

CARTON LOADING MECHANISM

This invention relates to packaging of primary articles such as cans and bottles in multiple packaged cartons and is more particularly concerned with feeding such cartons from a hopper and for initiating and then completing a loading operation of cartons in sequence and continuously.

One common method used by known packaging machines typically comprises removing a collapsed carton from a supply of such cartons or blanks. The collapsed carton is then erected, and the cans, bottles or other articles to be packaged are placed into the erected carton. Alternatively, a supply of cartons in the form of flat blanks may be provided. After withdrawal of the carton from the supply, the carton may first be partially formed, and is then placed onto the articles. The carton is further formed into the completed package.

A number of different forms of machinery are known for practising these basic methods. In one form of machinery, separated groups of articles comprising one or more article are formed and moved along a conveyor through the machine. Cartons are also moved along the machine, and each carton is positioned over one of the article groups. As the group and carton continue to move, the carton is lowered onto the group to load the articles into the carton. A known example of such a machine is shown in WO 96/32324.

Machines of this type have several disadvantages. Many bottling plants package cans and bottles into a variety of carton sizes, for example, cartons which hold six, eight or twelve articles. Various packaging machines have been developed that may be adjusted to accommodate cartons of different sizes, but the machine must be shut down for a period of time (known as "downtime") while the adjustment is made. Minimising downtime is therefore desirable.

Further , as can be seen in the machine disclosed in WO 96/32324, the carton may be lowered along a downwardly inclined path onto the moving article group. The angle of inclination must be kept quite small, because an angularly-oriented carton will not properly fit over the tops of the articles in the group. By
5 keeping the angle of inclination small, however, the overall length of the machine is made relatively large. This is undesirable, because it increases the amount of floor space required in the bottling plant.

The present invention seeks to overcome the commercial disadvantages of known packaging machines by providing a carton loading mechanism which is able
10 to load more than one type or size of carton, and in which changeover between carton sizes or styles may be made rapidly. Further, the invention provides a loading mechanism that requires relatively little machine length to perform its loading function.

The present invention can be used with a packaging machine described in a
15 corresponding application (Applicant's reference D-7725 . It is envisaged that the present invention can be used in various types of packaging machines. Alternatively, the carton loading mechanism of the present invention can be sold as an individual module to be fitted to new equipment or to existing equipment on a retro fit basis.

20 One aspect of the invention provides an apparatus for continuously loading different types of cartons with articles delivered to the apparatus from an infeed stream of a packaging machine, which apparatus comprises conveying means sequentially to deliver successive cartons from a supply, and support means
25 co-operating with said conveying means to maintain the carton in a set up condition as it is moved downstream and to load said carton by lowering said carton onto at least one article wherein said conveying means comprises a plurality of carton engaging means mounted to respective ones of a pair of endless chains,



wherein each said carton is held between synchronised carton engaging means characterised in that adjustment means is provided to adjust one of said pair of endless chains relative to the other said endless chain to receive a different carton type.

5 According to an optional feature of this aspect of the invention control means may be arranged to control the adjustment means. Preferably, the control means may be arranged to control the speed of said carton engaging means to marry the carton speed with the speed of the articles. Optionally, the control means may controls the angle of incline of the carton engaging means.

10 According to another optional feature of this aspect of the invention said control means comprises means for receiving information regarding the speed of articles in the feed path. Preferably, control means comprises a sensor arranged to measure the speed of articles in the feed path.

15 According to a further optional feature of this aspect of the invention said carton engaging means comprises a plurality of spaced lugs, , said lugs being adapted to engage opposed panels of said carton at spaced locations intermediate ends and at spaced locations intermediate its traverse edges. Optionally, said lugs are shaped to engage and/or maintain said carton in a horizontal plane.

20 According to another optional feature of this aspect of the invention, said support lugs comprise a support face in juxtaposed relationship with said panel during said engagement and a protruding portion adapted to engage a recess or aperture of said panel. There may further comprise a second protruding portion spaced horizontally from said protruding portion.

25 According to a further optional feature, each said lug is mounted on a cam track, wherein said cam track provides a path for said lug to maintain said support face parallel to said panel during said engagement.

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Another optional feature of this aspect of the invention there is provided regulating means to control the flow of articles at said infeed end, said regulating means further comprising means to control the pressure of said articles into the machine and means to determine the correct number of articles for each carton.

