without departing from the copy of the present invention.

CLAIMS

1. A method for continuous loading and set-up of cartons, each carton for containing a group of similar articles, such as bottles, arranged in rows, the carton being formed from first and second parts of a two part blank, the first part comprising a bottom panel and opposing end walls for forming a carton base and the second part comprising a top panel containing apertures and opposing side walls for forming a top part, said method comprising the steps of:

(a) forming the carton base by forming the first part into a U-shaped structure;

(b) side-loading the base with the group of articles;

(c) lowering the top part over the loaded group of articles, an upper portion of each article being received in each aperture of the top part; and

(d) securing the top part to the carton base thereby completing construction of the carton.

2. An apparatus for continuous loading and set-up of cartons, each carton for containing a group of similar articles, such as bottles, arranged in rows, the carton being formed from first and second parts of a two part blank, the first part comprising a bottom panel and opposing end walls for forming a carton base and the second part comprising a top panel containing apertures and opposing side walls for forming a top part, said apparatus comprising:

(a) means for forming the carton base by forming the first part into a U-shaped structure;

(b) means for side-loading the base with the group of articles;

(c) means for lowering the top part over the loaded group of articles, an upper portion of each article being received in each aperture of the top part; and

(d) means for securing the top part to the carton base thereby completing construction of the carton.

3. A method for continuous loading and set-up of cartons, each carton for holding an array of articles such as bottles, each said carton comprising a top part which includes one or more top panels and one or more side panels, and further comprising a carton base which carton base includes a main base panel and one or more wall panels;

said method comprising the steps of:

(a) continuous loading of one or more articles onto said carton base,

(b) offering up the top part in alignment with said carton base,

(c) maintaining secure alignment of said top part with said carton base, while

(d) securing together the or each said side panel of said top part to said carton base so as to complete the carton base and so that the array of articles is substantially encased in the set-up, loaded carton.

4. A method as claimed in claim 3, which method further comprises a preliminary step of unfolding of the said carton base from a collapsed, folded condition.

5. A method as claimed in claim 3 or 4, wherein said step of maintaining secure alignment of said top part with said base is achieved by engagement of a securement portion attached to one of said top part and said carton base, with a complimentary securement aperture which complimentary securement aperture is defined in the other one of said top part and said carton base.

6. A method as claimed in any one of claims 3-5, wherein said step securing together said top part and said carton base is achieved by the application of an adhesive material to at least a part of one or both of said top part and said carton base.

7. A method as claimed in claim 6, wherein said step of securing together said top part and said carton base further comprises the process of applying pressure to said top part and said carton base, after application of adhesive material, on one or more of those panels to which said adhesive material has been applied.

8. A method as claimed in any one of claims 3-7, wherein said method is adapted to be applied to cartons wherein said top part includes a series of apertures adapted to receive said articles.

9. A method as claimed in any one of claims 3-8, wherein said step of offering up of the top part in alignment with said carton base is achieved by lowering said top part onto said carton base at an angle of approach which is acute to the horizontal.

10. A method as claimed in claim 9 wherein said angle of approach is in the region of 10°.

11. A method as claimed in any one of claims 3-10, wherein said step of offering up said top part in alignment with said carton base is followed by subsequent application of forming means, which forming means is so constructed and arranged as to engage one or more of said articles, thereby holding the carton and articles in careful alignment preceding the step of securing together said top part and said carton base.

12. A method as claimed in claim 11, wherein said forming means is constructed from a resilient material, with a series of apertures defined therein, said apertures being complimentary to the shape and configuration of said articles.

13. A method as claimed in claim 12, wherein said resilient material may be any one of wood, paperboard, metal or a plastics material.

14. A method as claimed in any one of claims 4 to 13, wherein said step of unfolding said carton base is preceded by disposition of one or more guide flaps defined within said carton base into a set of planes substantially perpendicular to that of the folded, collapsed carton base, and pointing downwardly with respect to said carton base.

15. A method as claimed in claim 14, wherein after said step of loading of said articles onto said carton base, said guide flaps are then passed through an angle of approximately 180° so as to engage the edges of said articles within said carton base.

16. A method as claimed in claim 14 or claim 15, wherein said process of disposition of the one or more guide flaps into said set of planes substantially perpendicular to said carton

base comprises the engagement of said one or more guide flaps by a rotationally motile series of laminas through one or more guide flap engagement apertures defined in one or more panels of said carton base.

17. A method as claimed in any one of claims 3-16, wherein the carton blank is supplied in a folded, collapsed condition, such that the area occupied by the carton remains substantially constant throughout the process of the carton's construction.

18. An apparatus for continuous loading and set-up of cartons, each for holding an array of articles such as bottles, each said carton comprising a top part which includes one or more top panels and one or more side panels, and further comprising a carton base which carton base includes a main base panel and one or more wall panels;
said apparatus comprising:

(a) means for continuous loading of one or more articles onto said carton base

(b) means for offering up the top part in alignment with said carton base

(c) means for maintenance of secure alignment of said top part with said carton base

(d) means for securing together the or each said side panel of said top part to said base so as to complete the carton base and so that the array of articles is substantially encased in the set-up, loaded carton.

