# United States Patent [19]

**Sherman**

[11] **3,832,822**

[45] **Sept. 3, 1974**


[54] **MULTI-LEVEL, IN-LINE SYSTEM FOR PACKAGING ARTICLES**


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[73] Assignee: **Olinkraft, Inc.,** West Monroe, La.



[22] Filed: **Jan. 30, 1973**

[21] Appl. No.: **327,045**

[52] **U.S. Cl.** ..... **53/32,** 53/207, 53/230, 53/387

[51] **Int. Cl.** ..... **B65b 11/26**

[58] **Field of Search** ..... 53/32, 34, 192, 194, 195, 53/207, 208, 230, 387



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*Attorney, Agent, or Firm*—C. Emmett Pugh; Calvin J. Laiche; Norvell E. Von Behren



[57] **ABSTRACT**

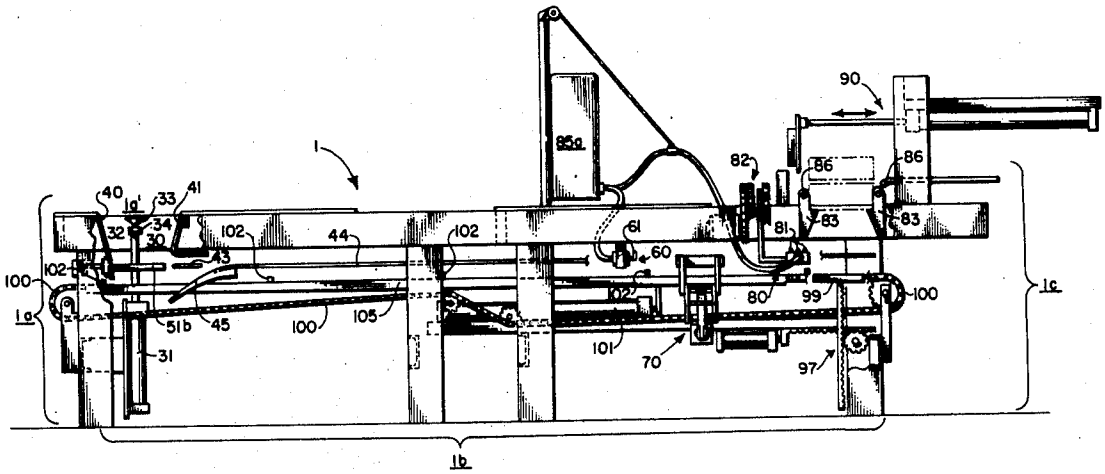
Multi-level, in-line method and apparatus for packaging articles such as doors which automatically folds and seals a five-panel, corrugated packing folder about the doors as the doors and the folder move in a generally "U"-shaped path through the machine, most of the folding being accomplished by static guides.

In the method and apparatus of the present invention the package is formed around the doors by dropping them with an appropriately positioned packing folder downward into the receiving well of the machine and then horizontally advancing the package through the various positions from the initial first and second positions to the sixth position where a traveling glue applicator applies glue to the last flap of the package, with the package then traveling upward to the seventh (compression) position to set the glue, and then finally out of the machine generally in-line with the door construction line.

The package thus begins by moving down in a vertical direction in the first section of the machine, then forward along a horizontal plane in the middle or second section of the machine, and then up in the third section, following generally a "U"-shaped path through the machine. This vertical-horizontal-vertical line of travel, combined with the operative steps of folding (the bulk of which is formed by static guides), gluing and setting along the way, result in a much improved and more compact system than heretofore achieved. The beginning and ending of the package at approximately the same general vertical level also greatly enhances the practical, production in-line use of the system of the present invention.

In the intermediate, horizontal section and the final vertical section there are included intermittent, reciprocating drive systems which allow a traveling glue pot applicator to laterally traverse the width of the machine to apply glue to the final, sealing flap and the final flap to be held under static compression after the article has been completely packaged.


**13 Claims, 15 Drawing Figures**



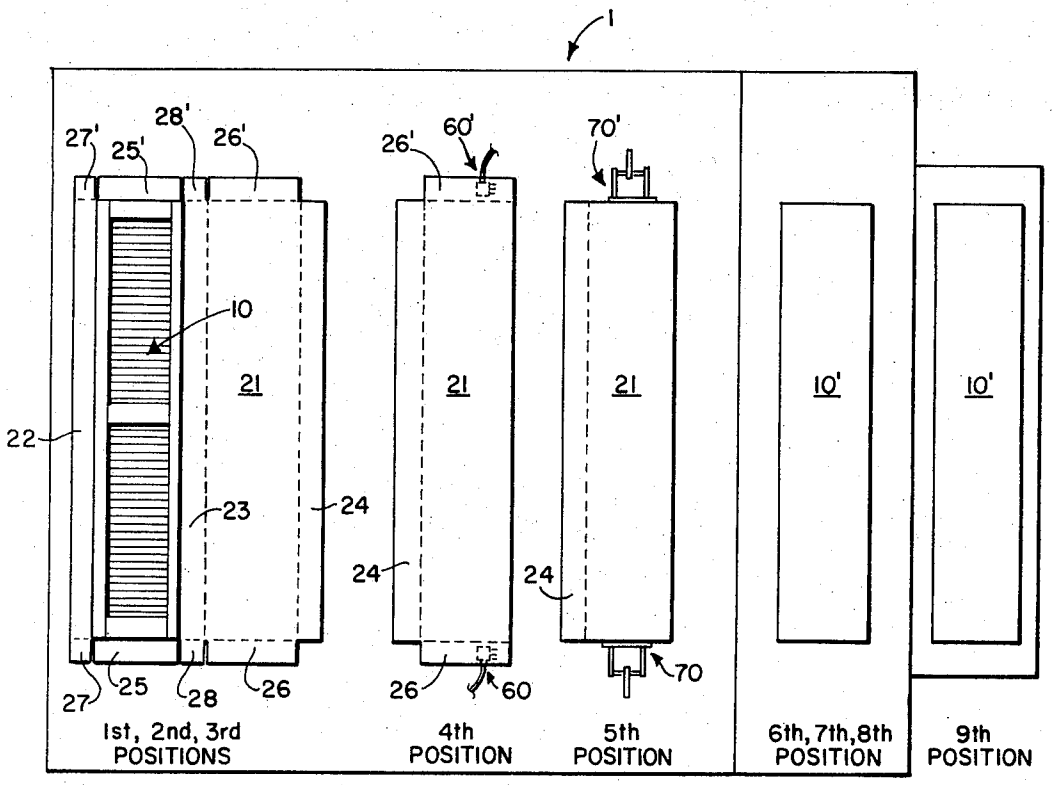

1
27'
25'
28'
26'
10
21
22
23
24
27
25
28
26
1st, 2nd, 3rd POSITIONS
26'
60'
60
4th POSITION
70'
70
5th POSITION
10'
6th, 7th, 8th POSITION
9th POSITION

FIG. 1B.

