June 16, 1964 L. E. KULLESEID 3,137,112

CARTON CLOSING MACHINE

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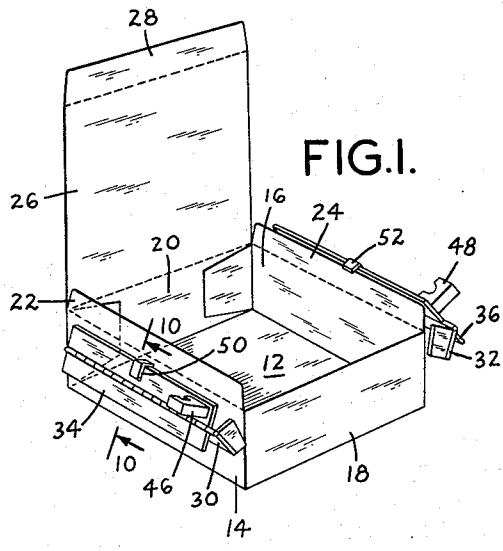


FIG.1.

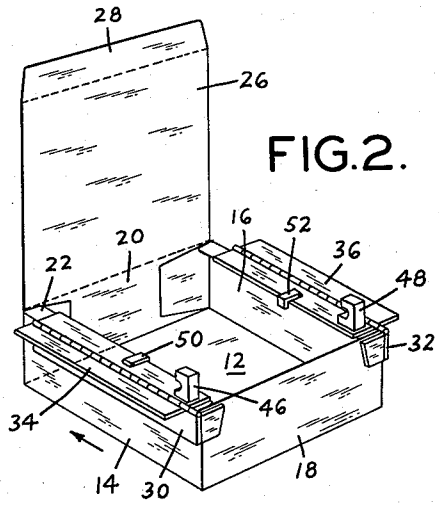


FIG.2.

FIG.3.

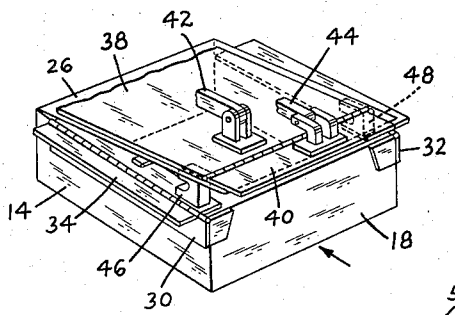
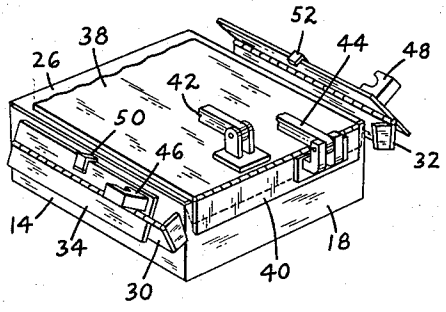


FIG.4.



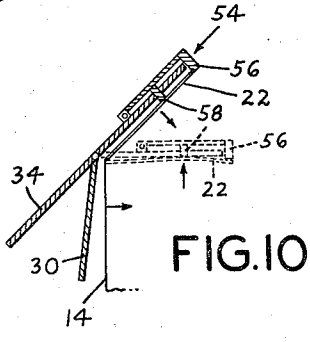


FIG.10.

