# United States Patent [19]

**Sabel**

[11] **3,748,813**

[45] **July 31, 1973**


[54] **SHIPPING CARTON CLOSURE MACHINE**


[76] Inventor: **Herbert J. Sabel**, 7074 Sayre Dr., Oakland, Calif. 94611



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[52] **U.S. Cl.** ..... **53/374**

[51] **Int. Cl.** ..... **B65b 7/20**

[58] **Field of Search** ..... 53/374



[56] **References Cited**

UNITED STATES PATENTS

2,739,513 3/1956 Dobson ..... 53/374 X

3,645,067 2/1972 Siegel ..... 53/374 X



*Primary Examiner*—Travis S. McGehee

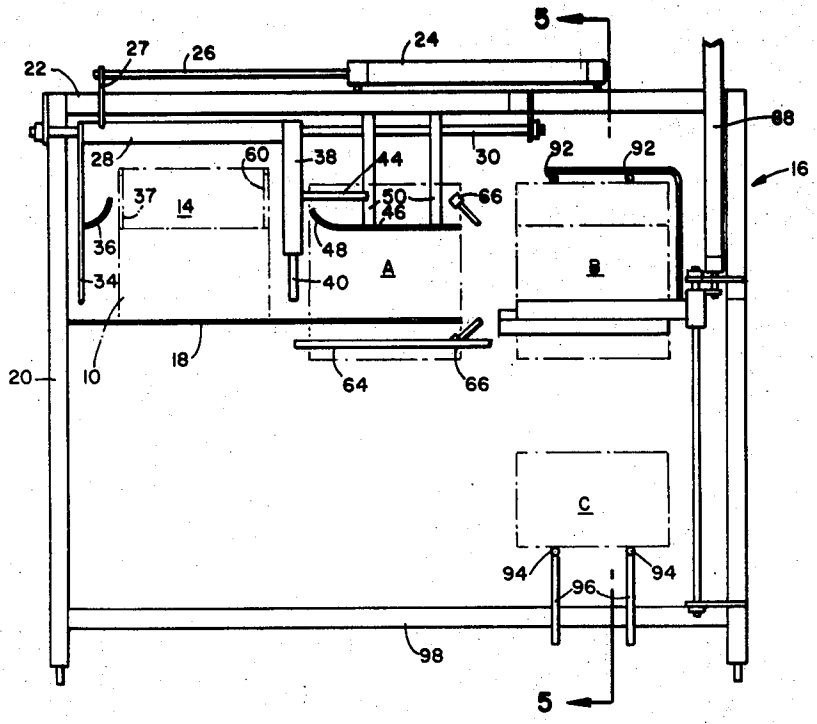
*Attorney*—Owen, Wickersham & Erickson



[57] **ABSTRACT**

A machine is disclosed for automatically folding the top and bottom flaps of a shipping carton at the same time a change in elevation is achieved with the carton kept level at all times.