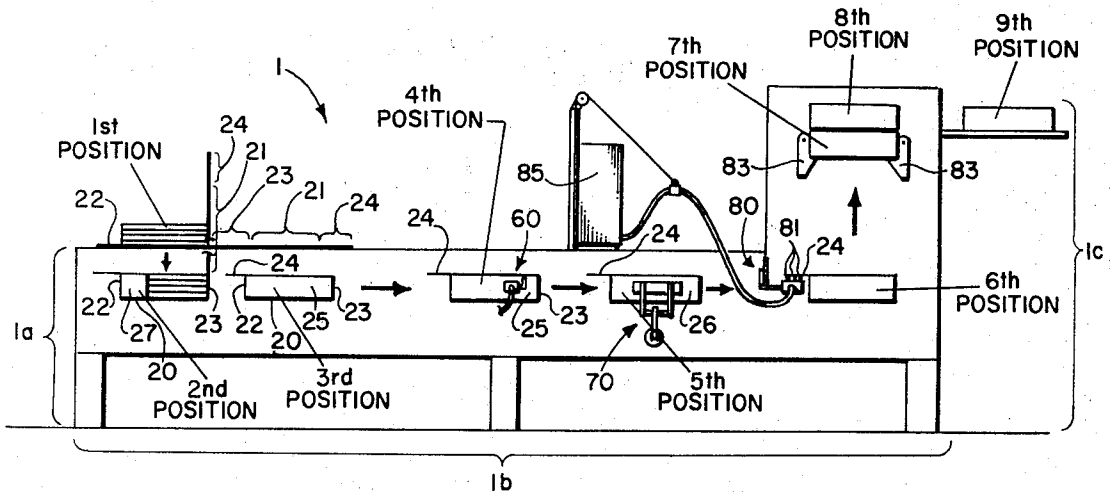

1
1st POSITION
24
21
23
22
27
20
2nd POSITION
3rd POSITION
25
4th POSITION
60
85
7th POSITION
8th POSITION
9th POSITION
83
80
81
6th POSITION
70
5th POSITION
26
1a
1b
1c

FIG. 1A.

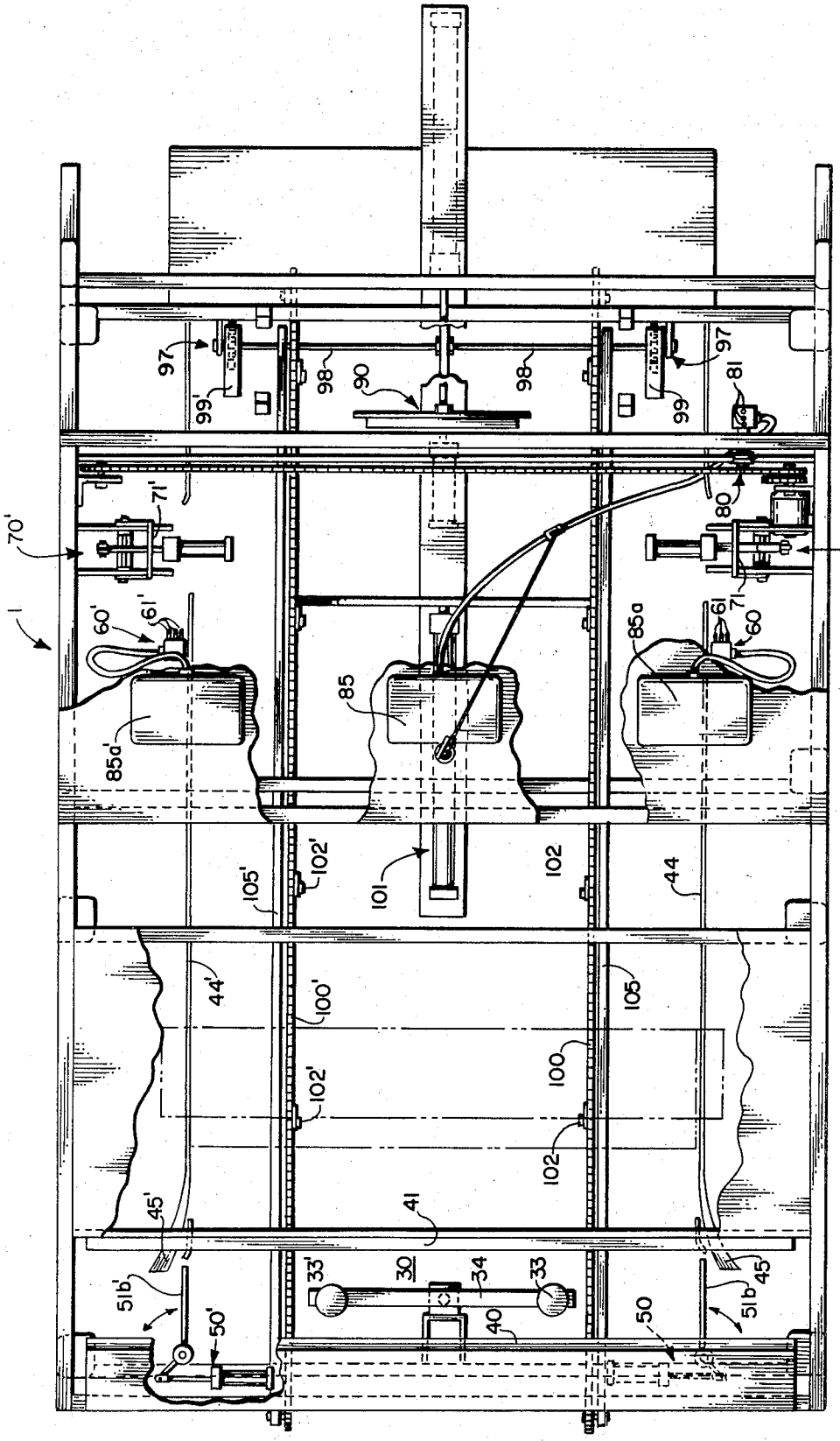

97
99'
98
90
98
97
99
81
80
70
70'
71'
1
60'
61'
85a'
85
85a
61
71
60
105'
102'
101
102
44
44'
100'
105
100
102'
102
45'
41
33'
30
34
33
45
51b'
50'
40
50
51b

FIG. 2A.