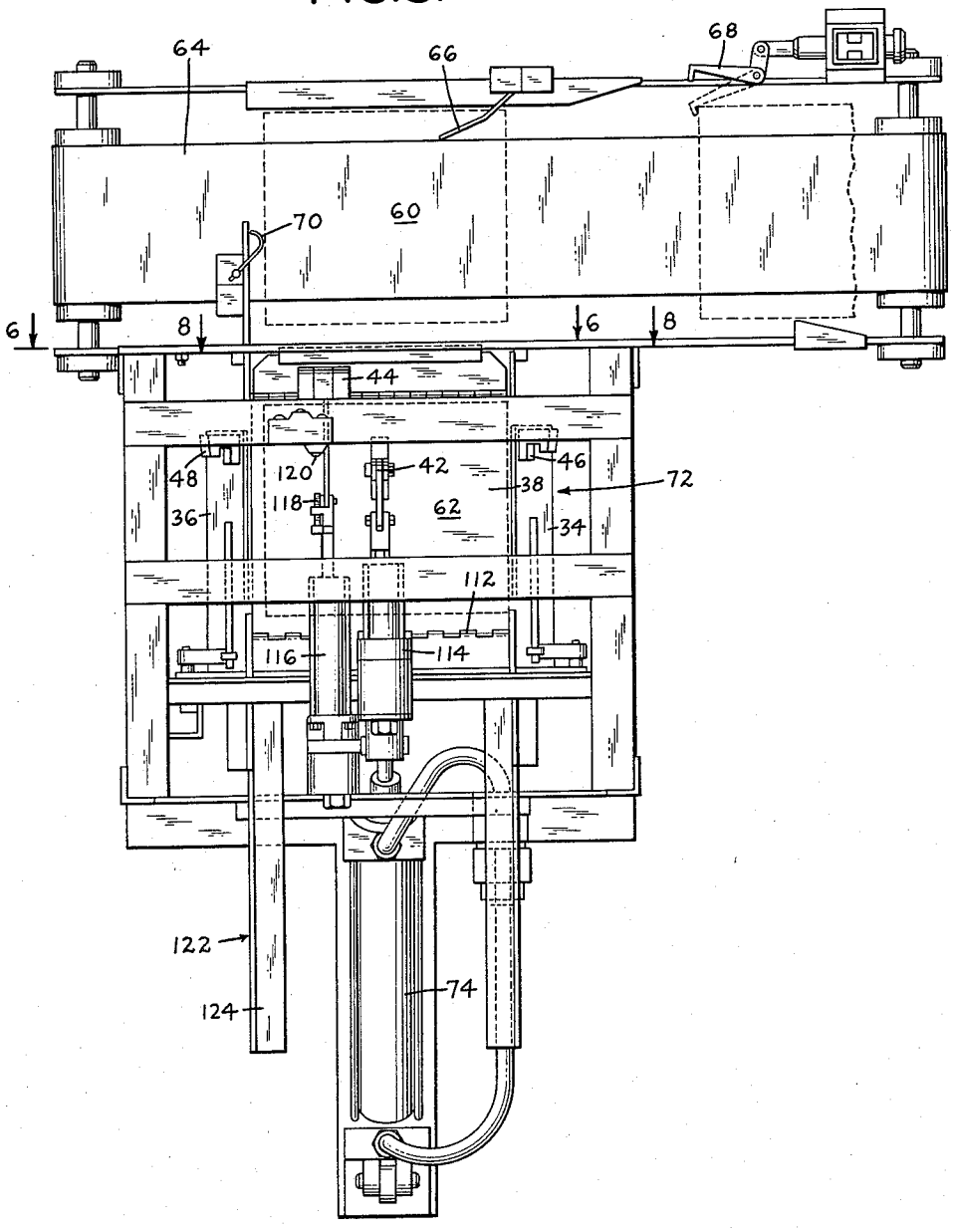
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CARTON CLOSING MACHINE

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FIG.5.



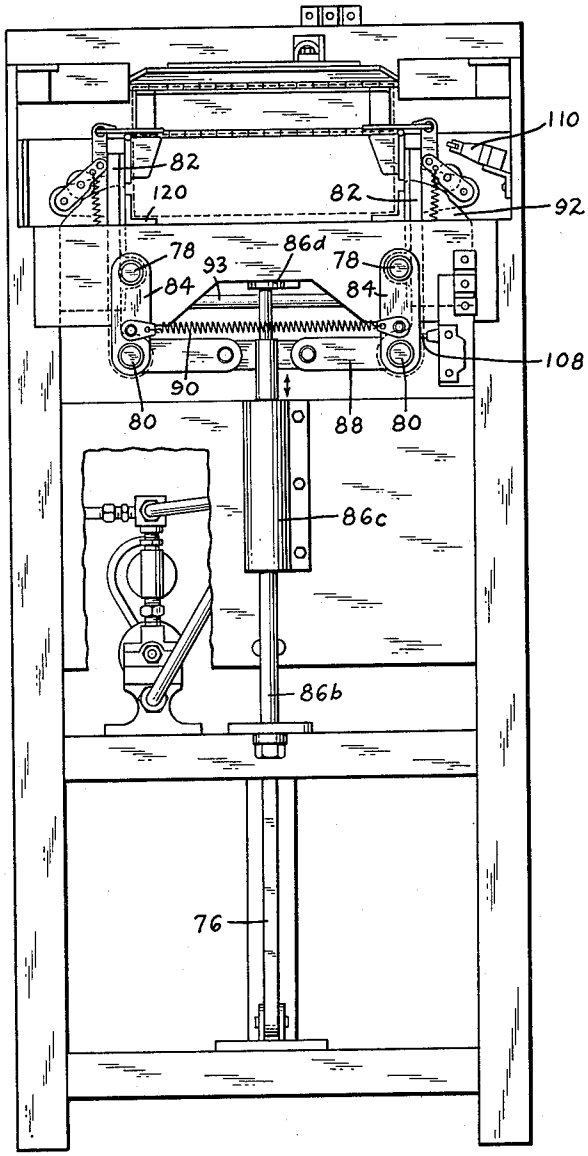
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FIG.6.



