Oct. 7, 1958 J. L. NEAL ET AL 2,855,117

FLAP OPENING APPARATUS

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Fig. 1

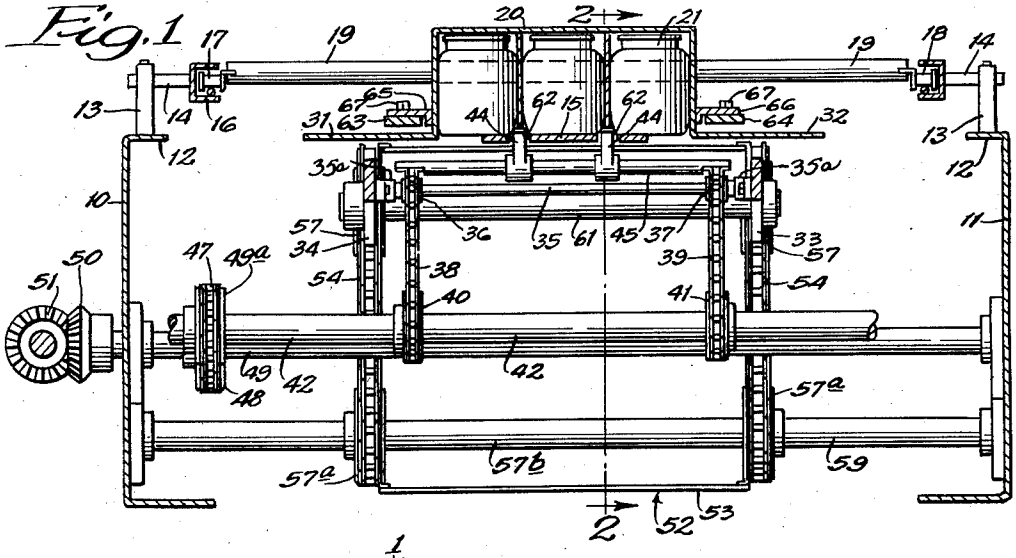


Fig. 2

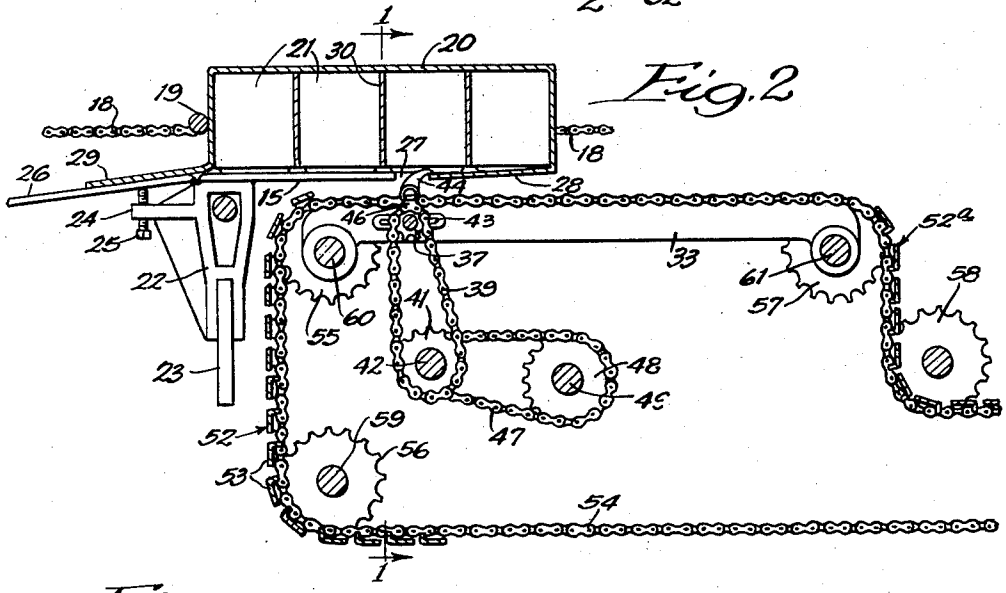
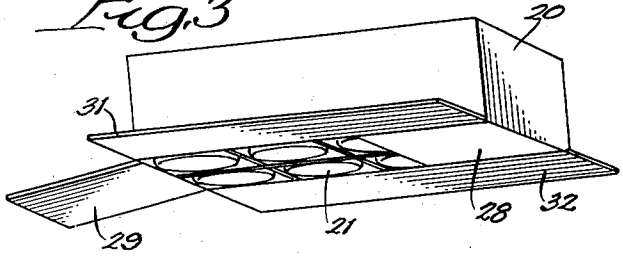


