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SYSTEM AND APPARATUS FOR PACKING CONTAINERS IN CARTONS

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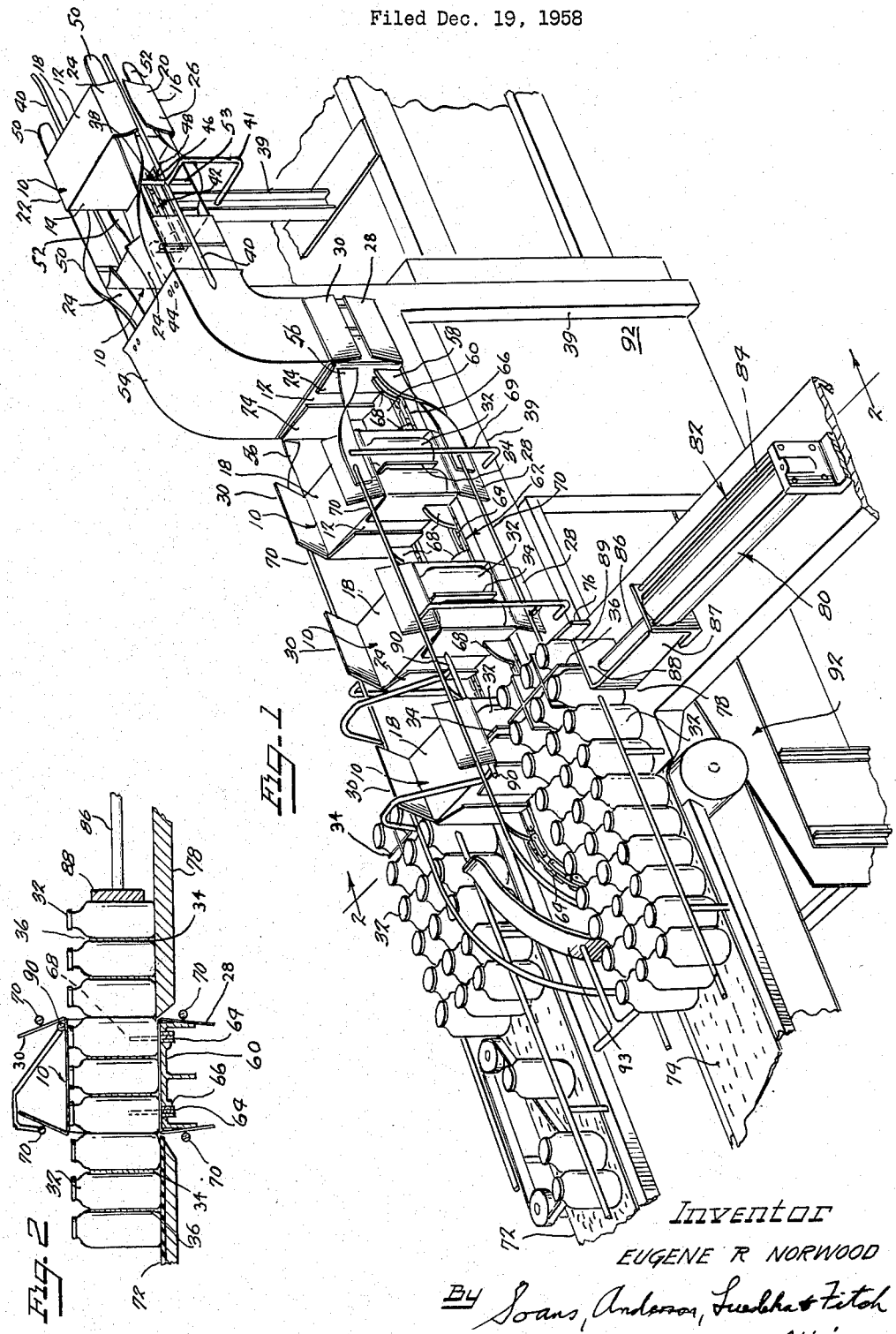


Fig. 1

Fig. 2

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SYSTEM AND APPARATUS FOR PACKING CONTAINERS IN CARTONS

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The present invention relates generally to a system and apparatus for packing containers in cartons, and more specifically the invention relates to a system and apparatus for unpacking empty containers from cartons and packing filled containers therein.