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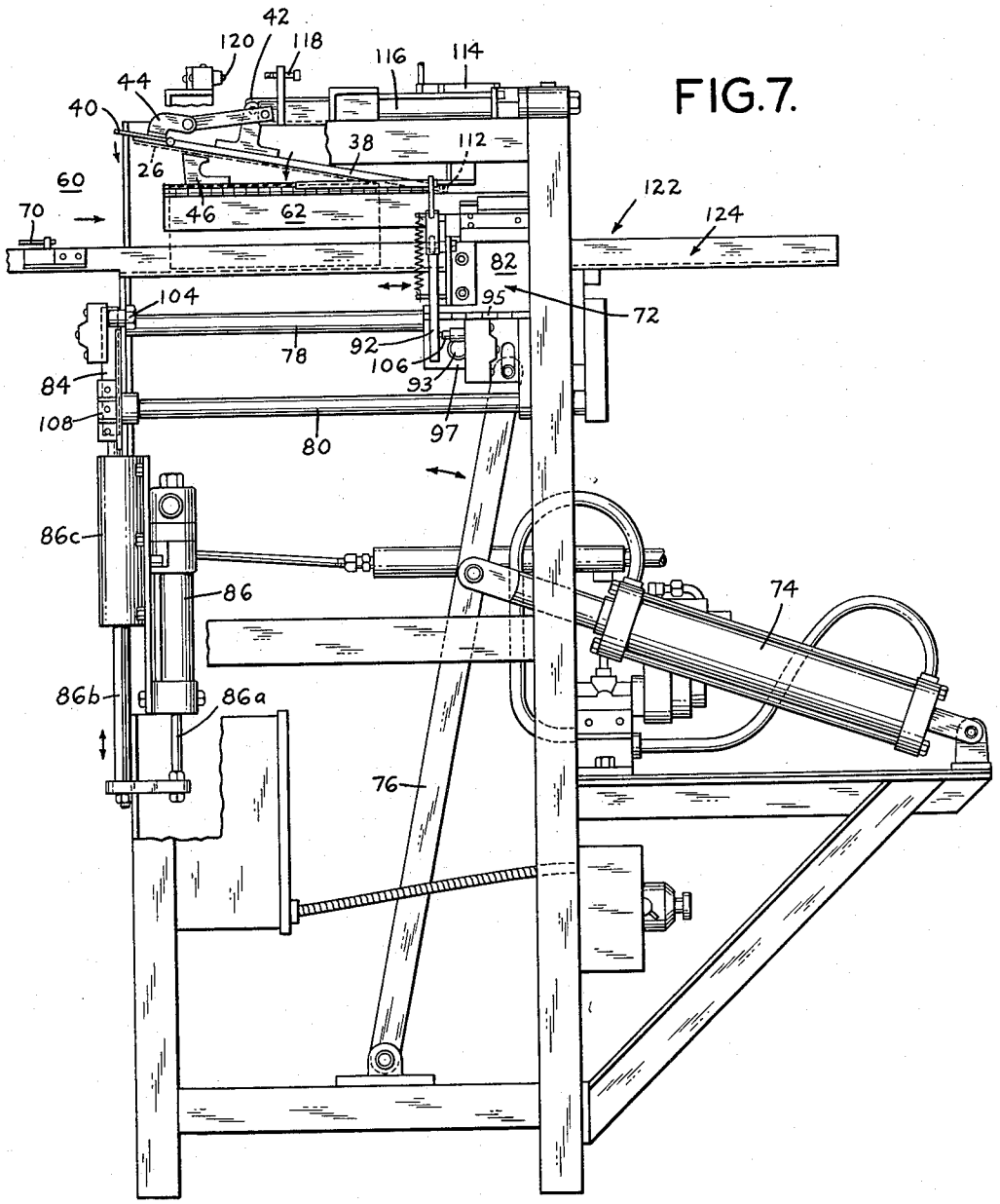


FIG.7.

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FIG.8.