Fig. 3



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Fig. 4

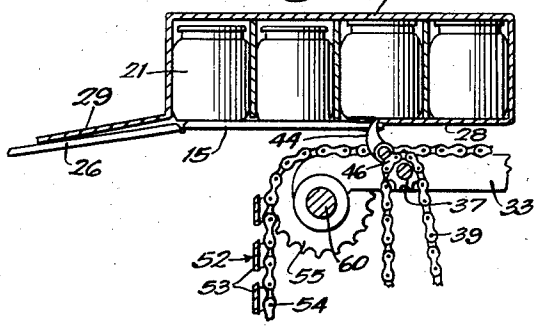


Fig. 5

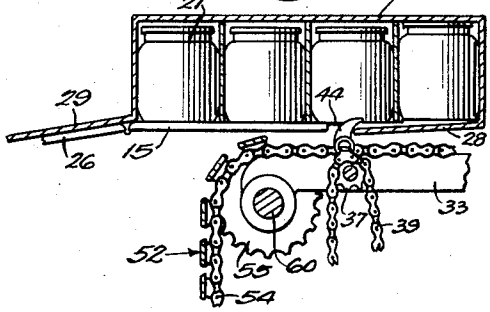


Fig. 6

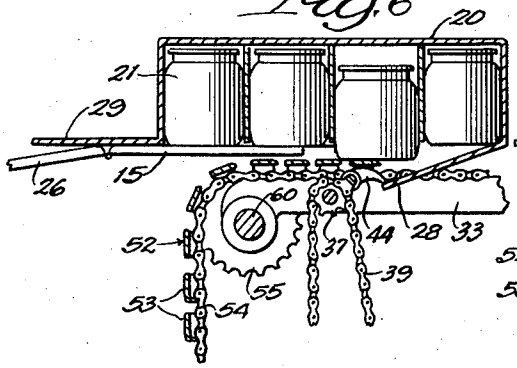


Fig. 7

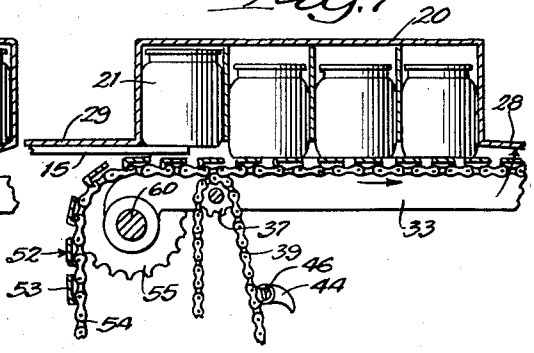
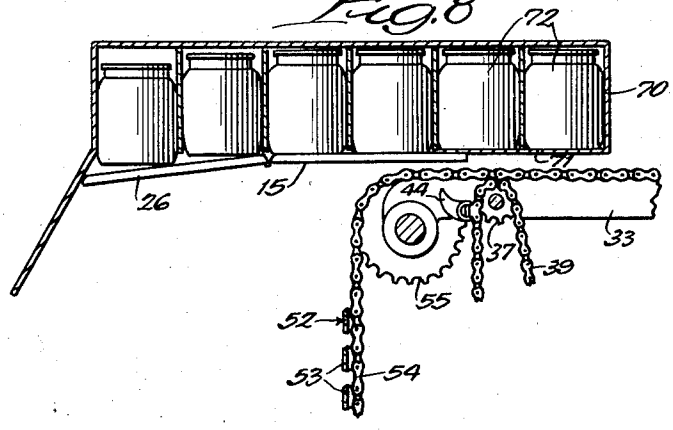