5 Preferably, said means to control the pressure of said articles comprises an infeed star wheel.

A second aspect of the invention provides a method of continuously setting up and loading different types of cartons which method comprises causing each carton sequentially to be delivered to an infeed end of a packaging machine,

10 conveying the carton through the machine, maintaining the carton in a set up condition as it is moved downstream, causing the set up carton to be supported by support means and held in a set up condition and loading the carton by lowering said carton onto at least one article as it moves downstream.

An embodiment of the invention will now be described by way of example

15 with reference to the accompanying drawings in which:

FIGURE 1a is a perspective view of a carton suitable for use with a packaging machine, hereinafter described ;

FIGURE 1b is a perspective view of an erected carton of the type illustrated in Figure 1a;

20 FIGURE 2 is a perspective view of an upstream end of a packaging machine incorporating the loading mechanism of one embodiment of the invention ;

FIGURE 3 is a perspective view illustrating the loading mechanism of the present invention;



FIGURES 4 and 5 are perspective views illustrating the lug assembly; and

FIGURE 6 is a cross-sectional view of the lug assembly.

A mechanism according to the present invention is capable of loading a variety of carton types, for example fully enclosed and basket type cartons. Any reference in this specification to a carton type includes different sizes of any particular carton style. For example, the mechanism can process fully enclosed cartons for eight or twelve articles. The cartons are loaded by the same method, so only the loading of a fully enclosed carton is described.

Referring to the drawings, and in particular, Figures 1a and b of the drawings carton 10 is a basket type carton, shown in Figure 1a in its flat collapsed form and formed from a unitary blank of paperboard or similar sheet material. The carton blank includes opposed side wall panels 12, 14 and opposed end wall panels 16, 18 hingeably connected one to next. The carton further comprises a handle structure 20 which interconnects end wall panels 16, 18 and comprises transverse partition panels 22 interconnecting each side wall 12, 14. Base panels 24, 26 hingeably connected to respective side walls 12, 14. Articles (not shown) are inserted into the carton from above or, as the case may be, from below and the base panels are then secured together to provide a completed carton.

It is envisaged that the cartons will vary depending upon the shape and or quantity of articles to be packaged and accordingly, a machine in accordance with the present invention is adjustable in numerous respects so that it can process a wide variety of such cartons. The principal arrangements which are likely to be varied are shown in Figures 1a in which "H" is the overall height of the set up carton equivalent to the distance between the upper edge of the side wall and base panel, "L" is the overall length of the carton when the base panels have closed.

The carton, whatever the type, will include apertures 28 struck from the base panels 24, 26 which are used by the loading mechanism. In this embodiment, three triangular apertures 28 provided to support the base panels 24, 26 during construction of the base, are also used by the loading mechanism.

5 Referring to Figure 2 of the drawings there is shown a machine 30 for processing cartons of the type outlined above. The upstream end of the machine includes a dual hopper 32 in which a multiplicity of cartons 10 in a collapsed condition are held ready for processing. A back feeder 34 of the type referred to in corresponding application (Applicant's reference D-7723) and a rotary vacuum
10 feeder 36 are positioned adjacent the dual hopper 32. The rotary vacuum feeder 36 transfers sequentially cartons from the hopper 32 to a paper feed chain 38. The back feeder 34 comes into contact with the carton during its orbital path and separates opposing walls to part erect the carton. The paper feed chain 38 is provided to complete the carton set up and to transfer the cartons downstream to a
15 loading station 40. As the erected carton is moved forward by the paper feed chain 38, a plate (not shown) maintains the carton in a horizontal plane. At the loading station, the base panels 24, 26 of the carton are outwardly folded by guides (not shown) positioned either side of the carton , before being transferred to a carton lowering module 50.

20 The carton lowering module 50 is described with reference to Figures 3 and 4. The module comprises a conveyor, for example one or more side lug chain sets 52, 54 mounted on tables 56, 58 respectively which are downwardly inclined towards the point of loading 60. In this embodiment, a pair of side lug chain set 52, 54 is used which are of similar construction and so only the near side set 52 is
25 described in detail. The endless chain set 52 includes an endless chain 62 driven by a motor, such as a servo motor. Suitable means connected to the side lug chain sets are provided to periodically engage cartons supplied from the paper feed chain. In this embodiment, the carton engagement means comprises a plurality of guide pin lugs 64 mounted on the endless chain which are operable to engage the

opposed base panels 24, 26 of a carton and to retain the base panels 24, 26, side panels 12, 14 and end panels 16, 18 in a set up condition as it moves downstream.