19. An apparatus as claimed in claim 18, wherein there is further provided means for unfolding of the carton base from a collapsed, folded condition.

20. An apparatus as claimed in claim 18 or claim 19, wherein said means for maintenance of secure alignment of said top part with said carton base further comprises means to engage a securement portion provided in one of said top part and said carton base, with a complimentary securement aperture in the other.

21. An apparatus as claimed in any one of claims 18 to 20, wherein said means for securing together said top part and said carton base further comprises means for the

application of an adhesive material to at least part of one or both of said top part and said carton base.

22. An apparatus as claimed in claim 21, wherein said means for securing together said top part and said carton base still further comprises means for applying pressure to said top part and said carton base together, after the application of adhesive material, upon one or more of those panels where adhesive material has been applied.

23. An apparatus as claimed in any one of claims 18 to 22, wherein said apparatus is further adapted to accommodate cartons wherein said top part includes a series of apertures adapted to receive said articles.

24. An apparatus as claimed in any one of claims 18 to 23, wherein said means for offering up said top part in alignment with said carton base is adapted to ensure that the angle of approach of said top part towards said carton base is acute to the horizontal.

25. An apparatus as claimed in claim 24, wherein said means for offering up said top part in alignment with said carton base is further adapted to ensure that said angle of approach is in the region of 10°.

26. An apparatus as claimed in any one of claims 18 to 25, wherein there further comprises forming means, which forming means is so constructed and arranged as to engage one or more of said articles, thereby holding the carton and articles in careful alignment preceding the step of securing together said top part and said carton base.

27. An apparatus as claimed in claim 26, wherein said forming means is constructed from a resilient material, with a series of apertures defined therein, said apertures being complimentary to the shape and configuration of said articles.

28. An apparatus as claimed in claim 27, wherein said resilient material is chosen from wood, paperboard, metal or a plastics material.

29. An apparatus as claimed in any one of claims 19 to 28, wherein there is further provided means for the disposition of one or more guide flaps defined within said carton base into a set of planes substantially perpendicular to that of the folded, collapsed carton base, and pointing downwardly with respect to said carton base.

30. An apparatus as claimed in claim 29, wherein there is further provided means to fold said guide flaps through a further angle of approximately 180°, so that said guide flaps may engage the edges of said articles.

31. An apparatus as claimed in claim 29 or claim 30, wherein there is further provided a series of guide tracks complimentary to the form of said guide flaps, so constructed and arranged as to engage the said guide flaps as the carton base is progressed through the apparatus, in order to maintain alignment of said carton base.

32. An apparatus as claimed in any one of claims 29 to 31, wherein said means for disposition of said guide flaps takes the form of a rotationally-motile series of one or more laminas so constructed and arranged as to engage one or more panels of said carton base.

33. An apparatus as claimed in any one of claims 18 to 32, so constructed and arranged as to allow the carton blank to be supplied to the apparatus in a folded condition such that the area occupied by the carton remains substantially constant throughout the process of the carton's construction.