Fig. 8



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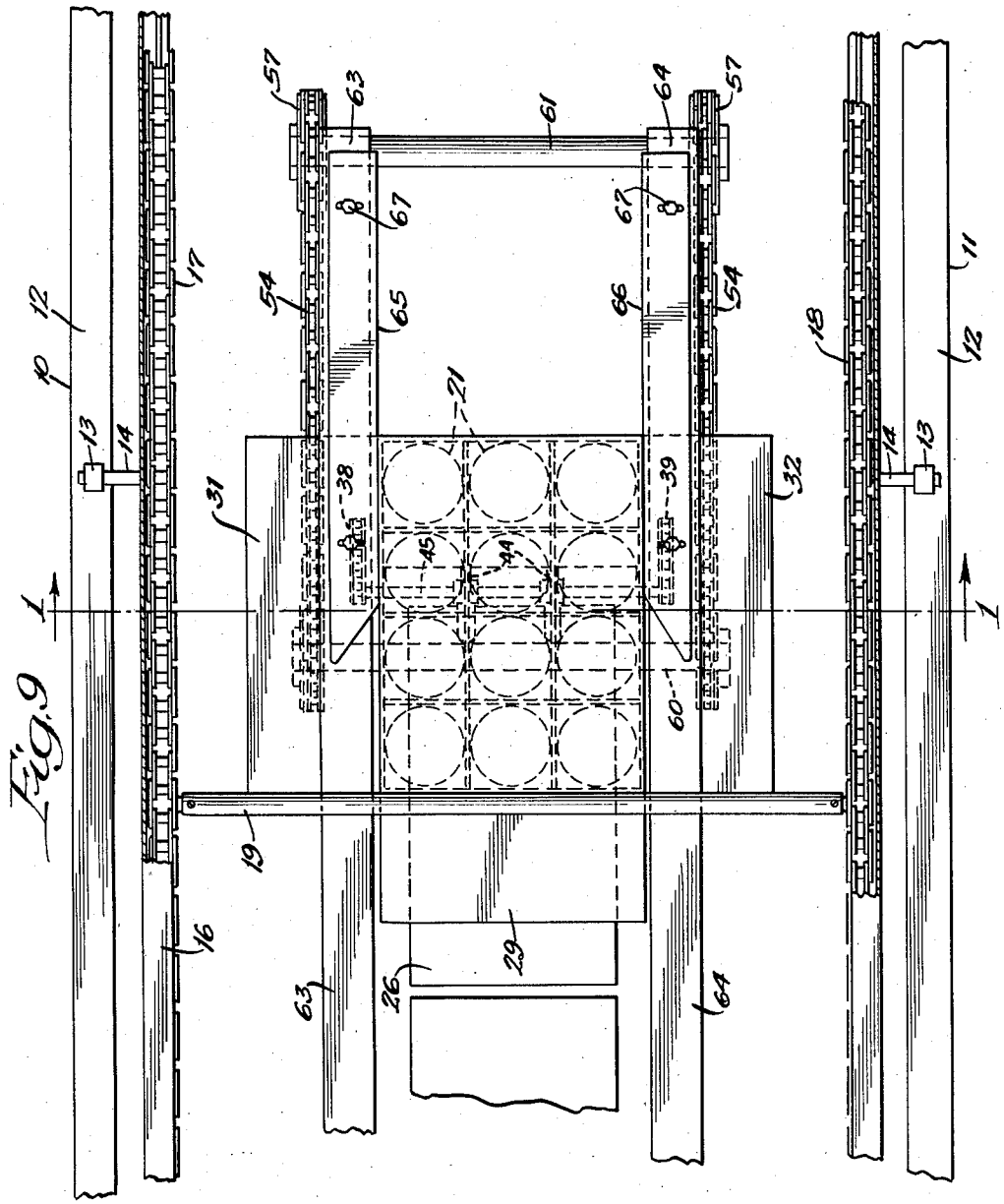


Fig. 9

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United States Patent Office 2,855,117 Patented Oct. 7, 1958

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FLAP OPENING APPARATUS

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Application January 25, 1955, Serial No. 484,034

6 Claims. (Cl. 214—304)

This invention relates to case unloading mechanism, and more particularly to apparatus for opening certain of the flaps of cardboard cases and cartons. The apparatus is useful in the opening of cases however oriented in the case unloading mechanism, and we have found it especially useful where the cases are inverted during the flap opening operation.

Bottles and cans and similar containers are now shipped in great quantities from the manufacturer in cardboard and paperboard cartons having top and bottom closure flaps. The cartons must be opened and the containers removed therefrom prior to their being run through a filling line. The flaps of such cartons are ordinarily unsealed and automatic unloading mechanism has been developed for opening those flaps and for discharging the containers from the cartons. One of the serious problems encountered in such mechanism is that of opening the carton flaps, for unless properly and freely opened, the carton cannot be unloaded and interruption of the operations and jamming of the mechanism may occur.