**11 Claims, 6 Drawing Figures**



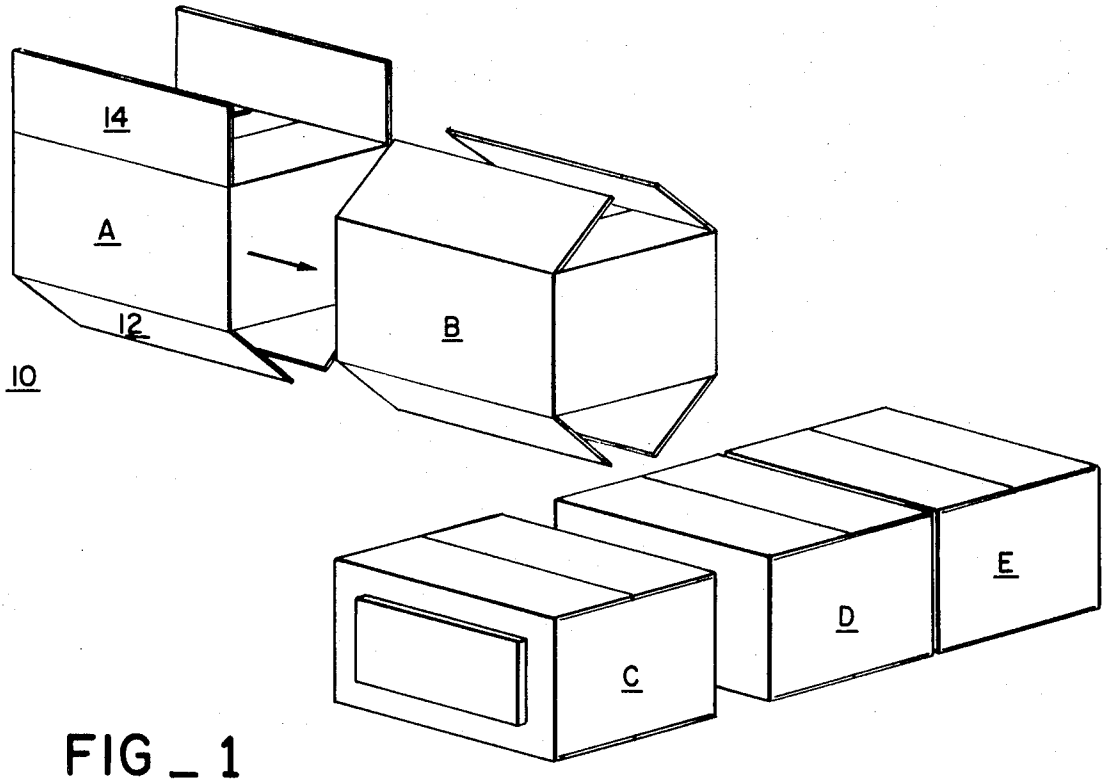



FIG_1

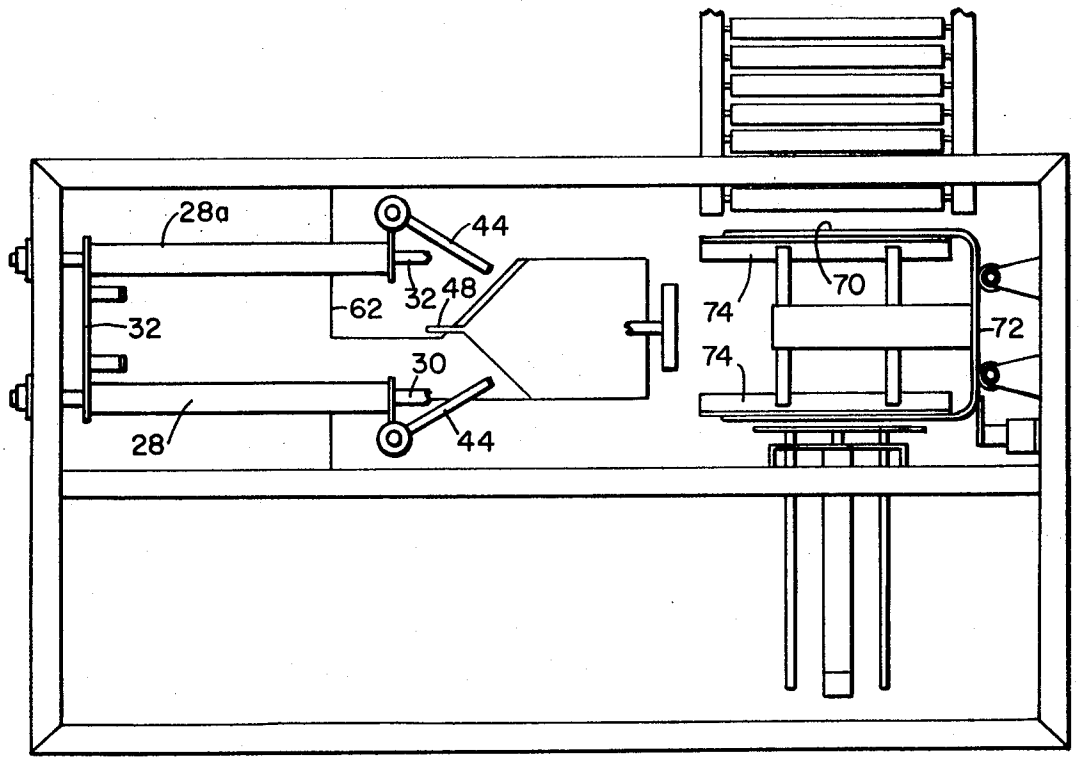



FIG_4

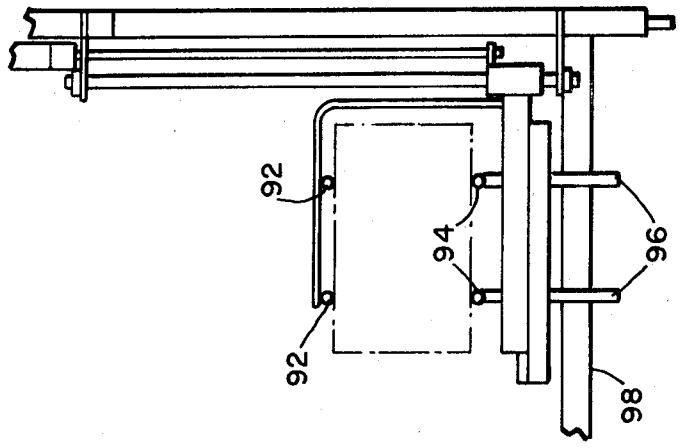

92
94
96
92
98

FIG_3

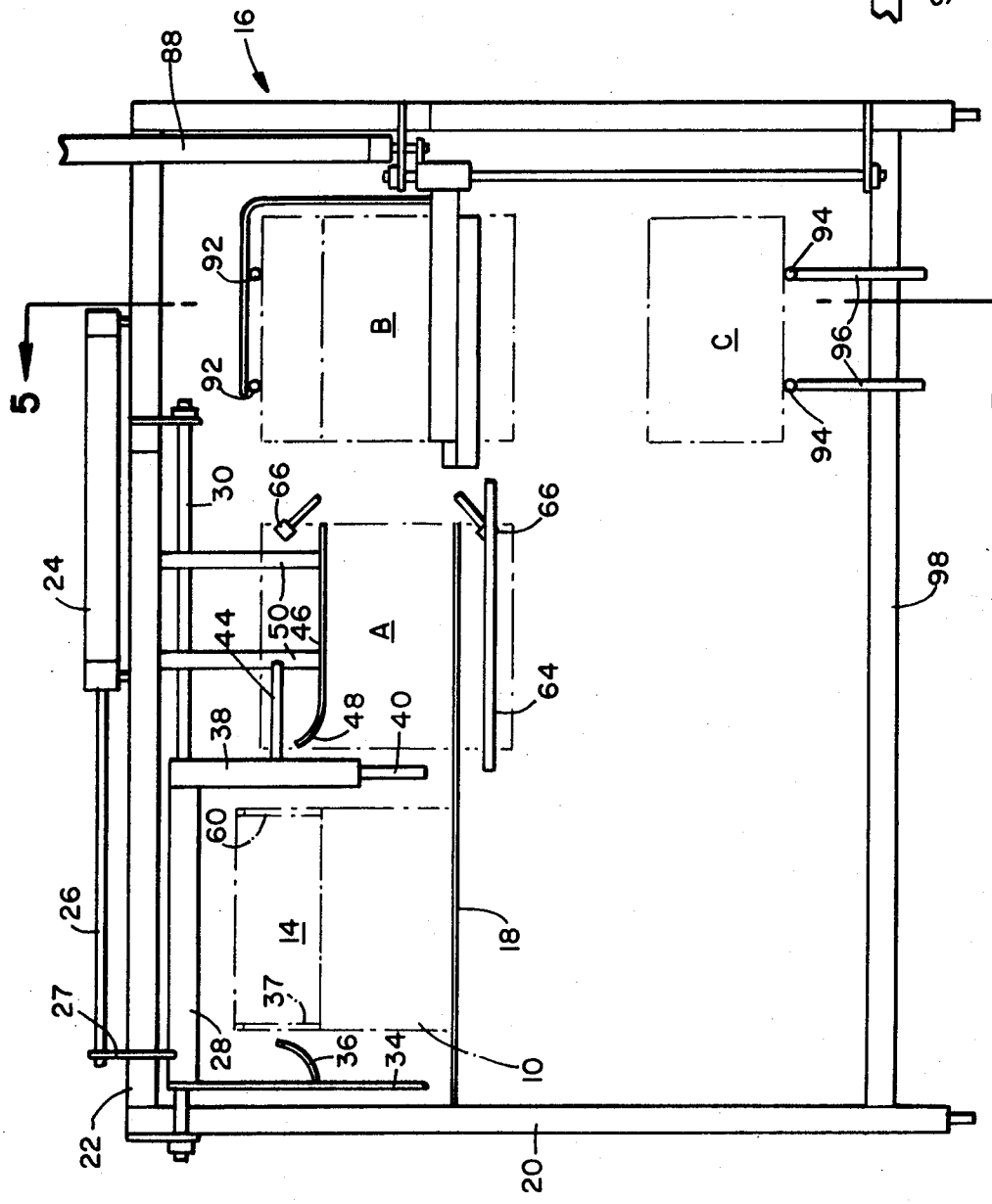

16
88
92
92
B
C
94
96
94
5
5
30
66
66
24
A
44
50
46
48
40
38
64
98
60
14
18
26
27
37
28
36
34
10
22
20

FIG_2

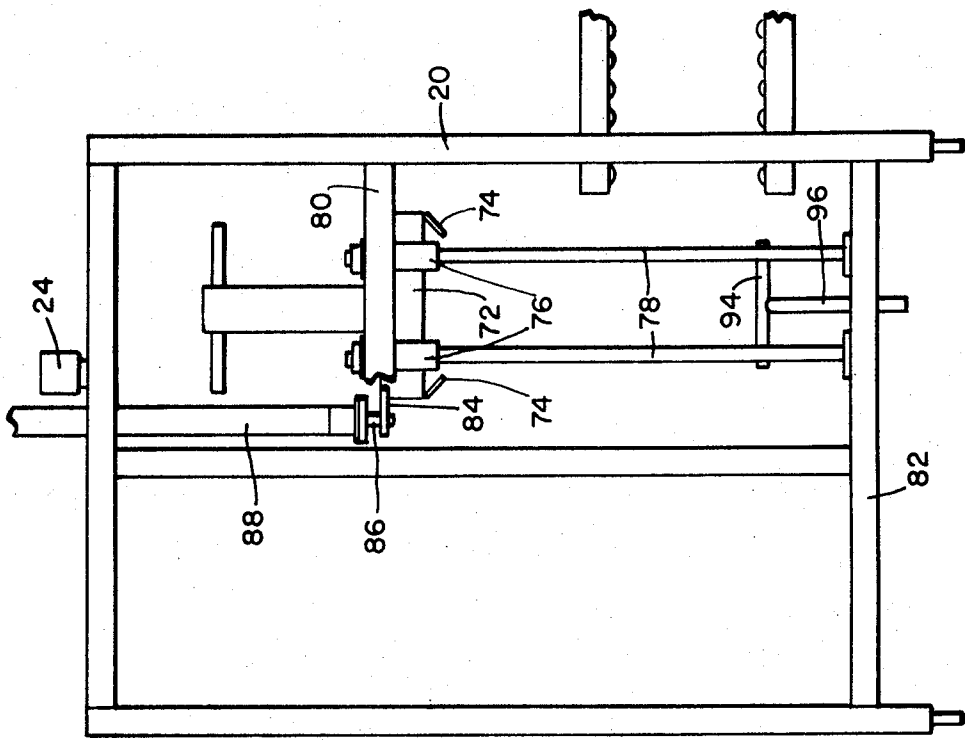

20
80
74
96
24
72
76
78
94
84
74
82
88
86

FIG_6

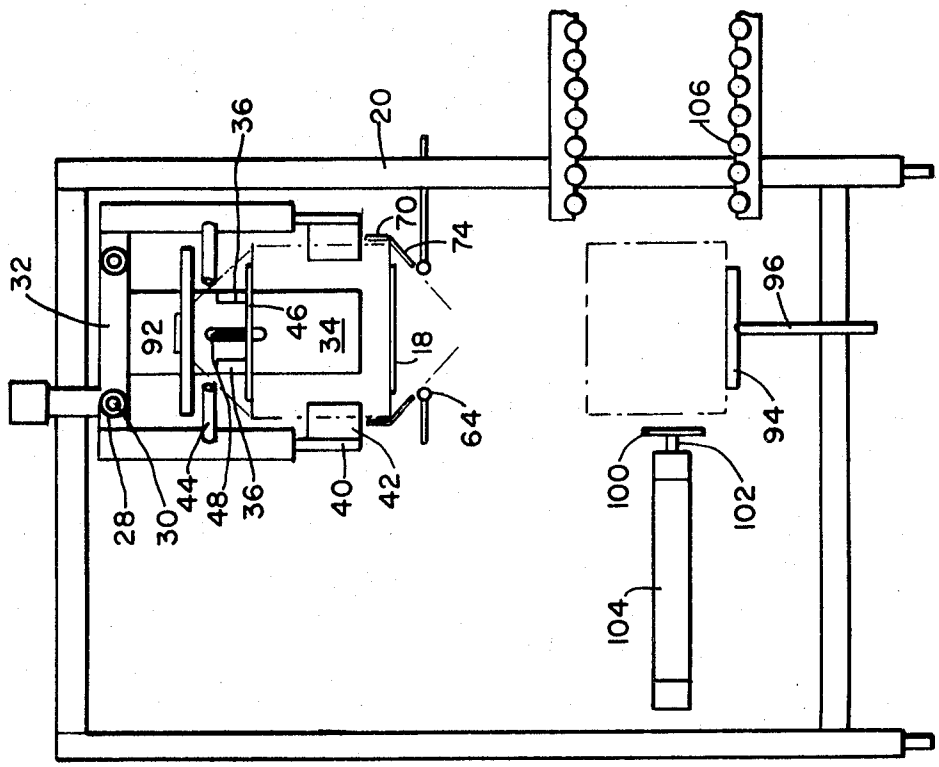

36
20
106
70
74
32
96
92
46
34
18
64
94
100
102
28
30
44
48
36
40
42
104

FIG_5

# SHIPPING CARTON CLOSURE MACHINE

This invention relates to apparatus for automatically loading or packing shipping cartons, and more particularly it relates to an improved machine for closing such cartons that have already been loaded.