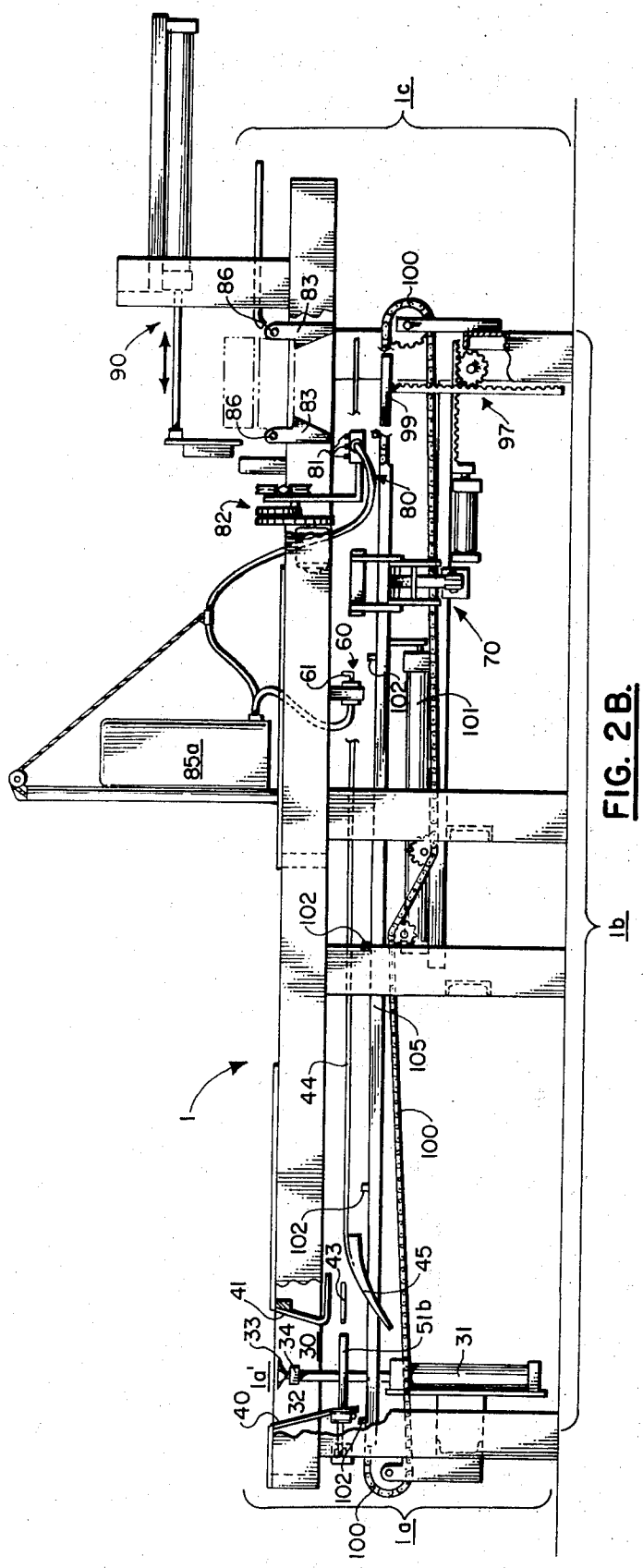



FIG. 2B.

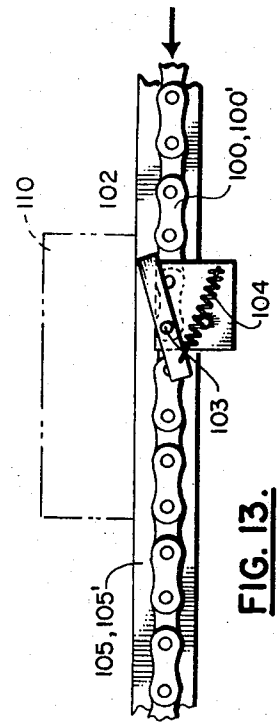



FIG. 13.

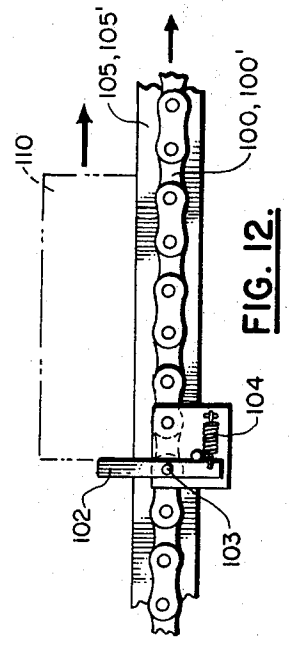



FIG. 12.

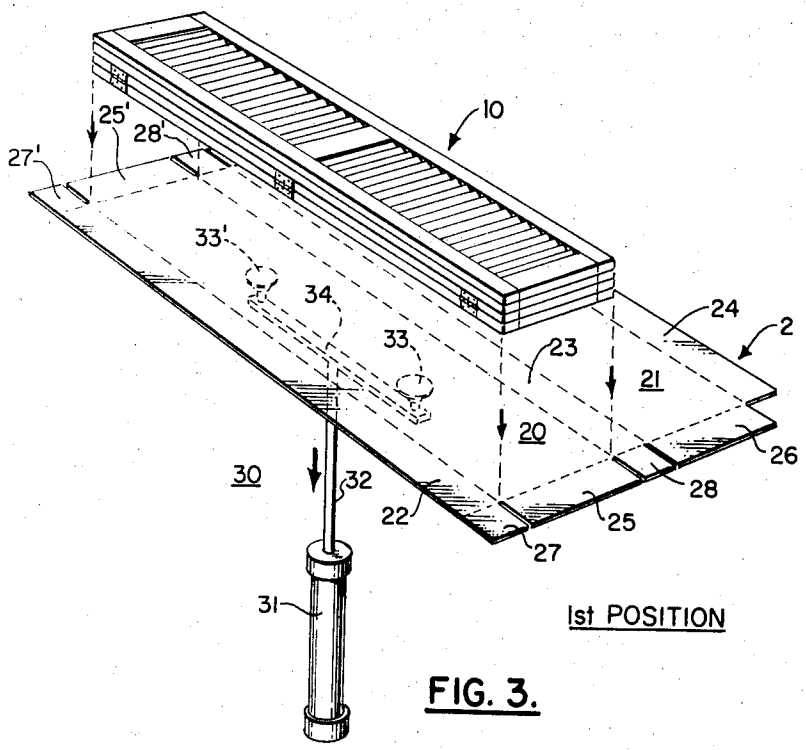

10
25'
28'
27'
33'
34
33
24
2
23
21
20
26
30
32
28
22
25
27
31
1st POSITION

FIG. 3.

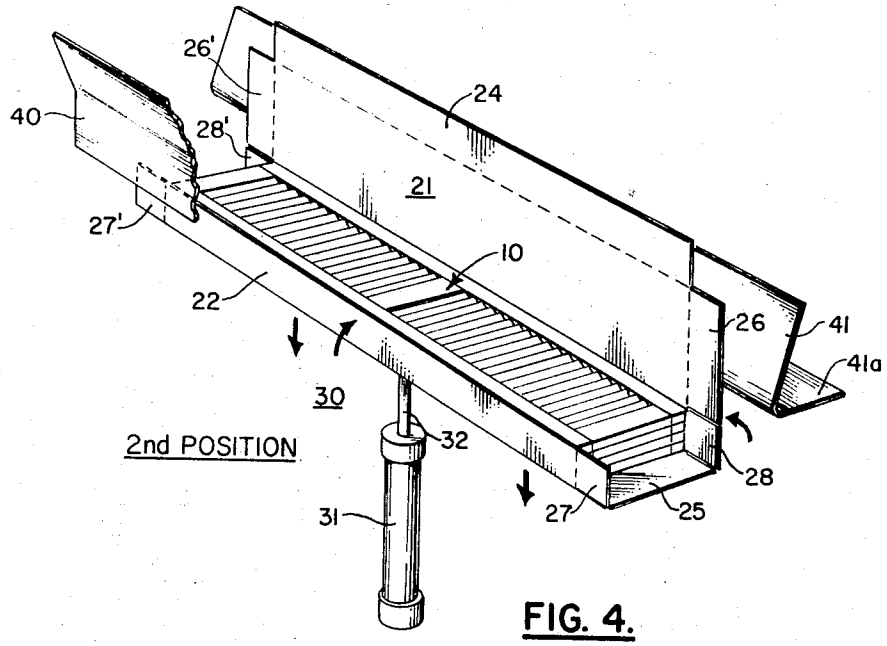

26'
24
40
28'
21
27'
10
22
26
41
41a
30
2nd POSITION
32
28
31
27
25

FIG. 4.