As is well known, the cartons have four closure flaps, both on the top and bottom sides thereof. The front and rear flaps (transversely-extending flaps) are the inner flaps, while the side flaps (longitudinally-extending flaps) are folded there-over and are the outer flaps. The inner flaps and the opening thereof will be considered in particular in this application.

The top closure flaps, both the inner and outer, are not generally sealed, and in the opening thereof, particularly of the inner flaps, dependence has been placed in the past on the natural resiliency or tendency of those flaps to spring outwardly toward open position. However, such resiliency is not always present, especially where the cartons have been stored for long periods with the flaps thereof in closed position, which causes them to take on a permanent "set." Other conditions may be present which will also overcome the natural resiliency of the flaps, together with the weight of the containers within the carton, and tend to keep them in closed position. Further, in some case unloading lines, the speed of movement of the cases therethrough is such that there is insufficient time for the flaps to spring open through their own resiliency.

There has long been a need for a good means in case unloader apparatus for positively opening the flaps of cartons, and it is, accordingly, an object of this invention to provide such a means. Another object of the invention is to provide simple and effective mechanism for positively initiating the opening of the inner flaps of cartons being unloaded in automatic case unloader apparatus. Still another object is in providing, in case unloader apparatus, fingers that move in timed relation with

the movement of a case or carton through the apparatus, the fingers being operative to engage the free edge of an inner flap and to pull it outwardly, whereby the opening of such flap is positively initiated and any tendency of the flap to remain in closed position is overcome.

Yet another object is to provide in case unloader apparatus wherein cartons are advanced in inverted position and the flaps opened to permit containers to be discharged therefrom, flap opening fingers carried by an endless chain timed with the movement of cartons through the apparatus, the fingers being operative to engage the free edge portion of the forward inner flap to positively pull the flap toward an open position wherein other mechanism can complete the flap opening operation. A further object is in providing case unloader apparatus wherein the flaps of the case are opened and the containers discharged therefrom while the carton is inverted, gripper means operative to squeeze the carton along one dimension thereof to hold the containers therein while certain of the flaps are being opened. Still a further object is in the provision of apparatus as described wherein the gripper means comprise members mounted along the conveyor track and on each side thereof, the members being operative to squeeze the cartons transversely to hold the containers therein while they are otherwise unsupported, such members being particularly useful where elongated cases are employed and the inner flaps do not extend under all of the containers, a twenty-four pack case, for example. Additional objects and advantages will appear as the specification proceeds.

An embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical sectional view of apparatus embodying the invention and which is taken along the line 1—1 of Fig. 2; Fig. 2 is a broken, longitudinal, sectional view, taken along the line 2—2 of Fig. 1; Fig. 3 is a perspective view showing a twelve-pack carton of the character shown in the apparatus shown in Figs. 1 and 2; Figs. 4, 5, 6 and 7 are broken longitudinal sectional views showing the progression of steps in the opening of an inner flap of a case or carton; and Fig. 8 is a broken longitudinal sectional view similar to that of Figs. 4 through 7 showing a twenty-four pack carton in position in the apparatus and Fig. 9 is a fragmentary top plan view of the apparatus shown in Fig. 1.

Case unloading apparatus, as such, is well known in the art, and for that reason the complete structure in its entirety has not been shown in the drawings, for it is believed unnecessary to a complete description and understanding of the present invention. In the event that it is found desirable to refer to the complete mechanism comprising a case unloader, reference may be made to the copending application of Sylvan V. Dice, Serial No. 388,351, filed October 26, 1953. In such apparatus, cartons are advanced along a track and through a plurality of separate stations. In the first of these stations, the outer, or longitudinally-extending, closure flaps are moved from closed to an open position, and in subsequent stations the inner, or transversely-extending flaps are moved to open position. Thereafter, the contents of the cartons are permitted to drop therefrom and onto a suitable conveyor, while the empty carton is carried away from the contents.

The apparatus shown comprises side plates 10 and 11 that are adapted to be supported upon suitable standards (not shown). The plates 10 and 11 are spaced apart and extend in parallel relation and are turned inwardly at

their upper ends to provide the flange supports 12. Extending upwardly from the flanges 12 and rigidly secured thereto, are support bars 13 which adjustably receive support arms 14 that extend inwardly therefrom and toward the conveyor track 15. The flight chains 17 and 18 are endless and are entrained about suitable drive and idler sprockets (not shown), which advance the chains in a direction toward the right, as viewed in Fig. 2, and thereby advance the cartons 20 which are engaged by one of the flight bars 19.