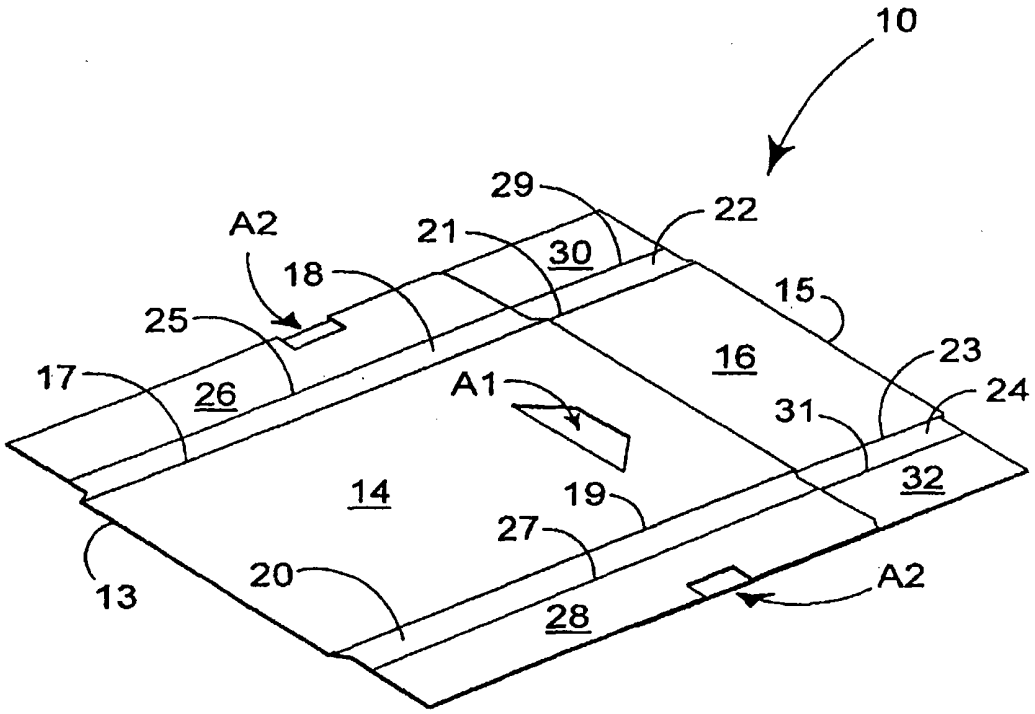


FIGURE 1A

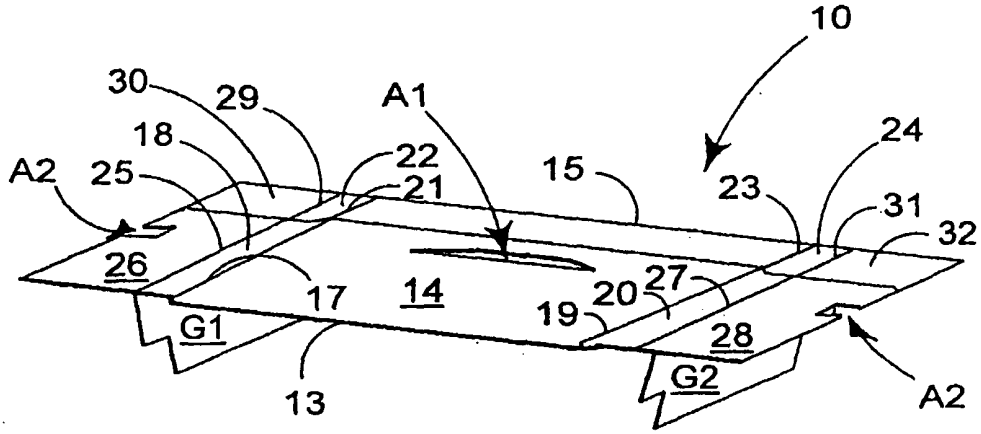