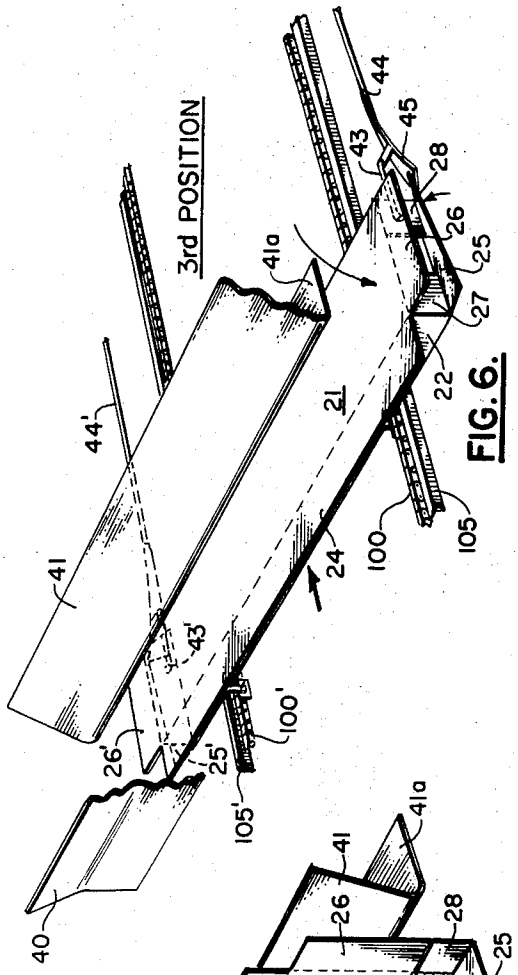



FIG. 6.

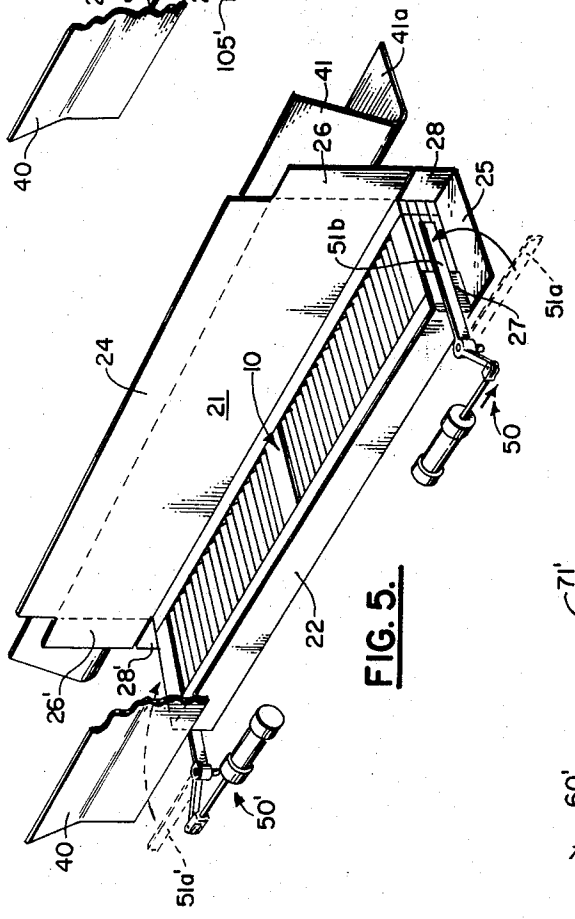



FIG. 5.

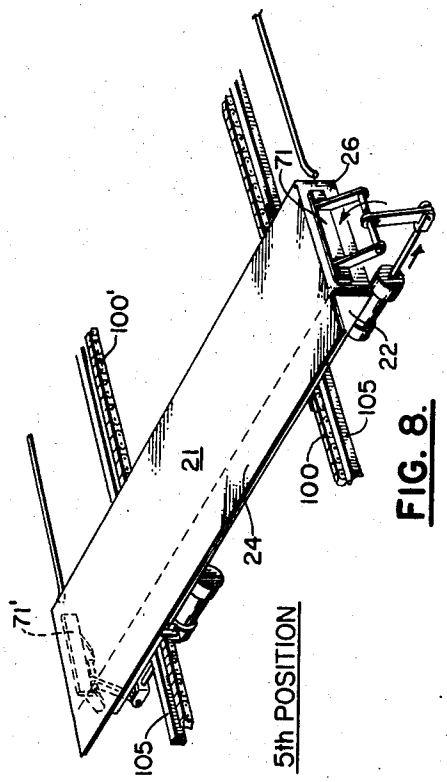



FIG. 8.

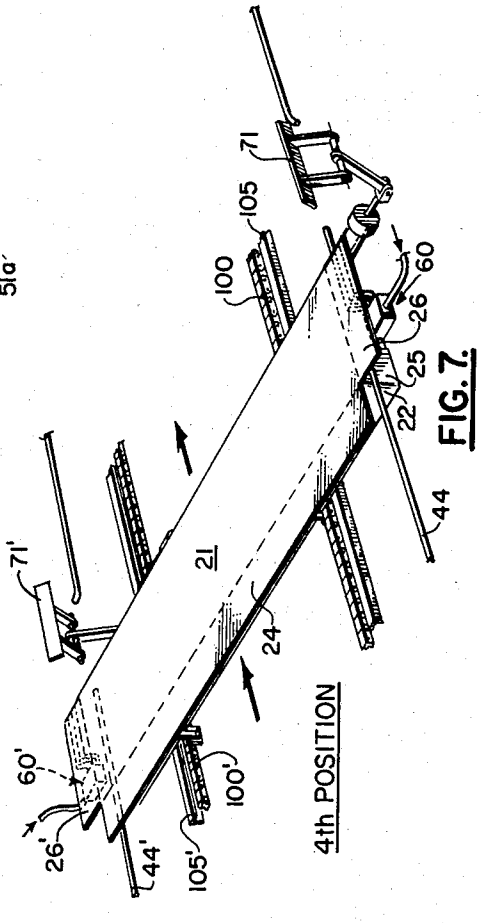



FIG. 7.

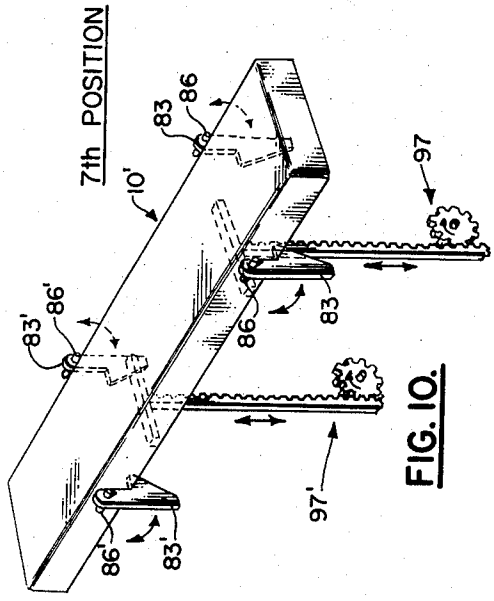



FIG. 10.