Preferably, the conveyor track 15 provides a flat, horizontal surface that receives and supports the containers 21 carried within the carton 20. The track or table 15 may be supported by a bracket member 22 that is rigidly secured to an upright or standard 23. The bracket 22 may have a rearwardly-extending flange 24 secured thereto which threadedly receives a stop pin 25 extending therethrough and which provides an abutment for limiting downward pivotal movement of the conveyor track plate 26 which is hingedly secured to the main conveyor track 15, as is seen best in Fig. 2.

The conveyor track 15 terminates or provides an opening therethrough, as is designated generally with the numeral 27, that is adapted to permit the forward inner flap 28 of a carton 20 to be swung downwardly therethrough. The carton 20 is also provided with an inner rear flap 29 and has a plurality of partitions 30 therein which provide separators for the containers 21. As is seen best in Fig. 3, the cartons 20 also have outer side or longitudinally-extending flaps 31 and 32, and those outer flaps are opened prior to the opening of the inner flaps. In the position of the carton as shown in Fig. 2, the outer flaps 31 and 32 have already been opened, as has the rear inner flap 29.

Ordinarily, the forward inner flap 28 will tend to spring downwardly when adjacent the opening 27, due to its natural resiliency and due also to the weight of the containers 21 which rest thereon. Where the flap is set in closed position, or where the containers 21 are extremely light in weight, for example, metal cans as contrasted with glass jars, the flap 28 may not spring downwardly. We insure positive opening of the flap 28 by the arrangement that will now be described.

A pair of spaced-apart supports 33 and 34 are provided along opposite sides of the track 15 and extend in substantially longitudinal parallel relation therewith. Extending between the supports 33 and 34 and journaled therein for rotational movement, is a shaft 35 that carries thereon adjacent its opposite end portions a pair of sprocket wheels 36 and 37. Entrained about the sprockets 36 and 37, respectively, are endless chains 38 and 39 that are entrained about drive sprockets 40 and 41. The sprockets 40 and 41 are carried on a shaft 42 that extends transversely across the apparatus. The members 33 and 34 are provided with an elongated slot 43 therein, as is seen best in Fig. 2, that receives the shaft 35 and permits relative longitudinal movement between that shaft and the track 15 so as to accurately position the point at which the fingers 44 enter the opening 27. Means are provided for locking the shaft 35 in any selected position within the slot 43, as is shown in Fig. 1 wherein slidably-adjustable bearing blocks 35*a* are illustrated.

The fingers 44, as is seen best in Fig. 1, are rigidly secured to a bar 45 that extends transversely between the chains 38 and 39 and is rigidly secured thereto by bracket members 46 that may constitute one of the links of the endless chains. When the sprockets 40 and 41 are driven, the endless chains 38 and 39 are carried about their respective sprocket wheels and cause the fingers 44 to move through a path that brings them into the opening 27 where they can engage the free forward edge of the flap 28 and then outwardly therefrom so as to cause the flap to be moved toward open position.

A link chain 47 entrained about a sprocket wheel 48, carried on a shaft 49 is also entrained about a sprocket 49*a* carried by the shaft 42. Movement of the fingers 44 is provided through that mechanism when the shaft 49 is rotated. The shaft 49 is journaled in the plates 10 and 11 and extends outwardly through the plate 10 and is equipped with a bevel gear 50. The gear 50 meshes with a complementary bevel gear 51 that is driven by suitable means (not shown), such as an electric motor.

A package plate, designated generally by the numeral 52, and which comprises a plurality of L-shaped support members 53, is carried by endless chains 54 each entrained about paired sprockets 55, 56, 57, and about at least one other sprocket 57*a* mounted on shaft 57*b* (Fig. 1). Preferably, a take-up and guide sprocket 58 is provided for each chain 54. It will be appreciated that one chain 54 is provided on each side of the track 15 and similar sprocket members 55, 56 and 57 are provided for each of the chains. Since the chains are identical, as are the sprocket members, the same numerals are affixed thereto for purposes of identification.

The sprockets 56 are mounted upon a shaft 59 that is journaled for rotation in suitable bearings provided by the plates 10 and 11. The sprockets 55 and 57 are carried respectively by shafts 60 and 61 that are journaled for rotary movement in the plates 33 and 34. The chains 54 are driven in a timed relation with the movement of the flight chains 17 and 18 and with the movement of the chains 38 and 39 and the fingers 44 carried thereby, so that the package plate 52 is brought into engagement with the flap 28 after the opening thereof has been initiated by the fingers 44, and its movement is at a greater rate of speed than the movement of the flight chains 17 and 18 so that it is effective to complete the opening of the flap 28 and functions to receive the containers 21 thereon as they drop from the carton 20.

It is noted in Fig. 1 that the track 15 is provided with longitudinally-extending slots 62 adjacent the forward end thereof which are adapted to have the fingers 44 pass therethrough. With this arrangement, the fingers can be brought into engagement with the free edge portion of the flap portion 28 at substantially the moment that it is adjacent the opening 27. Extending along the longitudinal edges of the plate 15 are rails 63 and 64 that are suitably supported and that carry gripper or squeezer members 65 and 66 thereon. The grippers 65 and 66 may be adjustably secured to the rails 63 and 64 by capscrews 67 so that the spacing between the squeezers 65 and 66 may be adjusted to accommodate cartons that may vary somewhat in width.

In operation of the apparatus, the flight chains 17 and 18 are actuated so as to move the flight bars 19 forwardly and thereby advance cartons 20 along the table or track 15. As the carton advances, the outer flaps and the rear inner flaps are opened, and ultimately the forward flap 28 approaches the opening 27 at the end portion of the track 15. The position of the carton 20 at this time is illustrated in Fig. 4.

At the same moment, the fingers 44 have been carried by the endless chains 38 and 39 into the position shown in Fig. 4, where they are about to engage the free edge of the flap 28. When the carton has advanced to a somewhat greater extent, as is shown in Fig. 5, the fingers 44 reach inwardly and into the carton 20 and engage the underside of the flap 28, and subsequent thereto, and while the carton is still being advanced, the fingers 44 move downwardly and swing the flap 28 into a partially open position, as seen in Fig. 6. It is noted that at precisely this time the package plate 52, which is moving at a greater rate of speed than the carton 20, is advancing toward the partially open flap 28. The package plate ultimately engages the flap, and since it does move at a greater rate of speed than the carton, it swings the flap 28 completely through an arc of about 180° from the position of the flap when it is closed. This position of the carton and the flap is shown in Fig. 7, and it is apparent that at such time the fingers 44 are being car-

ried downwardly and away from the carton. Since the underside of the carton is completely open, the containers **21** are free to fall outwardly therefrom and drop onto the package plate **52**. In subsequent stations in the apparatus, the carton is carried away from the containers and the containers are moved onto a suitable conveyor from the package plate.

If a 24-pack carton, such as the one shown in Fig. 8 and which is designated with the numeral **70**, for purposes of identification, is unloaded in the apparatus, the gripper members **65** and **66** are extremely important. It will be noted that the forward inner flap **71** of the carton **70** covers only the forward two rows of containers **72**. Therefore, some of the containers within the carton are unsupported when the outer flaps are opened, and it is desired to hold those containers within the carton while the outer flaps are being opened. The gripper or squeezer members **65** and **66** are spaced apart by a distance such that the side walls of the carton are squeezed together slightly as the carton advances along the track, and the force imposed upon the containers within the carton is sufficient to lock them therein. After the carton has moved beyond the gripper members, the transverse force applied thereby is removed and the cartons can then drop onto the package plate.

As is seen in Fig. 2, the endless chains **54** are preferably provided with at least two package plates. For identification the second plate is designated with the numeral **52***a*. It will be apparent that any number of package plates may be carried by the chains, and the specific number will depend upon the length of the chains and upon the speed of movement thereof and the speed of movement of the cartons through the apparatus. In any case, the package plates will be moved at a speed greater than that of the cartons so that when the package plates engage the forward inner flap, the flap will be moved through an arc of substantially 180°. The fingers **44** function to positively initiate the opening of the inner forward flap and, in the specific apparatus shown, actually open the flap through an angle of about 5°.

While, in the foregoing specification, an embodiment of the invention has been described in considerable detail for purposes of adequately setting forth the invention, it will be apparent to those skilled in the art that numerous changes may be made in these details without departing from the spirit and principles of the invention.