FIGURE 1B

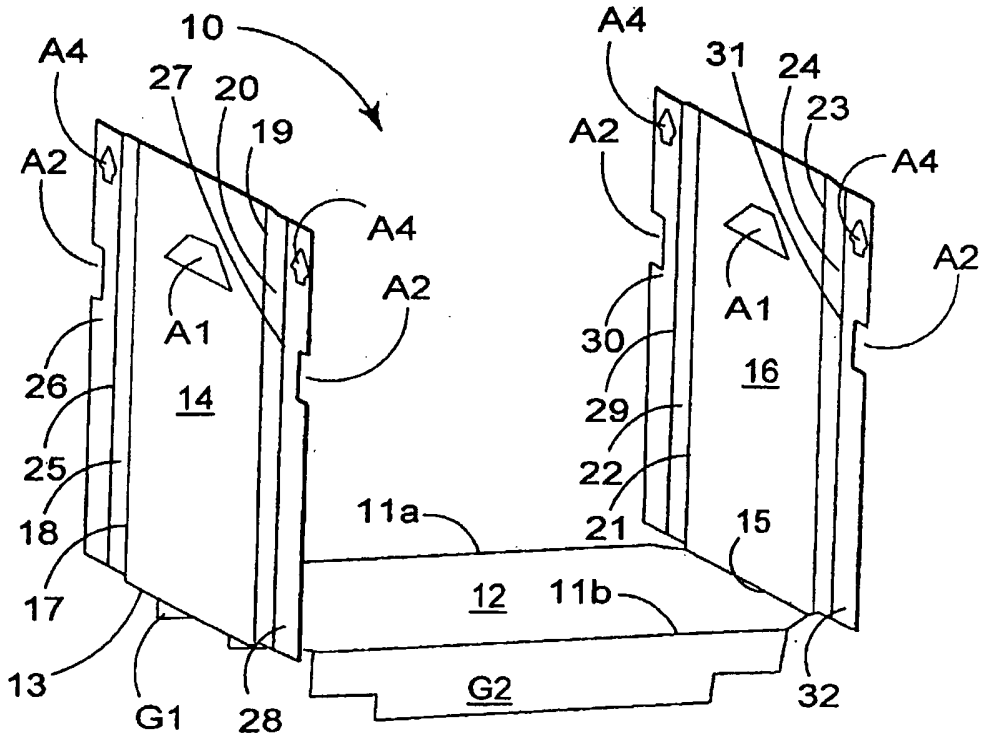


FIGURE 1C

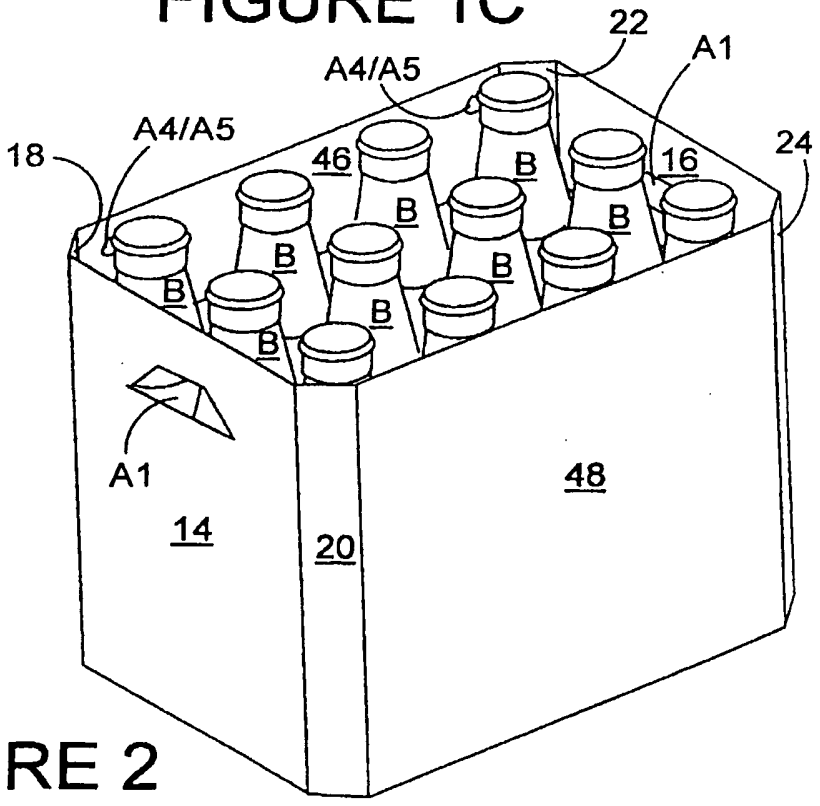