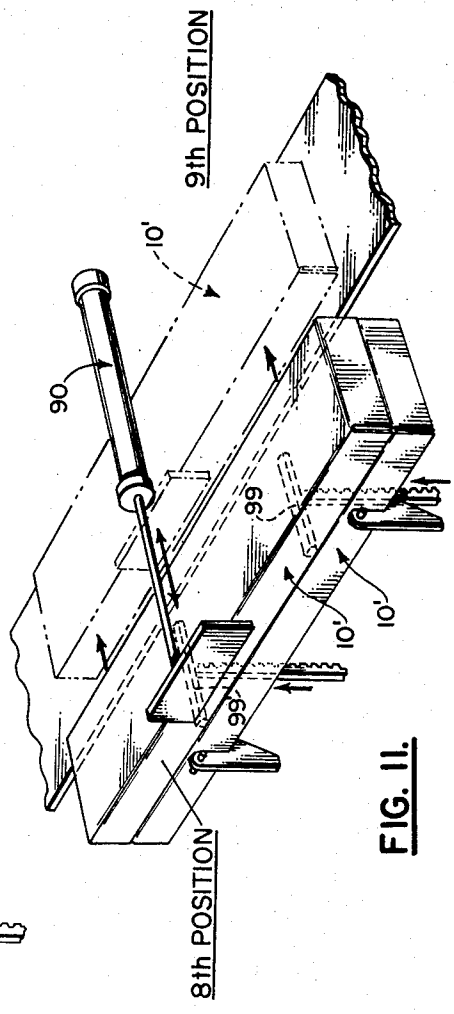



FIG. 11.

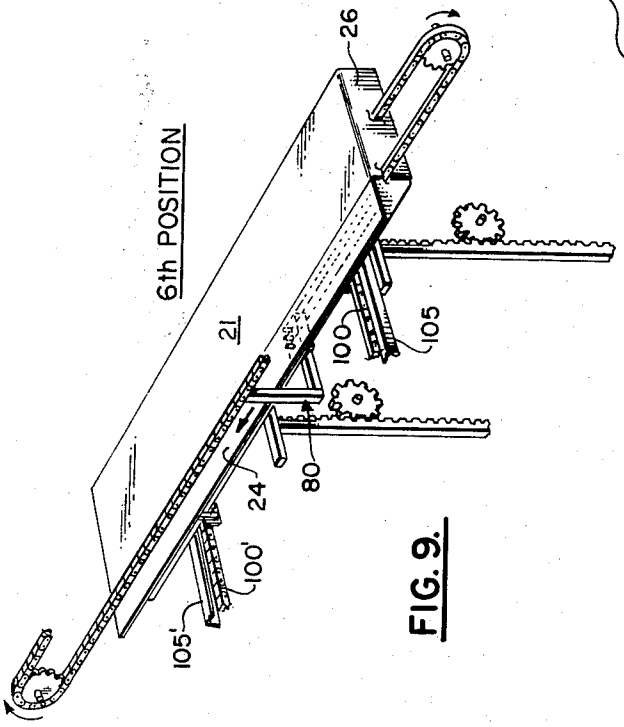



FIG. 9.

# MULTI-LEVEL, IN-LINE SYSTEM FOR PACKAGING ARTICLES

## BACKGROUND OF THE INVENTION

The present invention is directed to a method and apparatus for packaging articles and includes a multi-level, in-line compact packaging machine which automatically folds and seals for example five-panel, corrugated packing folders about rigid, self-supporting articles, packaged individually or in multiples.

It is impossible of course to list all the articles suitable for packaging by the present invention, but some illustrative examples are outdoor swings, wood and metal shelving, dinette tables, sporting equipment, folding furniture, wood and metal doors, camping equipment, ornamental railings, etc.

The initial commercial installation of the present invention was in the packaging of metal, bi-fold, closet doors. For illustrative and disclosure purposes only, the present invention will hereinafter be discussed and described in detail with respect to this particular application, although the present invention is of course of far broader application.

Heretofore, the typical prior art packaging method used for such doors was basically a manual operation. Initially, a packing folder was laid on a table and the two door sections were placed on top. Then, end protectors were inserted and the folder was formed around the doors and stapled. The package was then pushed forward on a short conveyor, and a manual application of hot melt adhesive was applied along the end panel of the container. Finally, the container was physically pushed into a compression unit and afterwards, out to a loading area. Such a prior art method of packaging of course got the job done but was relatively time consuming and costly.

In contrast, the present invention, except for the initial placing of the articles on the packing folder, is completely automated. In comparison to the output of the prior art system, the present invention turns out twice as many packages per minute. Moreover, only two men are needed, compared to the four or five with the old manual method. The present invention also eliminates stapling and provides better, more uniform packaging.

The prior art also of course includes various types of automated machines for packaging articles in packing folders or wrapping sheets, typical examples of which are shown in the following U.S. Pat. Nos. - Smith et al. (3,654,745, issued Apr. 11, 1972), J. B. Grant et al. (3,383,832, issued May 21, 1968), Bivans et al. (3,665,674, issued May 30, 1972), A. Ricca (3,145,518, issued Aug. 25, 1964), and H. G. Lattke et al. (3,513,630, issued May 26, 1970). However, these automated prior art systems are relatively bulky, complex, less reliable, expensive and large, and, in at least some cases, slower in production. Moreover, they do not have the easy flexibility or the broad range of applicability of the present invention.

These prior art patents generally and broadly disclose the various steps of folding a packing material around the article to be wrapped, and the in-line gluing, pressing and discharging of the wrapped package at the end of the line. However, the present invention involves a multi-level, in-line system wherein in the preferred embodiment there is in the initial phase the lowering of the articles down through an opening which serves to fold up the sides of the packing folder and then the passing of the package horizontally to fold and glue the sides in after which the package is returned vertically after being finally sealed with the use of a traveling glue applicator, the bulk of the folding being accomplished by static guides. This technique along with the other mechanical and structural features of the present invention, particularly the sequence of folding and securing results in a highly compact, relatively simple and highly reliable machine.



The machine of the present invention can complete as many as five packages a minute, yet requires one-third less floor space than competitive packaging machines and of course eliminates laborious manual operations.

Moreover, the machine of the present invention can be custom-designed to package individual articles or multiples thereof of various sizes, ranging for example from a minimum of $2 \times 4 \times 22$ inches to a maximum of $2 \times 4 \times 8$ feet in the particular, preferred embodiment disclosed in detail herein. As an example of the system's speed, five sets of bi-fold (twin-paneled/hinged) closet doors can be fully packaged individually in one minute.

In the use of the present invention, an operator readies a blank sheet of corrugated material or wrapping material at the feed or receiving end of the machine and places the article (or articles) atop the blank or wrapping material. A button is then pushed, and the present invention automatically folds, for example, a five-panel corrugated packing folder and seals it with a hot-melt adhesive to provide a fully closed, protective package, with all stapling eliminated.

As compared to the manual prior art system described above, the present invention has more than doubled packaging speed and substantially reduced overall packaging costs.

In summary, the present invention thus provides a compact, mechanically simple and reliable, automatic packaging system for bulky flat articles such as doors and folding tables, etc., and, as compared to the prior art, reduces labor costs, saves floor space, increases production line speeds, lowers packaging costs and provides a superior package.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a further understanding of the nature and objects of the present invention, reference should be had to the following detailed description, taken in conjunction with the accompanying drawings, in which like parts are given like reference numerals and wherein:

FIG. 1A is a schematic representation of the machine of the present invention viewed from the side, illustrating the various stages (nine positions) of a set of articles being progressively packaged as it enters the machine from the top, left side and progresses down and then across the machine and finally up and out the machine at the top, right side; while

FIG. 1B is a plan view of the packing folder, generally coordinated with the stages of FIG. 1A, showing from the top the progressive folding of some of the panels and flaps of the packing folder.