In the packaging industry prior to this invention the most common method of folding flaps in the closing of packed shipping cartons was by means of stationery folding rods or plows through which the carton or case was pushed. Frequently this resulted in the flaps being partially spread open at one end with an undesired "V" effect being formed by flap edges that were not parallel. Also, if the flaps were made slightly wider than specified, they overlapped when closed which caused unsatisfactory carton sealing. Heretofore when closing flap edges on packed cases did not essentially meet along the same line as intended, the resulting "V" effect or overlapping not only detracted from the appearance of the carton but it also decreased its strength and durability in subsequent handling or increased the difficulty of stacking, palletizing or shipping large numbers of similar cartons.

A general object of my invention is to provide a flap closing machine for shipping cartons that overcomes the aforesaid problems.

Another object of my invention is to provide an automatic flap closing machine for shipping cartons that assures that the carton side flaps will close with their edges essentially parallel, close together but not overlapping.

Yet another object of my invention is to provide a carton closing machine that accomplishes the closing of the carton's flaps with uniformity and precision while providing a change in elevation of the carton and maintaining it level at all times. This feature makes my closure machine compatible with a wide variety of conveying operations for receiving the closed, packed cartons discharged from the machine.

Another object of my invention is to provide an automatic flap closing machine that is compatible with other automatic carton loading apparatus; that will operate to close cartons at a high production rate; that is easy to service and maintain without special tools or skilled labor; and which is readily adaptable for care and economy of manufacture.

Other objects, advantages and features of my invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a schematic view in perspective showing the steps for closing carton flaps in accordance with the present invention;

FIG. 2 is a view in side elevation of a carton closing machine embodying the principles of my invention;

FIG. 3 is a fragmentary view in side elevation similar to FIG. 2 and showing the closure mechanism in another position;

FIG. 4 is a plan view of the machine of FIG. 1;

FIG. 5 is a view in elevation taken along line 5—5 of FIG. 2; and

FIG. 6 is a view in end elevation of the machine of FIG. 1 with a portion of the frame broken away.

With reference to the drawing, FIG. 1 shows schematically the various positions of a typical carton **10** as it progesses through a flap closure operation according to the present invention. Position A shows the carton



supported horizontally while its bottom side flaps **12** are held at an angle of approximately 45°. In position B the top side flaps **14** are folded to an angle of approximately 45° which is the condition of the carton after it has been pushed onto a support assembly that holds the carton from the outside at the bottom and also maintains the bottom flaps at the 45° angle. Now, while the top flaps are also held at the 45° angle, the carton is lowered vertically to position C. During this vertical movement of the carton and the support assembly both the bottom flaps and the top flaps of the carton are closed by absolutely square folds with no possibility of overlapping or divergent flap edges. Position D shows the carton after it has been pushed free of the case support assembly, generally into a carton compression section which holds the flaps closed while the applied glue dries. Position E shows a carton in the compression section ready to be conveyed for stacking or palletizing.

A carton flap-closing machine **16** that accomplishes the progressive closure operation described in accordance with the principles of my invention is shown in one preferred form in FIGS. **2–6.** In a typical automatic carton packing system this mechanism would normally be attached to or located directly adjacent to an automatic carton loading apparatus that places the products being packed into an open carton. Such an apparatus is described in my U.S. Pat. No. 3,605,377. Thus, as each carton **10** arrives at the machine **16** it is fully loaded with its upper side flaps **14** extending vertically upward and its lower side flaps **12** normally closed but unglued. In this condition the loaded carton is moved onto an elongated horizontal sheet metal platform **18** which is supported by a frame **20** for the machine. Attached to a horizontal frame member **22** spaced above this platform is a linear actuator cylinder **24** which is preferably pneumatically actuated. A movable piston rod **26** extending from this actuator is connected at its end by a connector bracket **27** to a tubular sleeve **28** slidably mounted on one of a pair of horizontal guide rods **30** that are spaced apart and parallel to each other and supported on frame members above the platform **18.** Another movable sleeve **28*a*** is mounted on the other rod **30** and these sleeves are connected together at one end by a cross member **32** so that the actuator will simultaneously move both sleeves horizontally in a linear manner. Attached centrally to the cross-member between the sleeves at its upper end is a downwardly extending vertical pusher member **34** having a width that is substantially less than cartons being closed by the machine. A pair of spaced apart curved-up members **36** extend from one side of this pusher member and are fixed at a level that enables them to engage and close one inner flap **37** of the carton between its upper side flaps **14.** Fixed to the other end of each sleeve **28** is a downwardly extending vertical sleeve member **38** which supports a rod **40** that is adapted to rotatably pivot within angular limits. A flat paddle member **42** extends from one side of each rod at its lower end. These members are movable from a pushing position wherein they extend toward each other as shown in FIG. **5** and press against the carton when the actuator **24** moves the horizontal sleeves **28** in one direction, (from left to right in FIG. **2**). When the actuator moves the sleeves in the opposite direction, the paddles rotate approximately a quarter turn to a position wherein they are essentially parallel to each other and will pass freely along the sides of the carton.

Extending substantially horizontally and inwardly at an angle from each vertical sleeve **38** is a relatively short flap positioning rod member **44.** These rod members, as shown in the plan view of FIG. **4,** thus converge toward each other and terminate at a distance apart that is less than the width of the carton. Hence, on the extnding stroke of the actuator **24** which moves the horizontal sleeves **28** from right to left, these rod members engage the upright side flaps **14** of the carton in the position equivalent to A in FIG. **1.** This moves these flaps inwardly toward each other, and when the actuator moves in the opposite direction to transfer the carton to the next station (B), the members **44** maintain the flaps at the partially closed angular position.

At that portion of the machine **16** where the cartons **10** attain the position A is a centrally located plate member **46** having a curved upturned member **48** at its forward end. This plate member is supported by support brackets **50** extending downwardly from the upper frame **22** on the curved upturned member that is positioned vertically so as to contact and close the inner top end flap **60** of the carton as it is pushed along the platform **18** to the position A. Once these end flaps **37** and **60** are closed the attached plate member retains these inner flaps in this position so that the top side flaps **14** can be partially closed by the angular rods **44.**

Also near the station A the platform **18** has a cutout area **62** as shown in FIG. **4,** so that the bottom side flaps can be opened partially to an angular portion similar to the top side flaps **14.** A pair of parallel, spaced apart horizontal rods **64** located below the platform **18** are connected to the frame **20** and serve to retain the lower side flaps in this partially open portion as each carton is moved along toward its station B.