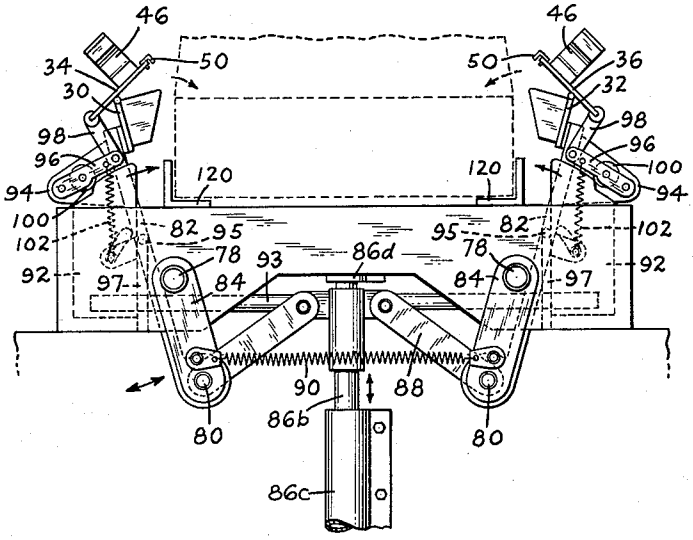
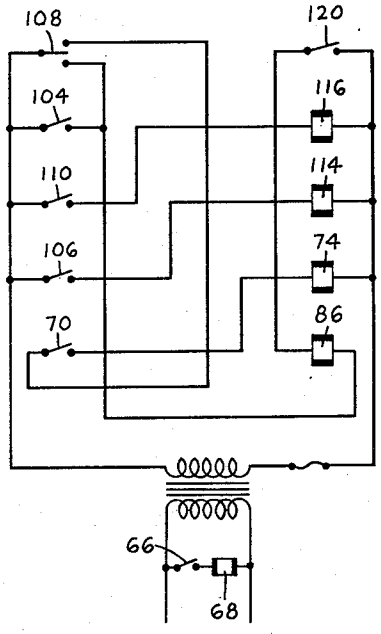


FIG.9.



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3,137,112

CARTON CLOSING MACHINE

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Filed July 12, 1960, Ser. No. 42,320
9 Claims. (Cl. 53—376)

This invention relates to a carton closing machine, and in particular to an improved machine of the type designed to act on a carton at a plurality of stations.

Machines embodying the concepts of the invention are particularly suited for closing cartons of the type consisting of a carton having a bottom, side, front and back walls, a top panel hinged to the upper edge of the back wall, and side dust flaps hinged to the upper edges of the side walls. Additionally, the top panel at its front edge may have hinged, thereto, a tuck flap.

A number of machines have been developed for closing cartons of this type, or of types quite similar to it. One conventional machine in use is composed of an endless conveyor having lugs or some other means thereon designed to engage the side walls of the container or cartons, and so advance the carton along a defined path. A stationary rigid strip member, often called a sweep or plough, is appropriately curved and positioned to engage the top panel of the carton and to fold it down into a closed position, and means are utilized along the path of the conveyor to fold in the tuck flap and dust flaps. A principal disadvantage of machines of this type is that they occupy a considerable amount of floor space in a plant, which floor space is becoming increasingly more valuable in the quest for greater efficiency in production.

Also, packagers, in an attempt to save on shipping costs have used cartons constructed of thinner materials, and conventional closing machines have, as a rule been unable to handle the lighter weight cartons without damaging a certain percentage of them.

Accordingly, the present invention relates to a carton closing machine designed to act on the cartons at a multiple number of successive stations in an intermittent manner. Essentially, the machine is provided with a first station and a second station, with means at the first station for holding a single carton only at that station. A carton gripping mechanism is provided to grip the cartons at the first station and to advance them to the second station, and at the same time means are provided associated with the gripping mechanism for folding the dust flaps of the carton.

At the second station, means are provided for folding down the top panel of the carton and for folding in the tuck flap attached to the top panel.

When the cycle is repeated with a subsequent carton, the first carton is forcibly ejected from the machine onto a conveyor leading away from the machine.

The principal advantages of the carton closing machine are that it occupies less than a quarter of the space that would be occupied by a conventional continuous machine of the prior art, but it will become apparent that at the same time, the machine of the present invention is capable of handling a high production rate equal to the average handling rate of the conventional continuous machine. Also, because of a number of features in connection with the machine, it will become apparent that the closing machine is capable of being adapted to any presently installed production line, and is capable of handling thin gauge material without damaging it. A further advantage of the machine is that it may be manufactured at a cost considerably less than those on the market today.