In the embodiment shown in Figures 4 to 6, each lug 64 is preferably substantially wedge shaped and comprises a support face 66 arranged at an acute angle with respect to a notional vertical plane Y-Y. A plurality of pins, for example, four pins 68 are mounted at spaced intervals along the support face 66. Each pin 68 is positioned on the support face 66 so that during use they are received in corresponding apertures 28 of the carton panel 24 being supported thereby to engage the carton. In this embodiment, only the leading three of the four pins are required for the basket type carton. Of course, for the larger cartons such as the fully enclosed cartons, all of the pins are used. Conversely, a smaller carton may only require to be engaged by two of the pins. Preferably, the trailing end of the lug 64 includes a protruding portion 70 with a substantially vertical support face 72 to receive the trailing edge 74 of the panel 24 being supported. In use, the carton 10 may tend to tip forward so the protruding portion 70 maintains the carton in its correct position and minimises any unwanted movement.

Each lug 64 is mounted to a support frame 76, shown in Figure 4: the support frame 76 being mounted to the endless chain 62 at a suitable or central point by a suitable attachment means 78, for example a roller bearing, which is capable of rotational movement. In this embodiment, cam followers 80, 82 extend from each end of the support frame 76.

As illustrated in Figure 3, the table 56 includes a recess 83 to receive the endless chain 62 and one or more cam tracks 84, 86 to receive the lug cam followers 80, 82. In this embodiment, the recess 83 and cam tracks 84, 86 are ovoid in shape, but other configurations could be adopted without departing from the scope of protection. As each lug 64 moves along the path of the cam track 84, 86 the guide pins 68 and support face 66 are maintained in plane parallel to the paper feed chain 38. This arrangement allows the lugs 64 to be moved laterally

designated by letter X, in Figure 3 at the upper end of the table 56 to assist in the smooth engagement of the pins 68 in the panel apertures 28. Thus, the cartons 10 are maintained in a horizontal plane by the lugs 64 as they are lowered by the endless chain set 52.

5 Articles such as bottles B are fed into the machine by an infeed conveyor 90 and the line pressure of the bottles is controlled by an infeed star wheel 92, as is well known. The articles are separated into groups of the correct number per carton by suitable means so that they can be introduced to the carton at the same rate as the carton flow.

10 At loading station 40 illustrated in Figure 2, the cartons are introduced to the group of articles from above as the carton and article group are moved forward in unison by the carton lowering module 50 and an article conveyor 94 respectively. The carton 10 is lowered onto the articles due to the downward incline of the endless chains sets 52, 54.

15 It is envisaged that the loading module can be used to load cartons with different configurations of articles, for example two rows or three rows. Accordingly, either or both chain sets 52 and tables 56, 58 are moveable towards or away from each other, by means of a pneumatic cylinder (not shown).

20 Advantageously, the lugs 64 and pins 68 minimise vertical and lateral movement of the cartons 10 as they engage with the articles. Optionally, vertical movement of the carton is further minimised by a pressure belt (not shown) positioned above the endless chain sets 52, 54 and adapted to apply downward pressure to the handle structure 22 or, as the case may be, the top panel. It is envisaged that in some embodiments, the pressure belt could be replaced by fixed
25 guides or, where appropriate, vertically mounted endless chain and lug sets.

Once the cartons have been loaded with articles, the lugs 64 are disengaged from the apertures 28. The path of the cam track 80, 82 at the lower end of each table 54, 56 enables the lugs 64 to move in a lateral direction, designated by letter Z, away from the carton 10 whilst maintaining the pins 68 in a parallel plane to the article conveyor 94. Thus, a smooth disengagement is achieved.

The loaded cartons are transferred by means of an outfeed conveyor 94 and/or pressure belt to a further set of endless chains with side lugs (not shown) which are used to transfer the carton to the outfeed end of the machine. During this stage, the base panels 24, 26 are folded around to the underside of the carton and are interconnected by a locking mechanism known in the art. A second pressure belt is provided above the handle structure to prevent unwanted upward movement of the carrier. The completed carton is transferred to the outfeed end of the machine.