In industries in which food and other products are packed in containers, such as those made of glass, paper or metal, it is common practice for the manufacturer of the containers to supply the product manufacturer not only with the empty containers themselves, but also with the shipping cases or cartons in which the food or other products are to be shipped to the distributor or consumer. Ordinarily, the closure flaps of such cartons are folded to a closed position but are generally left unsealed. When the product manufacturer desires to use the containers he opens the shipping cartons and removes the containers therefrom. The containers are then filled with the product to be packaged, labeled and replaced in the shipping cartons. Then the cartons are closed and sealed, after which the cartons are either stored, or shipped to the distributor or ultimate consumer.

In previously available apparatus for unloading containers from cartons, the top or bottom closure flaps are automatically folded back, and either the containers are lifted out of the carton, or else the carton is automatically inverted and the containers are displaced. The empty carton is then delivered to a second apparatus which loads filled containers into the carton, the carton being lowered over the containers or, in the alternative, the containers being pushed into an inverted carton. Such loading and unloading apparatus occupy excessive floor area and are inefficient in operation. The present invention provides a system and apparatus by which the cartons may be simultaneously loaded and unloaded, thereby minimizing the amount of floor area required for, and increasing the efficiency of the packaging operation.

Accordingly, it is an object of the present invention to provide a system for packing and unpacking cartons. Another object of the invention is the provision of a system of simultaneously loading and unloading a carton having closure flaps. Still another object is the provision of an apparatus for unpacking contianers from cartons and packing containers therein.

Other objects and advantages of the present invention will become apparent by reference to the following description and the accompanying drawing.

In the drawings:

Figure 1 is a fragmentary schematic perspective view of a system of unpacking and repacking cartons embodying certain features of the present invention; and

Figure 2 is a section view taken along line 2—2 of Figure 1.

Generally, the system illustrated in the drawing is utilized to unpack and repack a shipping case or carton having a pair of opposite end walls that include closure flaps. The carton, which is initially filled with empty containers and has its closure flaps closed but not firmly sealed, is continually or intermittently advanced along a

predetermined path of travel. As the carton is advanced therealong, the closure flaps of the carton are opened; after which a group of filled containers are inserted into one end of the carton in timed relation to the travel of the carton, thereby pushing the empty containers within the carton out through the other end of the carton. The closure flaps of the carton are then closed and sealed.

More specifically, the shipping cases or cartons **10** illustrated are rectangular in cross section and may be made of corrugated board, fiber board or the like. Each carton **10** includes four interconnected side panels **12**, **14**, **16** and **18** which define a tube having a rectangular cross section. A pair of opposite end walls **20** and **22** are also provided, each end wall including a pair of outer closure flaps **24** and **26** hinged respectively to two opposite side panels **12** and **16** and a pair of inner closure flaps **28** and **30** hinged respectively to the two other side panels **14** and **18**. Initially, each carton **10** is filled with containers **32**, such as glass jars, cans, etc., so that the seam between the outer flaps **24** and **26** is disposed generally parallel to the vertical axes of the containers **32**. If desired the individual containers **32** may be separated by a case divider **34** which may comprise longitudinally and transversely extending, vertically arranged partitions **36**.

The cartons **10** filled with empty jars **32** and having their end enclosure flaps **24**, **26**, **28** and **30** closed but unsealed are fed successively by a conventional loading conveyer (not shown) to the inlet end (i.e., the right hand end as shown in the drawing). In describing the movement through the apparatus, the terminal end of the apparatus will be considered as the front or forward end, and the movement of the cartons is from right to left as shown in Figure 1. Each carton **10** is placed upon the loading conveyer (not shown) so that the seam between the outer closure flaps **24** and **26** will be parallel to the path of movement through the apparatus.

The loading conveyor delivers the carton **10** to a guiding means which includes an elongated horizontally extending support table **38** supported by a suitable frame **39**. In order to insure the proper transverse positioning of the carton **10** on the support table **38** a pair of horizontally spaced apart, forwardly extending guide rods **40** may be provided along each side of the support table **38**. The guide rods **40** illustrated have their rearward ends bent outwardly and are spaced apart a distance slightly greater than the transverse length of the cartons **10** so that the guide rods **40** do not interfere with the folding back of the outer closure flaps **24** and **26** described hereinafter. Each guide rod **40** is located above the support table **38** at such a height as to be adjacent the medial line between the outer closure flaps **24** and **26**. The guide rods **40** are mounted to the frame **39** by brackets **41** or the like.