Other objects and advantages will become apparent upon further consideration of the specification and the accompanying drawings forming a part of the specification, in which:

FIGURES 1 through 4 show a carton of the type contemplated, in four stages of being closed, and portions of the mechanism for accomplishing this;

FIGURE 5 is a top plan view of a carton closing machine incorporating the principles of the invention;

FIGURE 6 is an elevation view taken along line 6—6 of FIGURE 5;

FIGURE 7 is a side elevation view of the machine illustrated in FIGURE 5;

FIGURE 8 is a section view taken along line 8—8 of FIGURE 5; and

FIGURE 9 is an illustration of a wiring diagram according to the concepts of the invention;

FIGURE 10 is a section view along line 10—10 of FIGURE 1.

A carton suitable for being folded according to the invention, is illustrated in FIGURE 1, and comprises a bottom panel 12, side panels 14 and 16, front and rear panels 18 and 20, dust flaps 22 and 24, top panel 26 and tuck flap 28. The sequence in closing the carton is as follows: The side panels 14 and 16 of the carton are gripped and the dust flaps 22 and 24 are folded inwardly in the manner shown in FIGURES 1 and 2. Subsequently, as shown in FIGURES 3 and 4, the top panel 26 is caused to assume a partly closed position and the tuck flap 28 is forced downwardly. Finally, the top panel 26 and tuck flap 28 are moved to the closed position illustrated in FIGURE 4.

Before describing the machine as a whole, the mechanism shown in FIGURES 1 to 4 will be described. Referring to FIGURES 1 and 2, the carton is gripped by flat L-shaped plates 30 and 32 adapted to hold the carton in a vise-like manner pressing against the side and front panels 14, 16 and 18 of the carton. By using elongated plates of the type shown, the side walls are supported against distortion or bulging during subsequent operations, particularly when the dust flaps 22 and 24 are folded inwardly. The base members of the L-shaped gripping plates abutting the front panel 18 of the carton assist the gripping mechanism in moving the carton in the direction of the arrow shown in FIGURE 2.

The L-shaped plates 30 and 32 are provided with members 34 and 36 pivotally attached along the top edges of the plates. By means of a mechanism to be described, while the L-shaped plates are being advanced against the walls of the carton, the members 34 and 36 are pivoted to bring the dust flaps 22 and 24 to the folded in and horizontal position, illustrated in FIG. 2. The above steps take place at a first station.

At a second station, FIGS. 3 and 4, a plate member 38 is located and positioned so as to be normally at an angle relative to the plane in which the carton is advanced from the first station to the second station in the direction indicated by the arrow in FIG. 3. However, the plate 38 is pivotally mounted to the frame along its trailing edge, not shown, so that subsequently it may be pivoted downwardly to move the top panel 26 to the closed position illustrated in FIG. 4. A second plate 40 is pivotally mounted on the leading edge of the angled plate 38, and is caused to fold the tuck flap 28 downwardly, before the top panel 26 is shifted to its closed position, in a manner so that when the carton is closed, the tuck flap enters the interior of the carton. Both plates 38 and 40 are provided with actuating levers 42 and 44.

On top of members 34 and 36, wedge means 46 and 48 are positioned, and from FIGURE 3, it is apparent that the top panel 26 of the carton is gripped securely between the wedge means 46 and 48 and the angled plate 38. The gripping of opposed sides of the top panel 26 prevents it from being distorted during the step of folding down the tuck flap 28 by the pivoting plate 40.

After the tuck flap 28 is folded downwardly by the plate 40, the L-shaped plates 30 and 32 are withdrawn

away from the sides 14 and 16 of the carton, also withdrawing the wedge means 46 and 48, thereby allowing actuating means 42 and angled plate 38 to force top panel 26 of the carton and the tuck flap 28 down to the position illustrated in FIGURE 4.

An important feature of the invention is illustrated in FIGURES 1 and 2 showing hook means 50 and 52 attached to the dust flap folding members 34 and 36. Details of this device are illustrated in FIGURE 10, and, generally, it comprises an F-shaped member 54 pivotally attached to the dust flap folding members 34 and 36. The forward portion 56 of the members grips the free edge of the dust flap and prevents the upper side edges of the carton from being distorted or bowed inwardly when the dust flaps are folded downwardly. When the dust flap reaches a horizontal position, it presses on the inner projection 58 causing the projection 56 to release the free edge, thereby permitting the unit to be withdrawn along with pivoting members 34 and 36 from the carton, when the top panel is forced down into the closed position illustrated in FIGURE 4.