FIGS. 2A and 2B are plan and side views, respectively, in substantially identical scale, of the machine of the present invention.

FIGS. 3–11 are isometric views from the perspective of the top, left side of the machine of a set of articles being wrapped and packaged in a packing folder as it progresses through the various stages in the machine of the present invention, the noted positions being keyed to those indicated in FIGS. 1A and 1B, associated elements of the machine also being included in the views.

FIGS. 12 and 13 are side views of a portion of the intermittent, reciprocating chain drive system used in the machine of the present invention, the former showing the drive chain as it moves forward, while the latter shows it moving backward in preparation for the next forward cycle.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

For illustrative and disclosure purposes only, the present invention is illustrated and will now be discussed and described with respect to the packaging of bi-fold doors **10**, although the present invention is of course of far broader application.

Referring to the drawings, particularly FIGS. 2A and 2B, the machine **1**, which is the preferred apparatus embodiment of the present invention, is an in-line machine which is placed at the end of the manufacturing production line for the folded doors and is designed to form and glue the shipping package around the doors **10** in the relatively short line space of approximately fourteen feet. The machine **1** is approximately three feet high at its entrance or upstream end (left side of FIGS. 1 and 2) and approximately four feet high at its exit or down-stream end (right hand side of FIGS. 1 and 2), and is approximately twelve feet wide. The height of the entrance end is designed for mating with the preceeding piece of production line equipment.

A multiple set **10** of doors is first moved to the machine **1** by way of a conveyor belt from the preceeding piece of production line equipment (not illustrated). An appropriate blank of wrapping material or packing folder **2**, such as for example an "Olinkraft Skuffmaster" corrugated blank which was developed to guard against scuffing of articles with highly finished surfaces, is manually fed onto the machine **1**. The packing folder **2** is a five-panel folder consisting of bottom and top panels **20, 21,** respectively, front and back side panels **22, 23,** respectively, and front glue panel **24,** with bottom end flaps **25, 25'**, top end flaps **26, 26'**, front flaps **27, 27'** and back flaps **28, 28'**.

The packing folder **2** is initially positioned on the article receiving section **1***a'* at the top of the machine **1** and the doors **10** are placed on the packing folder **2** in the manner shown (note FIGS. 1A, 1B and 3).

The machine **1** includes in its first section **1***a* an entrance cavity well **30,** with a vacuum cylinder **31** centrally positioned therein having a vertical plunger **32.** Two upturned suction cup members **33, 33'** are laterally disposed on a cross-bar **34** attached to the plunger **32** in the middle of the cavity to maintain the stability of the blanks or packing folders **2** as the door sections **10** are placed upon them.

After the doors **10** with packing folder **2** are placed on top of the cavity well **30** (1st. position), which serves as the receiving means for machine **1,** there weight retracts or drives the vacuum their unit down, and it settles into the cavity well **30.** As the doors **10** and the-underlying packing folder **2** move downwardly in the machine **1** to the second position (not FIG. 4), the laterally disposed, static guide and folding elements **40, 41** positioned about the vacuum cylinder system cause the front side panel **22** and the combined back side, top end panels **23, 21, 24,** respectively, to be folded vertically up along the doors **10.** The elements **40, 41** extend down and across the width of the machine and also serve to centrally bias or position the article and folder for proper folding.

The weight of the doors **10** is sufficient alone to cause the vacuum cylinder unit to retract, however, with lighter articles a supplemental, downward-drive system may be added.

As best illustrated in FIG. **5,** pneumatically actuated, moving folder bar systems **50, 50'** are disposed along the sides of the machine **1** adjacent to the 2nd. position. By actuating the systems **50, 50'**, the folder arms **51, 51'** are driven (note arrows) from their holding position "*a*" to operative position "*b*", causing the front flaps **27, 27'** to be folded in against the side edges of the doors **10.**

The package is then moved forwardly into the third position (FIG. **6**) which, under the action of the static, horizontally disposed, folding section **41**a of the guide element **41,** folds the top panel **21** of the folder **2** over on top of the doors **10.** As it continues to move forward in a horizontal plane, the longitudinally disposed, static side rails **43, 43'** and **44, 44'** fold the back flaps **28, 28'** in and the bottom end flaps **25, 25'** up, respectively. As illustrated, the leading edges **45, 45'** of the static guide and folding bars **44, 44'** are appropriately contoured for smooth mating with the folder flaps **25, 25'**.

The next step in the folding and packaging sequence is the moving of the package to the fourth position (FIG. **7**) where the top end flaps **26, 26'** have glue applied to the undersides thereof by means of the stationary, hot-melt glue applicators **60, 60'**. The top end flaps **26, 26'** are then subsequently folded down by pneumatically actuated, moving folding rail systems **70, 70'** as the package moves from the fourth position to the fifth position (note FIG. **8**). The folding bars **71, 71'** in their operative position (FIG. **8**) hold the glued, top end flaps **26, 26'** in until the glue sets which usually takes approximately nine seconds.

Thereafter in the sixth position (FIG. **9**) a laterally traveling, hot-melt glue applicator **80** traverses the full width of the package applying glue to the underside of the last, remaining flap which is the front glue panel **24.** Subsequently the package is moved up to the seventh position (FIG. **10**) in vertical section **1***c* of the machine **1** into a compression station between two stationary, vertical dead plates **93, 94,** all of which cause the final flap **24** to be folded down over the package and to be glued in place.

The traveling glue pot or applicator **80** is driven across the width of the machine **1** by means of a lateral chain drive system **82** (note FIGS. **2** and compression stage (7th position) by means of the dual rack-and-pinion system **97, 97'** driven by a common shaft **98** and carrying the package platforms **99, 99'** (note FIGS. **2, 9** and **10**).

The dead plates **93, 94** extend down and also across the width of the machine and resiliently bear inwardly against the package, slightly compressing it. During the setting period for the glue, the package is held up or suspended in its compression position by means of four dogs or swinging support elements **85, 85'**. The support

elements **85, 85'** are pivotably connected to the frame of the machine **1** by means of pivot pins **86, 86'** which allow the support elements **85, 85'** to be swung out as a package moves up into their grasp and then move back into their supporting position.

After the glue sets (approximately **12** seconds), the package is moved to the eighth position (FIG. **11**) by virtue of the next succeeding package pushing it up to that position. This action causes it to be moved up into the discharge station (8th. position) where it is pushed onto a holding platform or, if desired, a conveyor belt (not illustrated) by a horizontal, overhead discharge bar or ejector system **90.** The package **10'** is thus ejected from the machine **1** to the ninth position (FIG. **11**) where it is removed for shipment to the customer. The package **10'** is then complete and ready for appropriate labeling and loading for shipment.

Thus in the method and apparatus of the present invention the package is formed around the doors **10** by dropping the doors **10** with an appropriately positioned packing folder **2** downward into the receiving well **30** of the machine **1** and then horizontally advancing the package through the various positions from the initial first and second positions to the sixth position where the traveling glue applicator **80** applies glue to the last flap **24** of the package, with the package then traveling upward to the seventh (compression) position to set the glue, and then finally out of the machine **1** generally in-line with the door construction line.