It will be understood that the loading mechanism of the invention has been illustrated with reference to a specific embodiment and that numerous modifications are possible within the scope of the invention. The loading mechanism is able to process cartons comprising numerous configurations of groups of articles covering a range of carton size and shape, for example, four, six, eight and twelve bottles without undue time being spent in adjusting the mechanism. In particular, the carton lowering module can be raised or lowered by hydraulically powered columns 96, 98 that support the tables 54, 56 respectively.

Suitable control means is included to position the support tables 82, 84 at the desired location for a particular carton type or size by controlling the pneumatic cylinder and/or the hydraulically powered columns 96, 98. The control means may also control the motors driving each of the endless chains so that lugs 64 of each chain are moved in synchronisation as described above. Further, the speed of the chains can be adjusted by the control means according to the carton type and/or

size and to synchronise carton throughput with the paperfeed chain 38 the article conveyor 90 and outfeed conveyor 94.

The control means may be a dedicated processor or may be a control means for a packaging machine in which the loading mechanism is used. Alternatively,
5 the control means may preferably be a known programmable servo control system.

Advantageously, the speed of operation of the apparatus is improved as well as its efficiency and durability as the carton is moved from a collapsed position to a fully set up condition

While the preferred embodiment described herein is for loading bottles into
10 cartons, it will be recognised that the invention is not limited to cartons for bottles. The invention may be used with machines for packaging cans, paperboard "bricks" and other containers into cartons.

Moreover, while the preferred embodiment described herein is shown as part of a machine for loading containers into vertically-loaded basket-type carton,
15 the invention is not limited to cartons of this type. As will be recognised by those skilled in the art, the invention may be used with wrap-around or end-loaded cartons.

CLAIMS

1. An apparatus for continuously loading different types of cartons with articles delivered to the apparatus from an infeed stream of a packaging machine, which apparatus comprises conveying means sequentially to deliver successive
5 cartons from a supply, and to load said carton by lowering said carton onto at least one article wherein said conveying means comprises a plurality of carton engaging means mounted to respective ones of a pair of endless chains, wherein each said carton is held between synchronised carton engaging means, to maintain the carton in a set up condition as it is moved downstream characterised in that adjustment
10 means is provided to adjust one of said pair of endless chains relative to the other said endless chain to receive a different carton type.
2. The apparatus according to claim 1, wherein control means are arranged to control the adjustment means.
3. The apparatus according to claim 2, wherein the control means are arranged
15 to control the speed of said carton engaging means to marry the carton speed with the speed of the articles.
4. The apparatus according to claim 3 wherein the control means controls the angle of incline of the carton engaging means.
5. The apparatus according to claim 3 or claim 4 wherein said control means
20 comprises means for receiving information regarding the speed of articles in the feed path.
6. The apparatus according to claim 5 wherein said control means comprises a sensor arranged to measure the speed of articles in the feed path.



7. The loading mechanism according to claim 2 or claim 3 wherein said carton engaging means comprises a plurality of spaced lugs said lugs being adapted to engage opposed panels of said carton at spaced locations intermediate ends and at spaced locations intermediate its traverse edges.
- 5 8. The loading mechanism according to claim 7 wherein said lugs are shaped to engage and/or maintain said carton in a horizontal plane.
9. The loading mechanism of claim 7 or claim 8 wherein said support lug comprises a support face in juxtaposed relationship with said panel during said engagement and a protruding portion adapted to engage a recess or aperture of said panel.
- 10 10. The apparatus according to claim 9 further comprising a second protruding portion spaced horizontally from said protruding portion.
11. The apparatus according to claim 9 or claim 10 wherein each said lug is mounted on a cam track, wherein said cam track provides a path for said lug to maintain said support face parallel to said panel during said engagement.
- 15 12. The apparatus according to any of claims 1 to 11 wherein regulating means is provided to control the flow of articles at said infeed end, said regulating means further comprising means to control the pressure of said articles into the machine and means to determine the correct number of articles for each carton.
- 20 13. The apparatus according to claim 9 wherein said means to control the pressure of said articles comprises an infeed star wheel.
14. A packaging machine for continuously packaging cartons with articles, the apparatus of any one of claims 1 to 13.

15. A method of continuously loading different types of cartons which method comprises causing each carton sequentially to be delivered in a set up condition to an infeed end of a loading station in a packaging machine, maintaining the carton in a set up condition as it is moved downstream, causing said set up carton to be supported by support means and held in a set up condition and loading the carton by lowering said carton onto at least one article as it moves downstream.