FIGURE 2

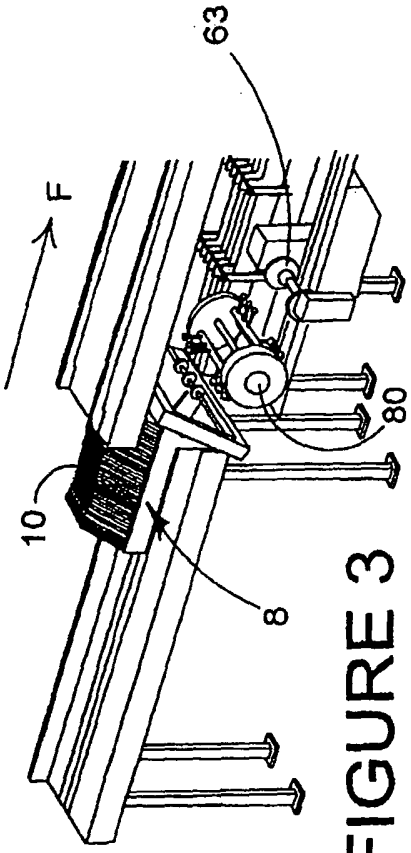


FIGURE 3

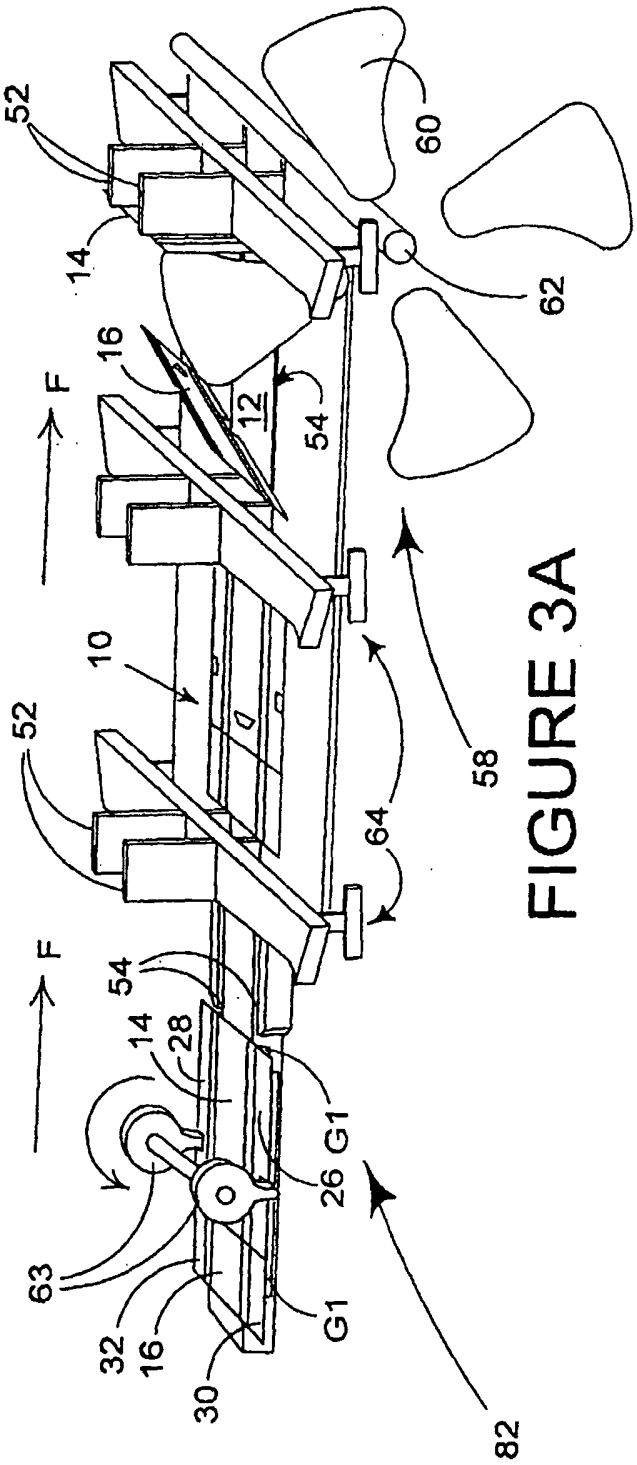