The folding of the panels and flaps are sequentially and summarily accomplished as follows. Panels **22** and **23, 21** and **24** are folded up by static guides **40** and **41,** respectively, as the package moves down in the first, vertical section **1***a* of the machine **1**; flaps **27, 27'** are folded in by moving folder bars **51, 51'**; panels **21**/24 and flaps **28, 28'** and flaps **25, 25'** are folded over, in and up, respectively, by static guides **41, 43** and **44,** respectively, as the package moves horizontally along the second, intermediate, horizontal section **1***b* of the machine **1**; flaps **26, 26'** are folded down by moving folder bars **71, 71'**; and finally panel **24** is folded down by static compression plate **93** as the package moves up in the third, vertical section **1***c* of the machine **1.**

The package thus begins by moving down in a vertical direction in the first section **1***a* of the machine **1,** then forward along a horizontal plane in the middle or second section **1***b* of the machine **1,** and then up in the third section **1***c*, following generally a "U"-shaped path through the machine **1.** This vertical-horizontal-vertical line of travel, combined with the operative steps of folding (the bulk of which is formed by static guides), glueing and setting along the way, result in a much improved and more compact system than heretofore achieved. The beginning and ending of the package at approximately the same general vertical level also greatly enhances the practical, production in-line use of the system of the present invention.

It is of course possible to vary the vertical-horizontal-vertical configuration to, for example, horizontal-vertical-vertical or vertical-vertical-horizontal, although the "U"-shaped configuration is preferred. Indeed it is possible to combine the two vertical sections into one unitary frame, the package going down for the first vertical folds and then back up for the second vertical folds, which would reduce the in-line length of the machine but make more complex the operative systems in the machine.

The packages are driven through the horizontal protions **1***b* of the machine **1** by means of intermittent, reciprocating, dual chain drives **100, 100'** which are powered by reciprocating main air cylinder **101** (note FIG. **2**).

As shown in FIGS. **12** and **13,** each chain **100, 100'** includes along at appropriately spaced positions its length drive cogs **102** which are pivotably mounted by pin **103** on the chain. The cog **102** is stopped from going past its vertical position (FIG. **12**) by an appropriate stop and is normally biased by spring **104** to maintain its vertical position. However, when the chain reverses (FIG. **13**), the cog **102** can swing down beneath any package **110** it may happen to pass. Thus the package **110,** which is always supported by smooth longitudinal bars **105, 105'** during its horizontal movement in the machine **1,** is driven forward by the cogs **102** when the chain moves forward, but remains stationary when the chain reverses.

As a package traverses across the horizontal portion **1***b* of the machine **1,** the chain goes through four cycles, with a total of six packages being in process in the machine **1** at the same time, with one waiting to be discharged.

A view of the three hot melt glue applicators **60, 60'** and **80** are shown in FIGS. **2**A and **2**B. Each tank has a glue head (**61, 61'** and **81**) which applies adhesive to the appropriate flap. The three glue heads have independent glue reservoirs **85, 85***a*, **85***a'*, as shown, but of course could have a common supply if desired.

An appropriate control panel with a start button is conveniently located for the operator near the cavity well **30,** an emergency stop button also being provided. Because of the machine's pneumatic system, production can be stopped immediately in the middle of any cycle. When the emergency button is released, the machine sequence goes back to the beginning of the cycle and repeats the procedure.

Another important aspect of the present invention is the flexibility of the machine **1** and its broad applicability to many different types and sizes of articles. The machine **1** is mounted on and includes a generally open framework, allowing easy access to its operative elements, viz. the various static and moving folding and guide elements and the glue applicators which serve as one type of securing means for the package. These operative elements are mounted on suitable mechanical supports which allow the position of their working surfaces to be quickly and easily varied, as desired or appropriate.

A typical system would be to mount the elements on crank-wheel operated screws, which by merely turning the crankwheel the position of the element is varied.

Additionally or alternatively, end knobs could be provided with sliding adjustments pre-marked for different article and packing folder sizes. Quick size adjustments of the folding rails can be designed to be easily accomplished in the machine **1,** for example, with a simple Allen type of wrench.

The easy access to hand knobs possible in the present invention for adjusting the distance of the hot-melt glue applicators for different package sizes, and the easy dimension settings of the main shoot hopper and the compression station which can be easily designed into the machine **1** allow quick change-overs to other sizes of articles in less than fifteen minutes. Moreover, in the

present invention there are no real critical adjustments.

Although using the "U"-shaped path of travel and combining both static and moving folding members has been found to be highly suitable, it is possible by varying the path to have all the folding members remain static. Thus the moving folding elements **50, 50'** could be replaced by static ones and the package moved horizontally to the left first before proceeding along its normal horizontal path to the right (as viewed in the drawings); in which case the horizontal drive system **100, 100'** would be appropriately changed to produce such motion. Likewise, the moving folding elements **70, 70'** could be replaced by static ones appropriately positioned in "up" vertical section **1***c* so that, when the package was driven up, the top end flaps would also be folded down and set in the compression station; in which case the machine could be shortened and the glue applicators **60, 60'** placed closer to the up vertical section **1***c*.

Because many varying and different embodiments may be made within the scope of the inventive concept herein taught, and because many modifications may be made in the embodiment herein detailed in accordance with the descriptive requirements of the law, it is to be understood that the details herein are to be interpreted as illustrative only and not in a limiting sense.

What is claimed as invention is:

**1.** A multi-level, in-line packaging machine for continuously packaging an article in a packing folder having a final sealing flap, said machine having multiple, continuous, juxtaposed sections, comprising:

an initial vertical section;

a horizontal section; and

a final vertical section, said sections being connected together in line with at least one of the other sections for packaging the article, said vertical sections being structurally separated, with said horizontal section being intermediately disposed between said initial vertical section and said final vertical section, the article with the packing folder traveling first through said initial vertical section, then across said horizontal section, and finally through said final vertical section;

said initial vertical section having at one vertical extremity thereof article and packing folder receiving means for receiving the article to be packaged along with a packing folder, and including within it

vertically moving means positioned vertically in line with said receiving means upon which the article with packing folder is positioned for moving the article and folder in a vertical direction through said initial vertical section; said initial vertical section further including within it first operative means located about said vertically moving means for at least folding a portion of the packing folder about the article, at least a portion of said first operative means being static means for causing a part of the packing folder to be folded vertically as it moves along past said static means;

said horizontal section having along its length article and packing folder moving means for carrying the article and folder across its length, and including within it

horizontally moving, intermittent drive means for intermittently driving the article and folder across in a horizontal direction; said horizontal section further including within it

second operative means for folding and at least in part securing the packing folder around the article, at least a portion of said second operative means being static means for causing a part of the packing folder to be folded back as it moves horizontally along said static means as it moves through said horizontal section, and

traveling glue applicator means, which laterally travels across the width of the machine during the pause portion of said horizontally moving, intermittent drive means, for applying glue to the underside of the final sealing flap, said traveling glue applicator being located at the down-stream end portion of said horizontal section and at the entrance portion of said final vertical section;

said final vertical section having located at one vertical extremity thereof ejecting means for moving the article along with the packing folder out of said final vertical section, and including within it

vertically moving, intermittent drive means positioned adjacent but vertically removed from said ejector means upon which drive means the article with packing folder thereabove is positioned for intermittently moving the article and folder in a vertical direction through said final vertical section to said ejecting means; said final vertical section further including within it third operative means located about said vertically moving, intermittent drive means for folding the final sealing flap portion of the packing folder about the article, at least a portion of said third operative means being static means for causing

the final sealing flap of the packing folder to be folded vertically as it moves along past said static means, and

static compression means placed on opposite sides of the section for holding the completely packaged article under static compression after the final sealing flap has been folded by said static means;

whereby each article and packing folder follow vertical paths and a horizontally across path as the packing folder is folded, primarily by static means, and secured about the article.