Referring to FIGURE 5, there is illustrated a machine according to the invention having a first station 60, and a second station 62, with a conveyor belt 64 leading to the first station. A switch 66 actuated by the presence of a carton at the first station actuates a solenoid operated lever and hook stop mechanism 68 which holds the flow of cartons on the continuously moving conveyor belt and prevents more than 1 carton from occupying the first station at any one time. Subsequent movement of the carton away from the first station causes switch 66 to actuate mechanism 68 whereby a succeeding carton is moved into the first station.

A second switch 70, against which the cartons impinge, causes the carton gripping mechanism described with respect to FIGURES 1–4, and generally designated by the numeral 72 in FIGURE 5, to be shifted to the first station 60. This is accomplished essentially by a mechanism better illustrated in FIGURE 7, comprising an air cylinder 74 driving a lever means 76 pivotally connected at the bottom of the frame. The lever 76 is attached to the carton gripping mechanism 72 causing it to be moved to the first station along four parallel rods 78 and 80 illustrated in FIGURES 6, 7, and 8. As illustrated in FIGURE 7, the parallel rods extend completely along the length of the machine.

Details of the carton gripping mechanism, in addition to those details described in reference to FIGURES 1 through 4, can be visualized from FIGURES 6 and 7, and 8, FIGURE 6 showing the mechanism in a closed position gripping the carton sides, FIGURE 8 showing it in an open position away from the carton sides. Essentially, the mechanism is composed of flat plates 82 pivotally mounted on two stationary parallel rods 78, and on laterally movable parallel rods 80. Referring to FIGURES 6 and 8, the parallel rods 78 and 80 are linked together by the linkage members 84, disposed in the front of the machine as shown in FIGURE 7, each linkage member being associated with air cylinder mechanism 86 through linkages 86*a* and 86*b*, FIGURE 7 and linkage 88, FIGURES 6 and 8. Note that the linkage 86*b* is held by bushing 86*c* and operates against the bushing-stop member 86*d*.

It can be seen from comparing FIGURES 6 and 8 that the rods 78 are held in the machine against lateral movement therein, while the rods 80 are laterally movable within the machine, normally assuming the position shown in FIGURE 8 biased by spring means 90, but alternately assuming the FIGURE 6 position on actuation of the air cylinder 86 acting against the spring 90. By relative lateral movement of the rods 78 and 80 with respect to each other, the plates 82 are caused to alternately adopt the vertical and angled positions shown in FIGURES 6 and 8 respectively, pivoting, relative to the machine about the stationary rods 78.

Referring to FIGURE 8, cam member 92 is arranged in the machine to travel longitudinally therein with the plate member 82, but is suitably held in a vertical direction by plate member 97 on transverse rod 93 shown in FIGURES 7 and 8, while the plate members 82 are permitted to pivot. Note that plate members 82 and 97 are pivotally connected at pivot point 95.

Adapters 94, FIGURES 6 and 8, are affixed to the outer surface of plate members 82, and pivotally attached to the adapters are linkages 96 and 98. A wheel or like means 100 is mounted on linkage 96 and is caused to ride on the upper surface of cam 92 and held against said surface by spring means 102. Attached to the upper inner surface of plate members 82 are L-shaped gripping plates 30 and 32 having on their upper edge pivoting members 34 and 36, the latter being attached to linkage means 98 as shown. It is now evident that, as the plate members 82 are pivoted about rods 78 so that the upper portions of the plate members are brought in towards the carton, the carton is gripped by the L-shaped gripping plates 30 and 32, and, by virtue of the cam and linkage arrangement, the cam being held vertically on transverse rod 93, the members 34 and 36 are caused to bring the flaps to a closed position.

FIGURES 6 and 7 illustrate switch means 104 and 106 and 108 and 110 which are contacted by the carton gripping mechanism at various positions of the mechanism, and their function in the machine will become apparent on further description.

As indicated above, while the carton gripping mechanism 72 is in its open position (FIG. 8) it is advanced by lever 76 and air cylinder 74 to the first station 60, caused to clamp a carton at that station by actuation of air cylinder 86, and while gripping the carton, is caused to be retracted to the second station 62. Referring to FIGURE 7, there is illustrated at station 62, the angled plate 38 described with reference to FIGURES 1–4, and having at its leading edge, the hinged plate 40. The carton top panel 26 is shown in dotted line, in the partly closed position of FIGURE 3. From FIGURE 7 it is apparent that the mere orientation of the angled plate 38 causes the top panel to go from its open position to the partly closed position as the carton is shifted to the second station.