The carton **10** is advanced to the left as shown in the drawing along the support table **38** by a suitable conveyor **42**, such as a series of spaced apart upstanding lugs **44** carried by an endless chain **46**, the rearward panel of the carton **10** being engaged by one of the lugs **44**. The upper run of the chain **46** is supported in a longitudinally extending channel **48** in the support table **38**, one end of the chain **46** being supported by an idler sprocket (not shown) and the other end being supported by a driving sprocket (not shown). The driving sprocket is connected through a gear arrangement (not shown) to a suitable drive motor (not shown) which may intermittently drive the chain **46**.

As the carton **10** is advanced to the left along the support table **38** the outer closure flaps **24** and **26** of each end wall **20** and **22** of the carton **10** are opened by suitable means such as a pair of longitudinally extending, horizontally spaced apart stationary plows **50**

and 52, the plows 50 and 52 being located so that the rear ends thereof are forced between the inner surface of the outer closure flaps 24 and 26 and the outer surface of the inner closure flaps 28 and 30. Each of the plows 50 and 52 defines a cam surface that is gently curved outwardly from a vertical plane near its rearward end to an inwardly directed, horizontal plane near its forward end in order to thereby gradually fold the flaps outwardly, upwardly, and backwardly and then maintain the closure flaps in a folded back condition. Pressure may be applied to the upper side panel of the carton 10 by suitable rollers (not shown) to partially open the closure flaps 24 and 26 and thereby facilitate the entry of the rearward ends of the plows 50 and 52.

So that the folding under of the lower, outer closure flaps 26 is unobstructed, the longitudinal side of the support table 38 adjacent the forward portion of the plows 52 may be recessed as shown in the drawing. The plows 50 and 52 are suitably mounted on the support table 38 by vertically disposed brackets 53 or the like.

In order to open the inner closure flaps 28 and 30 of the carton 10 and to position the containers 32 in an upright relationship, the carton is then rotated 90°. This is accomplished in the illustrated structure by a rotating means 54 in the form of an arcuate chute located adjacent the forward end of the support table 38 which rotates the carton 10 a quarter of a turn about its transverse axis to thereby position the inner closure flaps 28 and 30 so that they may be subsequently folded back by stationary plows 56 and 58. The arcuate chute 54, which is a 90° sheet metal elbow of slightly larger cross section than the cross of the carton 19, is located so as to receive a carton 10 from the conveyor 42, and then by gravity deliver the carton 10 to a lower longitudinally extending support table 60 suitably supported by the frame 39. To prevent the contents of the carton 10 and/or the carton itself from being damaged in moving through the chute 54, suitable retarding devices (not shown) may be located on the inner surfaces of the chute 54.

The lower end of the arcuate chute 54 terminates at a sufficient distance above the second mentioned support table 60 to allow a carton 10 to be moved from under the chute 54. The carton 10 is intermittently advanced to the left along the second mentioned support table 60, as shown in the drawing, by a suitable conveyor 62, such as a pair of intermittently operated endless chains 64, the upper runs of the chains being supported in longitudinally extending, spaced apart channels 66 in the surface of the second mentioned support table 60. One end of each of the chains is supported by a driving sprocket (not shown) and the other end is supported by an idler sprocket (not shown), the driving sprocket being intermittently rotated by a Geneva drive (not shown) powered by an electrical motor (not shown). The chains 64 are provided with a plurality of upstanding lugs 68 which are spaced apart a distance such that a carton 10 with its outer flaps 24 and 26 folded back may be positioned between the lugs 68, the lugs thereby maintaining the outer flaps in a folded back relationship.

To prevent the carton 10 from being impaled by the lugs 68, the second mentioned conveyor 62 may be operated in timed relation to the first mentioned conveyor 42. It should be understood that the carton 10 may be prevented from being impaled by the lugs 68 by other means without departing from the scope of the invention. For instance, a solenoid operated gate (not shown) may be located at the forward end of the first mentioned support table 38, the gate being opened electrically when the lugs 68 are in the proper position to receive a carton 10. For proper operation of the gate means the first mentioned conveyor 42 may be provided with an overriding clutch (not shown).