FIGURE 3A

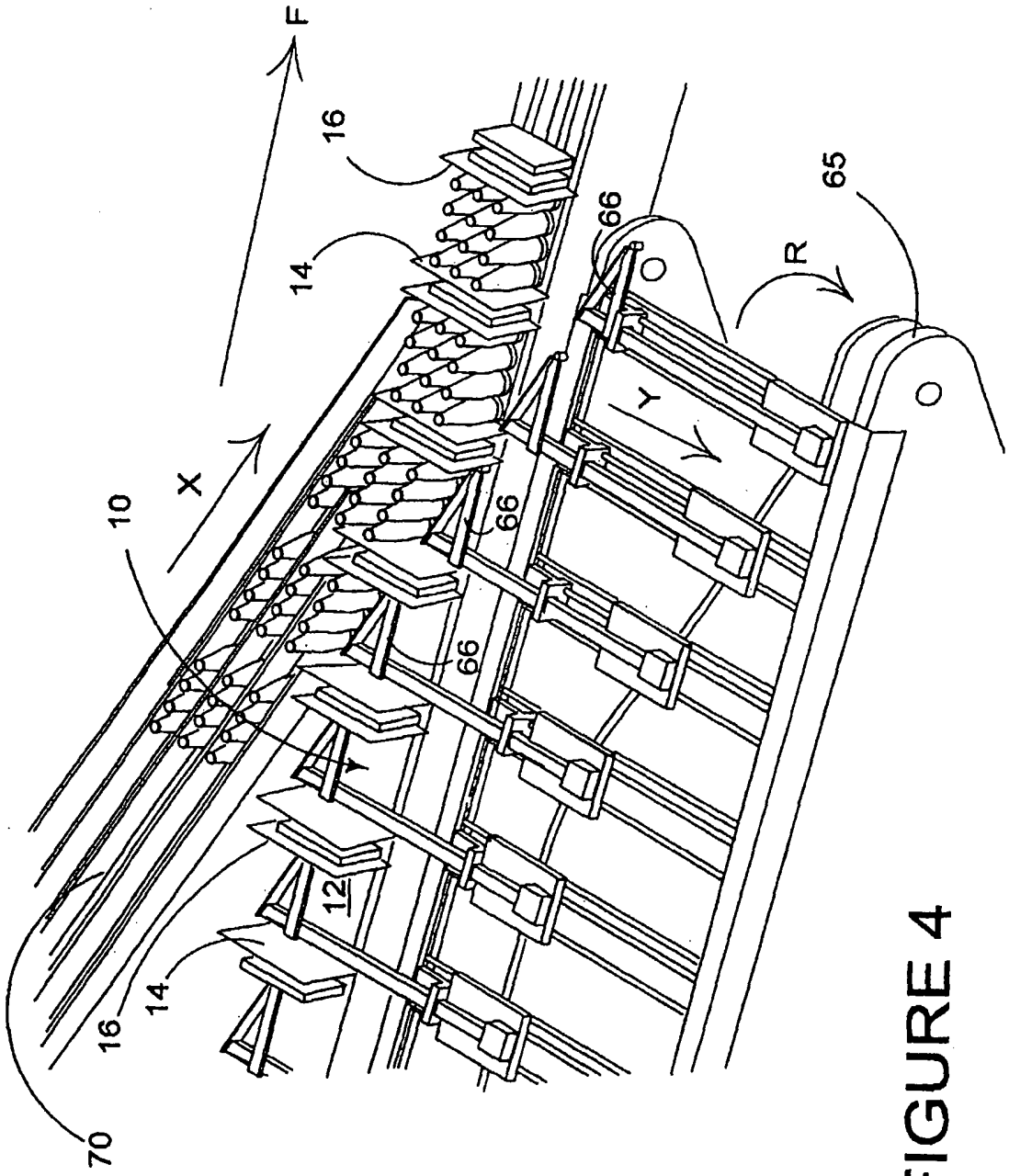


FIGURE 4

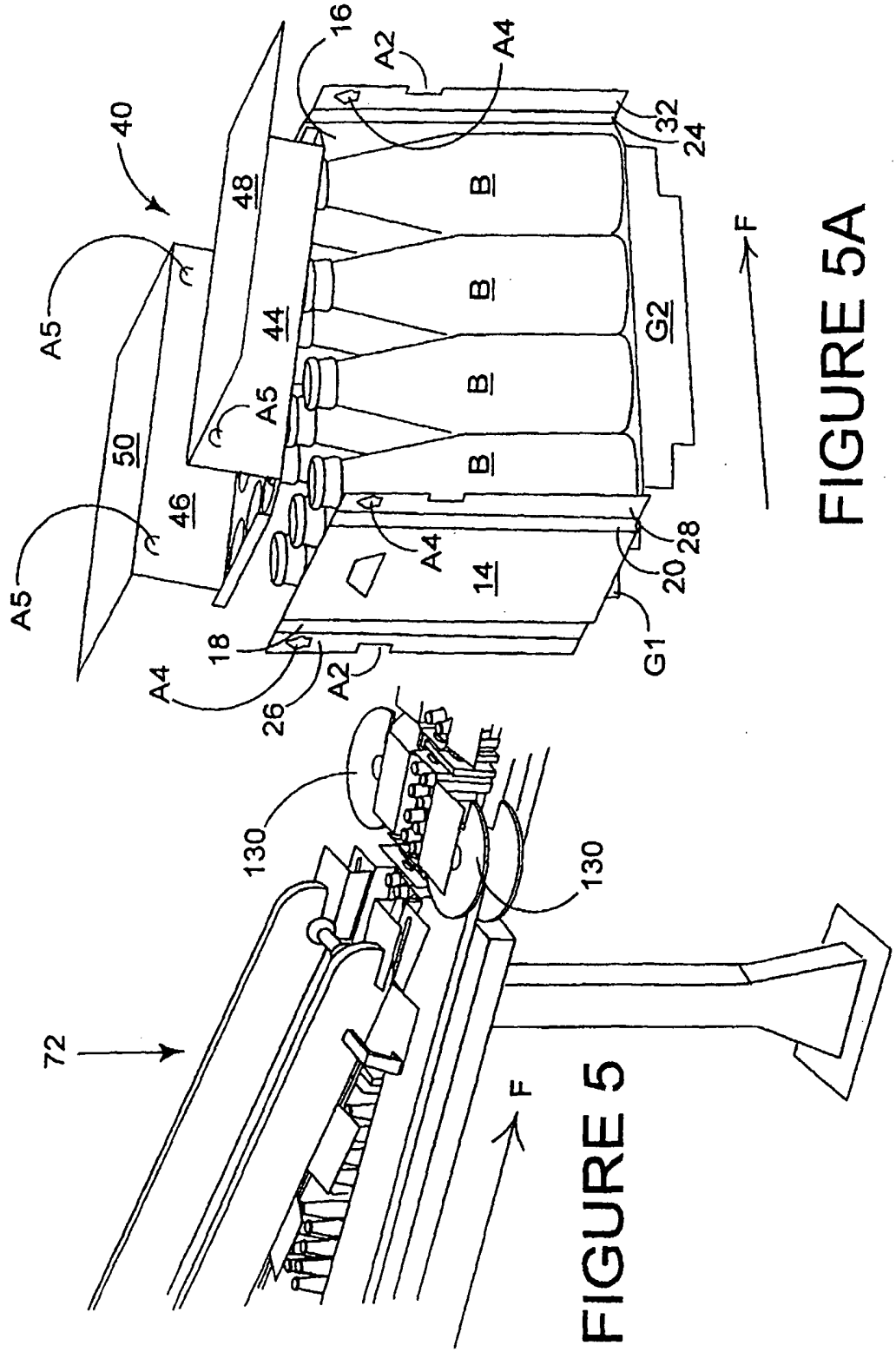