We claim:

1. In case unloader apparatus of the character described for opening the closure flaps of a carton for removal of the contents thereof, means for advancing an inverted carton through said apparatus, means at one location within said apparatus for supporting such carton with the forward inner closure flap thereof unconstrained whereby it can be swung from closed to open position, a finger member movable along a predetermined path for engagement with the closed forward inner flap of such carton to pull the same from closed toward open position, means for moving said finger along said path in timed relation with said first mentioned means, package plate means for receiving articles from such carton when the flaps thereof are opened, and means for moving said package plate means along the path of movement of such carton through said apparatus and at a speed greater than that of the carton so as to bring said package plate means into alignment with the carton after the forward inner flap of such carton is partially opened and the remaining flaps thereof are opened for permitting unloading of the carton onto the package plate means.

2. In case unloader apparatus for opening the closure flaps of a carton to permit the contents thereof to be unloaded, means for opening the forward inner flap of such carton subsequent to the opening of the other flaps thereof comprising a conveyor, means for advancing a carton along said conveyor at a preselected speed; means for supporting a carton at one location along said conveyor subsequent to the opening of the outer flaps and the inner rear flap thereof so as to permit free movement of the inner forward flap from closed to open position, a finger adapted to engage the forward inner flap of such a carton to pull the same from closed toward open position, means for moving said finger in timed relation with the movement of a carton through said apparatus and along a predetermined path to effectuate such engagement of said finger with such forward inner flap, a package plate adapted to engage the forward inner flap of such a carton subsequent to the movement thereof from closed toward open position by said finger to completely open that flap and to receive thereon articles from such carton, and means for moving said package plate in timed relation with the movement of said finger and at a speed in excess of the speed of movement of a carton through the apparatus and in the same direction of movement thereof to effectuate the complete opening of such forward inner flap.

3. In case unloader apparatus, a pair of spaced apart carrier chains equipped at one position therealong with a carrier plate extending therebetween, means for moving said chains through a predetermined path of travel, a conveyor bed disposed above said chains at one end thereof, means for advancing an inverted carton equipped with closure flaps along said conveyor bed, an endless chain oriented for movement along major paths generally normal to the path of movement of a carton along said conveyor bed and spaced therebelow adjacent the end thereof, a finger carried by said endless chain, and means for moving said endless chain so as to advance said finger upwardly toward said conveyor and into engagement with the forward inner flap of a carton advanced therealong and then downwardly therefrom to move such flap from closed toward open position, said carrier chains being moved in timed relation with the movements of said fingers and a carton along said conveyor bed and at a speed in excess thereof so as to engage a flap partially opened by said finger for moving the same into a completely open position and for receiving thereon articles from such carton.

4. In case unloader apparatus, a track, a flight chain equipped with flight bars at spaced points therealong operative to engage cartons supported on said track for advancing the same through said apparatus, a package plate, means for moving said package plate along said track a spaced distance therebelow and at a speed greater than that of said flight chain and the flight bars carried thereby and in the same direction of movement thereof, said track having an opening therein, a finger member, and means for moving said finger member along a predetermined path below said opening and in alignment therewith, said path being upwardly directed for advancing said finger member toward the flap of the carton aligned with said opening for engagement with such flap and then downwardly to partially open that flap, the movement of said package plate being synchronized with the movements of said finger member and said flight bars and at a speed with respect thereto for engagement with a flap partially opened by said finger member to move that flap into open position and for receiving articles carried by such carton, said track being adapted to receive inverted cartons thereon.

5. In apparatus of the character described, a track provided with an opening therein, means for advancing an inverted carton having opened outer closures and an open inner rear end closure flap into a position wherein the inner forward closure flap is aligned with said opening, a finger member, means for moving said finger member along a predetermined path toward said opening and into engagement with the forward inner closure flap of a carton disposed thereabove and thence away from said opening to partially open such engaged closure flap, and a package plate movable below said track and in the direc-

tion of a carton advanced therealong and at a speed in excess of that of such a carton advanced along the track for engagement with the partially opened forward inner flap of a carton aligned with said opening to move such flap toward completely open position and for receiving articles carried within such a carton.

6. The apparatus of claim 5 in which gripper members are mounted along said track and on opposite sides thereof, said gripper members being adapted to squeeze cartons

advanced along said track and thereby hold articles therein.

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