The cartons 10 may be maintained transversely of the support table 60 as they are moved therealong by providing a pair of longitudinally extending rods (not shown) which are horizontally spaced apart a distance slightly greater than the transverse length of the carton 10. So as not to interfere with the folding back of the inner closure flaps 28 and 30, described hereinafter, the rods are disposed above the second mentioned support table 60 a distance approximately equal to one-half of the distance between the side panels 14 and 18 of the carton 10.

As the carton 10 is moved along the second mentioned support table 60 each of the inner flaps 28 and 30 is folded back by the stationary plows 56 and 58, respectively. Each plow 56 and 58 defines a cam surface that is gently curved outwardly from a vertical plane near its rearward end to inwardly slanted plane near its forward end to thereby gradually fold the inner flaps 28 and 30 outwardly, upwardly, and then slightly backward. These second mentioned plows 56 and 58, which are suitably supported by brackets 69 connected to the second mentioned support table 60 are shaped and located so as to fold back the inner closure flaps 28 and 30 sufficiently to position the flaps 28 and 30 under flap guide rods 70 which extend forwardly from the forward ends of the plows 56 and 58. The flap guide rods 70, which are suitably mounted to the second mentioned support table 60, maintain the flaps 26 and 28 in a folded back position as the carton 10 is moved to the left along the second mentioned support table 60.

After the inner flaps 28 and 30 are folded back the carton 10 is advanced along the second mentioned support table 60 to a position where a group of filled containers 32 are inserted into one end of the carton 10 thereby pushing the empty containers therein out through the other end of the carton 10. In the illustrated embodiment, the empty containers 32 are pushed onto a conveyer belt 72 which, after the case divider 34 is removed from between the containers 32, delivers the containers 32 to other apparatus where the containers 32 may be sterilized, filled with the material to be packaged, sealed, labeled and returned by a loading conveyer belt 74 of the conventional type. The conveyer belt 74, in the illustrated embodiment, extends longitudinally of the second support table 60 and carries the containers 32 to a position opposite the opened end of the carton 10 to be filled. Before reaching such a position, however, the containers 32 may be manually or mechanically arranged in a group by a case divider 34 similar to the one previously mentioned, the group in the illustrated embodiment including two rows of three containers each. The case divider 34 may also be inserted automatically, if desired, without departing from the invention.

In order to assure that the group of containers 32 is in proper position to be inserted into the open end of the carton 10, a transversely extending stationary stop guide 76 may be provided on a loading table 78, the guide 76 extending parallel to the trailing side panel 16 of the carton being filled. The loading table 78, which is mounted on the frame 39, forms an extension of the surface of the loading conveyer belt 74.

The group of filled containers 32 is inserted into the carton 10 being filled by a suitable means 80 which is operated in timed relation to the second mentioned conveyer 62. In the illustrated embodiment, the inserting means 80 includes a compressed air operated piston 82 suitably mounted to the extension of the loading table 78, in normal relation to the end of the carton 10 being filled, and is spaced a sufficient distance transversely from the end of the carton 10 to permit a group of containers 32 to be positioned therebetween. The piston 82 includes a cylinder 84, a piston (not shown), a piston rod 86 and a L-shaped blade 88 attached to the end of the piston rod 86 so that one leg 87 thereof provides a stop for the containers 32 while the other leg 89 is being utilized to insert a group of containers into the carton 10. If desired the blade 88 may be made generally T-shaped without departing from the invention, so as to

thereby provide a guide for the trailing edge of the group of containers 32 as it is being inserted into the carton 10.

When compressed air is applied to the piston 82, the piston rod 86 moves outwardly and the blade 88 contacts the end of the group of containers 32 thereby pushing the containers 32 into the carton 10 to be filled. To reduce the possibility of the lower edge of the group of containers 32 from snagging on the lower edge of the carton 10 to be filled, the surface of the loading table 78 may be at a slightly higher lever than the surface of the second mentioned support table 60.