FIGURE 5A

FIGURE 5

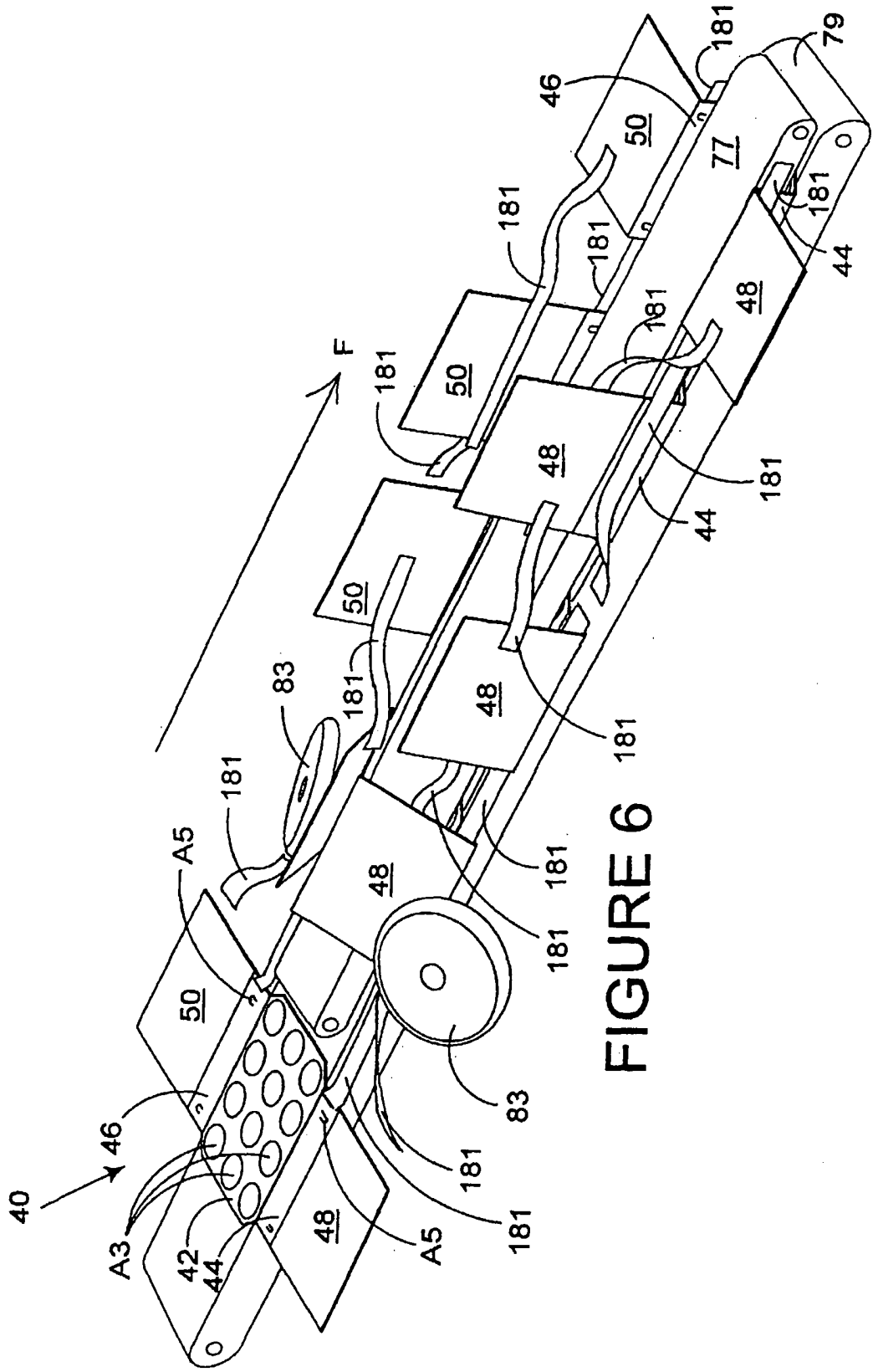


FIGURE 6