The trailing edge 112 of the plate 38 is pivotally attached to the frame as shown in FIGURE 7, and also in FIGURE 5, and actuating means 42 and 44, including air cylinders 114 and 116, are provided for pivoting plate 38 to a horizontal position, subsequent to pivoting plate 40 to a vertical position. Accordingly, as the carton is retracted from the first station 60 to the second station 62 against angled plate 38, the top panel 26 is forced to a partly closed position, and at this stage, is the wedge 46, as shown in FIGURE 7. When the carton gripping mechanism reaches the second station 62, air cylinder 116 is actuated to cause plate 40 to fold the tuck flap downwardly in the direction of the carton. When the tuck flap is folded in, stop member 118, mounted on actuating member 44 contacts switch 120, FIGURES 5 and 7, causing air cylinders 86 and 114 to be actuated. This causes the side gripping plates 30 and 32 to be withdrawn away from the sides of the carton in the manner shown in FIGURE 8, and permits plate member 38 to force the top panel and tuck flap into the closed position shown in FIGURE 4.

At this stage of operation the air cylinder 74 causes the carton gripping mechanism to advance again to the first station where the above cycle is repeated. As a subsequent carton is advanced to the second station 62 from the first station 60, the carton in the second station is forced to the rear of the machine, generally designated by the numeral 122, FIGURE 7, where it is conveyed away for subsequent packing operations.

It should be noted that the carton is advanced through the machine on rails 124 illustrated in FIGURES 5 and

7. The rails **124** function to support the carton, and also to assist in aligning the carton within the machine.

From FIGURE 9, the operation of the switches, solenoid actuated devices, air cylinders, and the like, and sequence of steps may be visualized. The carton advancing on conveyor **64**, FIGURE 5, actuates switch **66** which operates solenoid **68** and hook means therefor. The carton also actuates switch **70** which causes cylinder **74** to advance the carton gripping mechanism **72** from the second station to the first station. At this stage, the carton gripping mechanism is in its open position holding switch **110**, FIGURE 6, open and causing air cylinders **114** and **116** to be retracted holding plates **38** and **40** in their upper angled position. At the first station, gripping mechanism **72** contacts switch **104**, FIGURE 7, which causes current to be conducted to air cylinder means **86**, resulting in actuation of the gripping mechanism **72** and clamping of a carton at the first station by the mechanism. This movement actuates switch **108**, FIGURE 6, in a way to de-energize air cylinder means **74** so that the carton is withdrawn by the carton gripping mechanism to the second station. At the second station, switch **106**, FIGURE 7, is contacted causing cylinder **114** to operate pivoting plate **40**, for the tuck flap, which in turn, actuates switch **120**, in a way so that air cylinder **86** is de-energized and caused to move wedges **46** and the carton gripping mechanism **72** out of the way. Finally this movement of the mechanism **72** actuates switch **110**, causing the angled plate **38** to move the top panel and tuck flap to the closed position of the carton.

It should be noted that air cylinder **86** is responsive to switch **120**, **104** and **108**, depending on the position of the carton gripping mechanism **72**, and whether it is opened or closed. Also, cylinder **74** is actuated by having switches **108** and **70** closed at one time.

From the above description it can be seen that the invention is one involving essentially first and second stations where the carton is acted on in an intermittent manner, one carton being acted on at a time, whereby a significant saving in floor space in the plant is achieved. By means of the various mechanisms described, it is apparent that the carton is fully supported during all folding operations to prevent bulging of the sides of the carton, making the mechanism extremely useful for use with present day light weight cartons. Because of the particular arrangement of the devices and manner in which the carton is acted upon, the mechanism is capable of handling cartons at an extremely high rate comparable to the production rate of the average conventional continuous machine. For instance, the machine is capable of handling up to and above 80 cartons per minute. Also, because of the obvious simplicity of the machine, it is apparent that it may be manufactured at a cost considerably less than those on the market today. And finally, because of the manner in which it is associated with a conveyor belt or like mechanism, it may be combined with any conveyor conventionally used, and can be oriented to remove cartons from the conveyor at any angle, making it extremely useful for present plant installations.

Although a preferred arrangement has been described in connection with the invention, it is apparent that other embodiments and arrangements may be used embodying the principal concepts of the invention. For instance, instead of air cylinders **74**, **86**, **114**, and **116**, other equivalent means may be used, and it is intended that the scope of the invention be limited only as defined in the following claims.

I claim:

1. A machine for closing the top and tuck flaps of a carton comprising first and second stations, a first means for moving the carton from said first station to said second station, a pivotally mounted plate at said second station, said plate being stationary relative to the direction of movement of the carton, but being mounted initially at an acute angle relative to said direction of movement and positioned to cause the top flap of the carton to adopt a partially closed position when at said second station, means associated with said stationary plate to fold in the tuck flap of said carton and actuating means also associated with said stationary plate to cause said plate to pivot in a manner whereby the top flap adopts a fully closed position.