At the exit end of station A a pair of suitable applicator devices **66** are provided for applying a glue or cement to the top and bottom flaps as the carton passes by the devices. Each applicator comprises generally an elongated housing having perforations spaced apart through which the glue can be dispensed under pressure. The glue is supplied to each applicator from a suitable source through a flexible conduit connected to the applicator.

Spaced horizontally from the platform **18** at the end of the frame **20,** as shown in FIG. **2,** is a vertically movable support assembly that serves as the station B of my machine. Essentially this assembly is comprised of a U-shaped member **70** in plan form, as seen in FIG. **4,** having two spaced apart and parallel arm portions that are joined together at one end by a connecting back portion **72.** Attached to the inside surface of each of these arms is a rail-like member **74** having an angular cross-section. The lower portions of these rail-like members slope downwardly toward each other at substantially a 45° angle and they are spaced apart so that they can receive and cradle a carton with its flaps in the partially open angular position. The back portion **72** of the support assembly is fixed to a pair of spaced apart sleeves or bushings **76** that are slidably mounted on a pair of parallel vertical guide rods **78.** The latter are fixed to and supported by upper and lower horizontal frame members **80** and **82,** as shown in FIG. **6.** Attached to one side of the back portion **72** of the support assembly is a bracket **84** that is also connected to the outer end of a piston rod **86** extending from the cylinder of a linear actuator **88.**

Also attached to the back portion **72** of the support assembly and extending upwardly therefrom is a right angle bracket **90** that projects above the U-shaped member **70.** Attached to this bracket are a pair of spaced apart horizontal bars **92** that are oriented transversely to the edges of the top side flaps **14** of each carton arriving at this station B. These bars are spaced above the U-shaped member **70** so that they engage these flap edges when the carton is moved from station A to station B. Aligned vertically below the support assembly is another pair of horizontal transverse bars **94** that are spaced apart in a similar manner to the bars **92.** These latter bars are supported by a pair of brackets **96** attached to a lower portion **98** of the frame. When a carton is supported within the U-shaped platform and the actuator **88** lowers it vertically, the edges of lower side flaps **12** of the carton engage the parallel bars **94** which serve as a stop member and as the carton continues downwardly the flaps close. When these lower side flaps are fully closed, the U-shaped support assembly continues downwardly until the upper horizontal bars **92** force the top flaps **14** to fold together in their normally closed position. (See FIG. **3.**) At this point the fully closed carton is temporarily retained at the position C.

As shown in FIG. **5,** this closed carton is now pushed laterally by a flat pusher plate **100** attached to the piston **102** of a linear actuator **104** attached to the frame **20.** The carton is thereby moved to a suitable horizontal conveyor means which may consist of a series of rollers **106** arranged in the well-known manner and supported on the machine frame **20.**

The operation of my machine should be readily apparent from the foregoing description but it may be briefly summarized as follows. It should be noted here that each of the actuators described are preferably of the pneumatic type and they may be controlled in an automatic sequential manner using properly located valve controls which are tripped as the cartons move from one position to another. The machine will therefore function automatically as long as cartons are fed to it and air pressure is available for the actuators. The air pressure source, the conduits and actuator valves have not been shown in order to simplify the specification and drawings. Their precise nature and location should be readily ascertainable by one skilled in the art having the benefit of this disclosure. Now, assuming that a loaded carton has been placed on the platform **18,** power applied to the actuator **24** will move sleeves **28** and the pushing member **34** against the end of carton toward the station A. As this occurs the members **36** and **48** push the top end flaps inwardly. On the return stroke of the actuator **24** the bars **44** push the upper side flaps **14** of the carton in station A to the partially closed position. On the next actuation cycle of the actuator **24** the pusher paddles **42** bear against the carton and push it along toward station B. Glue is applied as this stroke occurs. When the carton is received by the angular rail-members **74** of the support assembly **70,** its partially closed top flaps **14** are retained in this position by the transverse bars **92,** and similarly its lower side flaps by the members **74.** When fully within the support assembly, the actuator **88** is energized by an appropriately placed valve (not shown) to lower the support assembly and its carton. As the carton engages the lower transverse bars **94** forming the stop means, the bottom side flaps **12** and then the top side flaps **14**