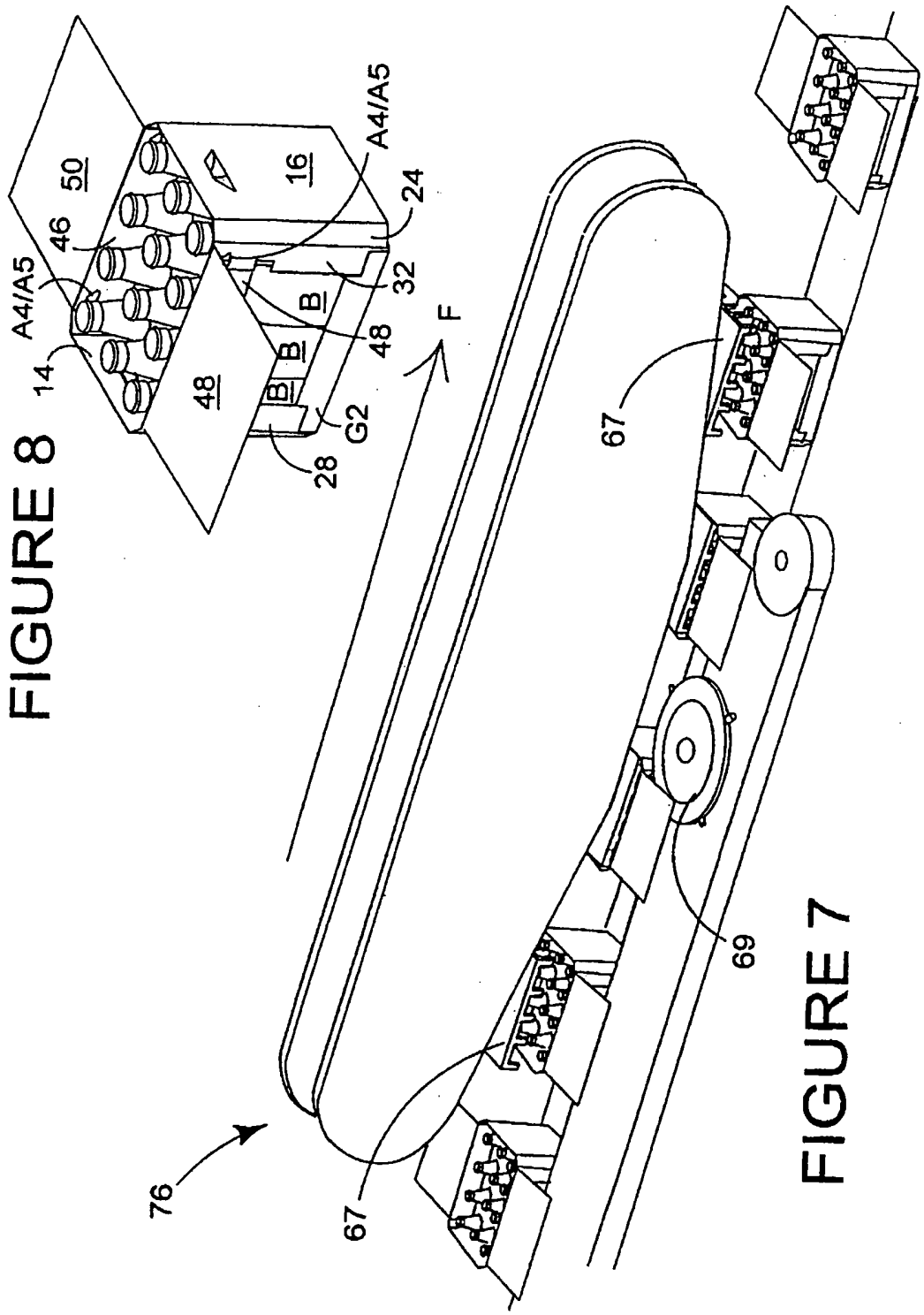


FIGURE 8

FIGURE 7

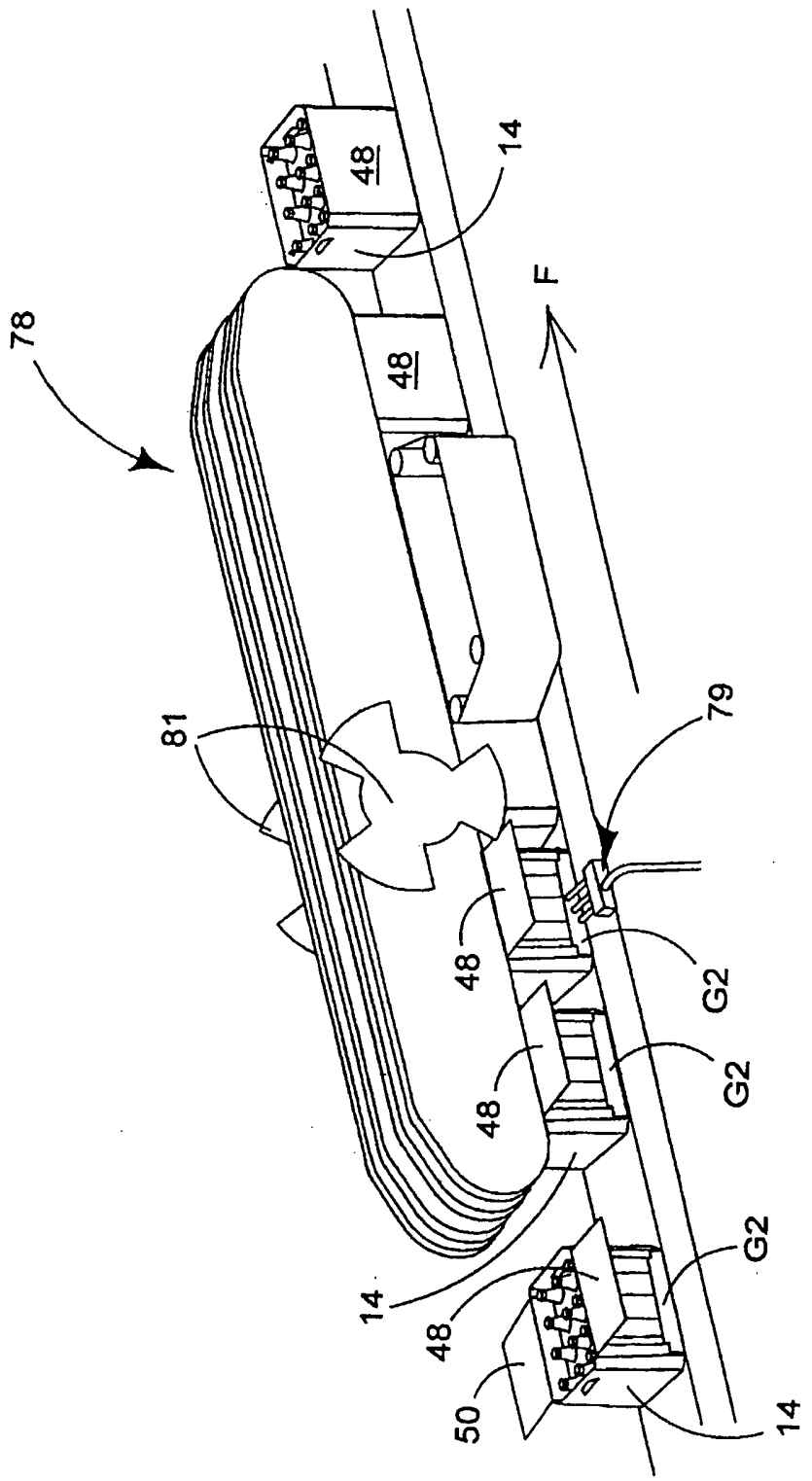


FIGURE 9