Suitable means, such as longitudinally extending stationary back-up rod 90 may be provided to prevent transverse displacement of the carton 10 being filled. The back-up rod 90 illustrated is located above the longitudinal side of the support table 60 which is adjacent the inserting means 82 in such a position as to bear upon the inner surface of the corner formed by the folded back upper inner closure flap 30 and the adjacent top side panel 14 of the carton 10 being filled. The back-up rod 90 is suitably mounted to one of the guide rods 70. The lower inner closure flaps 28 may be backed up by the longitudinal side of the support table 60 which may be slightly undercut, as shown in the drawing.

It should be apparent that since the closure flaps 24, 26, 28 and 30 on the end of the carton 10 facing away from the inserting means 82 open outwardly the closure flaps are positively opened as a matter of convenience and may be opened by the group of containers 32 being pushed through the carton 10 without departing from the invention.

After the carton 10 is loaded with the group of filled containers 32, the carton 10 is advanced to a suitable flap closing mechanism 92, shown generally in the drawing. In the illustrated embodiment, the flap closing mechanism is located on a lower level than the second mentioned support table 60. Suitable U-shaped guides 93 are provided at the forward end of the second mentioned support table 60 to receive the carton 10 from the second mentioned conveyer 62 and deliver the carton 10 to the flap closing mechanism 92.

Generally, the flap closing mechanism 92 closes the inner flaps 28 and 30, applies glue to the outer surfaces of the inner flaps 28 and 30, then closes the outer flaps 24 and 26, and maintains the flaps under compression until a proper bond is effected between the inner and outer flaps. Automatic closing mechanism are well known and since the particular construction of the flap closing mechanism is not an important part of the invention, it will not be described or shown in detail.

The carton 10, after it is sealed by the automatic flap closing mechanism 92, is then in condition to be shipped to the ultimate consumer or stored for further use.

Various changes and modifications, which will be obvious to those skilled in the art, may be made in the above described system and apparatus for unpacking and packing cartons without departing from the spirit or scope of the invention. Various of the features of the invention are set forth in the appended claims.

I claim:

1. A system of unpacking and packing a carton having a pair of opposite end walls that include closure flaps, the carton initially containing empty containers, said system comprising feeding the carton along a predetermined path of travel, opening the closure flaps of at least one end of the carton as the carton advances along said path of travel, inserting a group of filled containers into the one end of said carton in timed relation to the travel of said carton thereby effecting removal of the empty containers from the other end thereof, moving the removed empty containers away from the path of travel, and closing said closure flaps as said carton advances along said path of travel.

2. A system of unpacking and packing a carton having a pair of opposite end walls that include closure flaps, the carton initially containing empty containers, said system comprising feeding the carton along a predetermined path of travel, opening the closure flaps at each end of the carton, holding the closure flaps open as the carton advances along said path of travel, while holding the closure flaps open inserting a group of filled containers into one end of said carton in timed relation to the travel of said carton thereby effecting removal of the empty containers from the other end thereof, moving the removed empty containers away from the path of travel, and closing said closure flaps as said carton advances along said path of travel.

3. A system of unpacking and packing a carton having a pair of opposite end walls each including inner closure flaps hinged respectively to two opposite side panels of the carton and outer closure flaps hinged respectively to the two other side panels, the carton initially containing empty containers, said system comprising intermittently feeding the carton along a predetermined path of travel so that the seam between the outer closure flaps is parallel to the path of travel, opening the outer closure flaps of at least one end of the carton as the carton advances along said path of travel, rotating the carton a quarter of a turn about an axis disposed transversely of said path of travel, opening the inner closure flaps of the one end of the carton as the carton advances along said path of travel, inserting a group of filled containers into the one end of said carton in timed relation to the travel of said carton thereby effecting the removal of the empty containers from the other end thereof, moving the removed empty containers away from the path of travel, and sealing the closure flaps as said carton advances along said path of travel.

4. A system of unpacking and packing a carton having a pair of opposite end walls each including inner closure flaps hinged respectively to two opposite side panels of the carton and outer closure flaps hinged respectively to the two other side panels, the carton initially containing empty containers having their vertical axes disposed parallel to the seam between the outer closure flaps, said system comprising intermittently feeding the carton along a predetermined path of travel so that said seam between the outer closure flaps is parallel to the path of travel, opening the outer closure flaps on both ends of the carton as the carton advances along said path of travel, rotating the carton a quarter of a turn about an axis disposed transversely of said path of travel, holding the outer closure flaps open, opening the inner closure flaps on both ends of the carton as the carton advances along said path of travel, holding the inner closure flaps open, while holding the inner and outer closure flaps open inserting a group of filled containers into one end of said carton in timed relation to the travel of said carton thereby effecting the removal of the empty containers from the other end thereof, moving the removed empty containers away from the path of travel, and closing and sealing the closure flaps as said carton advances along said path of travel.