are closed as previously described. Since these top and bottom flaps are initially held in a partially closed position in a precise manner with the carton well supported and since the ultimate closing force by the bars **92** and **94** is uniformly applied, the flaps are closed with a high degree of precision with no overlapping or V gaps between the closed flaps. The closed carton is thus more easily handled for shipment or palletizing.

An important feature of my invention is the fact that the machine **16** not only closes the carton with precision but also affords a change in elevation so that the closed carton can be made accessible to various types of conveying apparatus for removing the cartons to a stacking area. While the invention has been shown with the vertical movement in the downward direction, it should be readily apparent that an upward vertical movement can be employed to close the carton flaps within the scope of the invention.

To those skilled in the art to which this invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

I claim:

**1.** A machine for closing the flaps of a shipping carton comprising

a frame;

horizontal platform means attached to said frame for supporting a loaded carton with a pair of open, upwardly extending side flaps;

means for moving said flaps to an angular partially closed position with respect to a horizontal plane;

means for moving said carton in a vertical path while said flaps are held in their angular position;

stop means attached to said frame and located in said vertical path;

closure means for engaging the edges of said angularly positioned flaps as said carton is moved vertically and for closing said flaps to a horizontal position when the carton engages said stop means.

**2.** The apparatus as described in claim **1** wherein said means for moving said carton vertically comprises a support means positionable at the same level as said horizontal platform, a vertical guide means, means for slidably attaching said support means to said guide means, and linear actuating means for moving said support means along said guide means, said closure means comprising transverse bar means spaced vertically from and attached to said support means.

**3.** The apparatus as described in claim **1** wherein said stop means comprises a pair of horizontal, transverse bar members attached to said frame for supporting said carton.

**4.** The apparatus as described in claim **2** wherein said support means is movable downwardly to enable the carton to engage said stop means.

**5.** A machine for closing the flaps of a shipping carton comprising

a frame;

horizontal platform means attached to said frame for receiving and supporting a loaded carton with open, upwardly extending side flaps;

a horizontally reciprocable carriage means and linear actuator means connected thereto for moving said carriage means with alternate back and forth strokes; said carriage means including a first pusher means for moving a carton along said platform means during a first stroke, a flap bending means for partially closing said side flaps on a return stroke in a direction opposite to said first stroke, and a second pusher means for pushing a carton further along after its flaps have been partially closed;

a vertically movable support assembly for receiving a carton with its flaps partially closed including upper closure means for retaining the flaps in that position;

means for moving said support assembly in a vertical path;

and stop means for engaging and holding the bottom of the carton so that said upper closure means can continue to move and fully close said side flaps.

**6.** The machine as described in claim **5** wherein said support assembly comprises a U-shaped member with parallel arms connected by an integral connecting portion, vertical guide means fixed to said frame and movable sleeve means on said guide means, said U-shaped member being fixed to said sleeve means.

**7.** The machine as described in claim **6** wherein said upper closure means comprises horizontal bar members connected by a bracket to said support assembly, said bar members being oriented transverse to the edges of said side flaps.

**8.** The machine as described in claim **5** wherein said flap bending means comprise a pair of rod members extending angularly from opposite sides of said carriage means and terminate at a distance apart so as to engage the end edges of the carton side flaps on the return stroke.

**9.** The machine as described in claim **6** wherein said support assembly includes rail members on said arms of said U-shaped member, said rail members having an angular cross section so as to hold the carton bottom side flaps in a partially open position.

**10.** The machine as described in claim **6** wherein said stop means comprises a plurality of horizontal bars connected by a support member to said frame, said bars being shorter than the distance between said parallel arms of said U-shaped member.

**11.** The machine as described in claim **5** including conveyor means attached to said frame and pusher means for moving a closed carton laterally from said stop means onto said conveyor means.

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