2. A machine for closing the top and tuck flaps of a carton comprising means for gripping the carton at a first station, a first actuating means associated with the gripping means for moving the carton to a second station, means at said second station including a first plate having a leading edge facing said first station, and a trailing opposite edge pivotally mounted on the machine, said plate being initially mounted at an angle relative to the direction of movement of the carton between stations and positioned to cause the top flap to assume a partially closed position, a second plate pivotally mounted on the leading edge of said first plate and including a second actuating means arranged to force the tuck flap downwardly, and a third actuating means for forcing said first plate downwardly to cause the top flap to be moved to a closed position.

3. A carton closing machine arranged to close a carton having dust flaps, a top panel and a tuck flap comprising in combination a first station and a second station, means at said first station for holding a single carton only at said station, a gripping mechanism for gripping said carton at said first station and advancing said carton to said second station, means associated with said gripping mechanism for folding in the dust flaps of said carton, means at said second station for folding down the top panel of said carton as said carton is advanced to said second station, and means for folding in the tuck flap attached to the top panel, said means for folding in the dust flaps having associated with them wedge means whereby the top panel is gripped between said wedge means and said top panel folding means to prevent distortion of the top panel when the tuck flap is folded downwardly.

4. A carton-closing machine for folding in the dust flaps of a carton, comprising a first station, side wall gripping plates at said first station, means adapted to actuate said side wall gripping plates inwardly to grip the sides of the carton, second plate means pivotally mounted on the upper edges of said side plates and having leading portions facing in the direction of movement of said side wall gripping plates, means associated with said second plate means and cooperating with a stationary cam in a manner to cause said leading portions of said second plates to fold in the dust flaps as said side wall gripping plates are brought into a gripping relation with said carton, spacer means carried by the upper face of said leading portion for preventing the top carton panel from closing while said gripping means are engaging said carton.

5. A machine according to claim 4 wherein said side wall gripping plates are L-shaped plates adapted to abut the side and front panels of the carton.

6. A machine according to claim 5 and further including parallel rails on which said carton is moved through the machine.

7. A machine for folding in flaps of a carton, the latter having dust flaps, a top flap, and a tuck flap, comprising first and second stations, means to segregate the cartons whereby only one carton at a time is positioned at said first station, a dust flap folding mechanism comprising means to grip the side walls of the carton and to fold in the dust flaps of the carton, said mechanism having an open position and a closed position, the latter being that position where the side walls of the carton are gripped and the dust flaps folded inwardly, a first means including an actuating device and switch means therefor to shift said dust flap folding mechanism while in an open position to said first station, a second means including an actuating device and switch means therefor to actuate

said dust flap folding mechanism to a closed position wherein it firmly grips opposed side walls of the carton and at the same time folds in the dust flaps of the carton, third means including an actuating device and switch means therefor to shift said dust flap folding mechanism while in its closed position to a second station, means at said second station comprising a plate oriented at an angle relative to the plane of travel of said dust flap folding mechanism so as to initially fold the top flap to a partly closed position and having a leading edge facing said first station and an opposite trailing edge, means pivoting on said leading edge arranged to fold the tuck flap of said carton downwardly and having fourth means including an actuating device and switch means therefor to actuate said means downwardly, means pivotally mounting said trailing edge of said plate on said machine and a fifth means including an actuating device and switch means therefor to pivot said plate downwardly whereby said top flap is moved to its closed position.

8. A dust flap folding machine for a carton having dust flaps on opposed sides of said carton comprising plate-like means for gripping the side walls of said carton, second plate means pivotally mounted on the upper edges of said side wall gripping means, F-shaped hook elements pivotally mounted on said second plate means and arranged so that the upper arms of the elements hook the upper free edges of the dust flaps, the lower arms of the elements projecting through slots in said second plates and being arranged so that the pressure of the dust flaps on the lower arms causes the upper arms to release said dust flaps.

9. A dust flap folding machine for a carton having dust flaps on opposed sides thereof comprising plate like means for gripping the side walls of said carton, second plate means pivotally mounted on the upper edges of said side wall gripping means, means to actuate said second plate means downwardly on said dust flaps when said side wall gripping means are advanced into gripping relation with said carton, means on said second plate means for hooking the upper free edges of the carton dust flaps as said second plate means are pivoted down on said dust flaps to prevent the side walls of said carton from being bowed inwardly, and means for causing said hooking means to release the free edges of said dust flap when said dust flaps are in a horizontal position.

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