5. An apparatus for unpacking and packing a carton having a pair of opposite end walls that include closure flaps, the carton initially containing empty containers, said apparatus comprising means for guiding the carton along a predetermined path of travel, means associated with said guiding means for opening the closure flaps of at least one end of the carton, means associated with said guiding means for inserting a group of filled containers into the one end of the carton thereby effecting the removal of the empty containers from the other end of the carton, means associated with said guiding means for receiving the removed empty containers and moving the received containers away from the path of travel, means associated with said guiding means for closing the closure flaps of the carton, and means associated with said guiding means for intermittently advancing the carton along

said guiding means sequentially to said flap opening means, said inserting means, and said flap closing means, the inserting means operating in timed relation to said advancing means.

6. An apparatus for unpacking and packing a carton having a pair of opposite end walls that include closure flaps, the carton initially containing empty containers, said apparatus comprising means for guiding the carton along a predetermined path of travel, means associated with said guiding means for opening the closure flaps on both ends of the carton, means associated with said guiding means for holding the closure flaps open, means associated with said guiding means for inserting a group of filled containers into one end of the carton thereby effecting the removal of the empty containers from the other end of the carton, means associated with said guiding means for receiving the removed empty containers and moving the received containers away from the path of travel, means associated with said guiding means for closing the closure flaps of the carton, and means associated with said guiding means for intermittently advancing the carton along said guiding means sequentially to said flap opening means, said inserting means, and said flap closing means, the inserting means operating in timed relation to said advancing means.

7. An apparatus for unpacking and packing a carton having a pair of opposite end walls each including inner closure flaps hinged respectively to two opposite side panels of the carton, and outer closure flaps hinged respectively to the two other side panels, the carton initially containing empty containers having their vertical axes disposed parallel to the seam between the outer closure flaps, said apparatus comprising means for guiding the carton along a predetermined path of travel so that the seam between the outer closure flaps is parallel to said path of travel, means associated with said guiding means for opening the outer flaps of both ends of the carton, means associated with said guiding means for rotating the carton a quarter turn about an axis disposed transversely of said path of travel, means associated with said guiding means for opening the inner closure flaps of both ends of the carton, means associated with said guiding means for inserting a group of filled containers into one end of the carton thereby effecting the removal of the empty containers from the other end of the carton, means associated with said guiding means for receiving the removed empty containers and moving the received containers away from the path of travel, means associated

with said guiding means for closing and sealing the closure flaps of the carton, means associated with said guiding means for intermittently advancing the carton along said guiding means sequentially to said outer flap opening means, said rotating means, said inner flap opening means, said inserting means, and said closing and sealing means, said inserting means operating in timed relation to said advancing means.

8. An apparatus for unpacking and packing a carton having a pair of opposite end walls that include inner closure flaps hinged respectively to two opposite side panels of the carton, and outer closure flaps hinged respectively to the two other side panels, the carton initially containing empty containers having their vertical axes parallel to the seam between the outer closure flaps, said apparatus comprising means for guiding the carton along a predetermined path of travel so that the seam between the outer closure flaps is parallel to the path of travel, means associated with said guiding means for opening the outer and inner closure flaps of both ends of the carton, an inserting means associated with said guiding means which includes a reciprocable member which is operable along a path of movement disposed transversely of said path of travel, said member being reciprocable between a position in which the member is engaged with a group of filled containers and a position in which the group of filled containers is fully inserted into the carton, the empty containers within said carton being removed as the group of filled containers is inserted into the carton, means associated with said guiding means for receiving the removed empty containers and moving the received containers away from the path of travel, means associated with said guiding means for closing the inner and outer closure flaps, means associated with said guiding means for intermittently advancing the carton along said guiding means sequentially to said flap opening means, said inserting means, and said flap closing means, the member being reciprocated in timed relation with the advancing means.

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