**2.** The multi-level, in-line packaging machine of claim **1** wherein said vertical sections are separated apart a substantial distance and said horizontal section is connected and disposed between said vertical section at their bottom portions, said initial vertical section being connected at its upstream end and said final vertical section being connected at its downstream end, the article with packing folder being initially received at the top of said down vertical section and traveling during the packaging thereof down through said initial section, then across said horizontal section and then up through said final vertical section; whereby the article and packing folder follow a generally U-shaped path as the packing folder is folded and secured about the article.

**3.** The multi-level, in-line packaging machine of claim **2** wherein the packing folder is a five-panel, at least generally rectangular, packing folder having initial front and back panels, top and bottom panels and

a final, sealing, front panel and a multitude of side end flaps, and wherein

said static means of said first operative means includes two vertically and laterally disposed static guide elements placed on opposite sides of said downwardly moving means, the front and back panels of the folder being folded up by said static means as the package progresses down said initial vertical section;

said static means of said second operative means includes a top, horizontally and laterally disposed static guide placed above said horizontal drive means, and at least two side, longitudinally disposed static guides placed on opposite sides of said horizontal drive means, the top panel and at least two of the end flaps being folded down and back, respectively, by said static top guide and side guides, respectively, as the package progresses across said horizontal section; and

said static means of said third operative means includes a static guide element placed along the side of said vertically moving drive means, the final, sealing, front panel being folded down by said static means as the package progresses up said final vertical section.

**4.** The multi-level, in-line packaging machine of claim **1** wherein the vertical level of said receiving means and said ejecting means are approximately equal.

**5.** The multi-level, in-line packaging machine of claim **1** wherein the positions of said operative means are adjustable and include adjusting means for adjusting their positions, and the machine further includes a generally open framework in said three sections, allowing free and easy access to said adjusting means, whereby the machine can be readily and easily adaptable to many different size packing folders by adjusting the position of said operative means.

**6.** The multi-level, in-line packaging machine of claim **1** wherein said horizontally moving drive means comprises at least two parallel, longitudinally disposed support bars upon which the article and packing folder rest during its travel across said horizontal section and a reciprocating chain drive disposed parallel to but below said support bars, the chain drive having projecting drive elements for contacting and driving the article and packing folder which are rigidly mounted when the chain drive is driven forwardly and are freely moveable downardly when the chain is driven rearwardly.

**7.** The multi-level, in-line packaging machine of claim **1** wherein said vertically moving means in said initial vertical section is a pneumatic cylinder which allows a restrained downward movement which is caused by the weight of the article itself.

**8.** The multi-level, in-line packaging machine of claim **1** wherein said vertically moving, intermittent drive means comprises an intermittent, reciprocating drive system including a reciprocating, vertically moving portion and a static holding portion, and wherein said holding portion includes said static compression means, the packaged article being held under compression between said static compression means when in said holding portion.

**9.** The multi-level, in-line packaging machine of claim **8** wherein said holding portion comprises at least two opposed sets of two swinging support dog elements which support a packaged article during the pause portion of said vertically moving, intermittent drive means, the next succeeding packaged article pushing the four swinging support elements aside and pushing the previously supported packaged article up during the moving portion of the intermittent drive system, said next succeeding packaged article then being supported by said swinging support elements.

**10.** The multi-level, in-line packaging machine in claim **9** wherein said swinging support elements each are pivoted and have an inclined bottom portion and a supporting upper ledge, the minimum separation distance between each set of support elements being less than the corresponding dimension of the packaged article, a packaged article pushing said swinging support elements aside as it moves up in contact with said inclined bottom portions and then being supported by said upper ledges.

**11.** The multi-level, in-line packaging machine of claim **8** wherein said static compression means are two opposed stationary vertical dead plates which extend down and across the width of the machine and resiliently bear inwardly against the packaged article, slightly compressing it.

**12.** The method of folding and securing packing folders, each having a final sealing flap, about articles comprising the following steps:

a. providing a multi-level, in-line packaging machine for continuously packaging articles in the packing folders, said machine having multiple, continuous, juxtaposed sections, comprising an initial vertical section; a horizontal section; and a final vertical section, said sections being connected together in line with said horizontal section being intermediately disposed between said vertical sections, each of said initial vertical and said horizontal sections having at least two static, folding, opposed elements placed on opposite sides of the section, said final vertical section having at least one static, folding element placed along one side of said section and having static compression means disposed on opposite sides of said section, said horizontal section also including at its down-stream end portion traveling glue applicator means moveable laterally across the width of the machine for applying glue to the underside of the final sealing flap, said horizontal and said final vertical sections each also including intermittent drive means for intermittently driving each article and packing folder through said section;

b. first moving each article with a packing folder appropriately positioned about the article vertically through said initial vertical section past the static guides therein thereby vertically folding a portion of the packing folder about the article;

c. then moving the article and packing folder horizontally across said horizontal section past the static guides therein folding back a further portion of the packing folder about the article;

d. moving said traveling glue applicator means laterally across the width of the machine, to thereby apply glue to the underside of the final sealing flap of the packing folder, during the pause portion of the intermittent drive means of said horizontal section;

e. moving the article and packing folder vertically through said final vertical section past the static guide therein folding the final sealing flap portion

of the packing folder about the article and securing the packing folder about the article; and

f. statically holding the completely packaged article between said static compression means during the pause portion of the intermittent drive means of said final vertical section; whereby the article and packing folder follow a generally vertical-horizontal-vertical path as the packing folder is folded and secured about the article and whereby at least the major portion of folding the packing folder about the article is accomplished by static guides.

**13.** The method of claim **12** wherein in the machine of step "*a*" said vertical sections extend above said horizontal section, and wherein the article and packing folder in step "*b*" are moved in a downward direction and in step "*e*" in an upward direction; whereby the article and packing folder follow a generally U-shaped path as the packing folder is folded and secured about the article.

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PO-1050
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# UNITED STATES PATENT OFFICE
# CERTIFICATE OF CORRECTION

Patent No. 3,832,822 Dated September 3, 1974

Inventor(s) Earle C. Sherman

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 50, "Pat. Nos." is changed to--patents--.

Column 3, line 65, "there" is changed to--their--, and

line 66, "their" is deleted and --cylinder-- is substituted therefor.

Column 4, line 58, after "and" there is inserted --9). The package is driven up into the--.

Column 6, line 1, change "pro-" to--por---.

line 54, change "crankwheel" to--crank-wheel--.

Column 7, line 19, add quotes (") around --up--.

Signed and sealed this 3rd day of December 1974.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents