Jan. 31, 1967 R. E. REEVES 3,301,144

BOX CLOSING DEVICE

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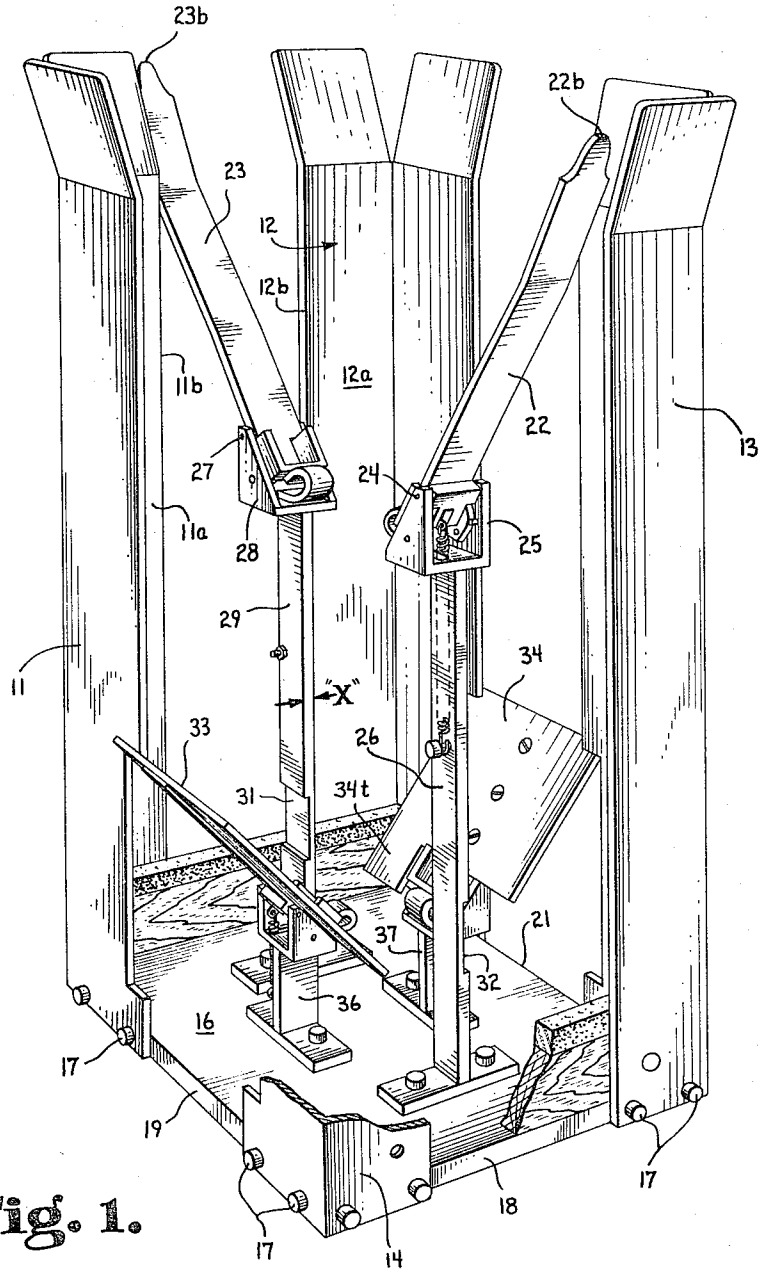


Fig. 1.

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BOX CLOSING DEVICE

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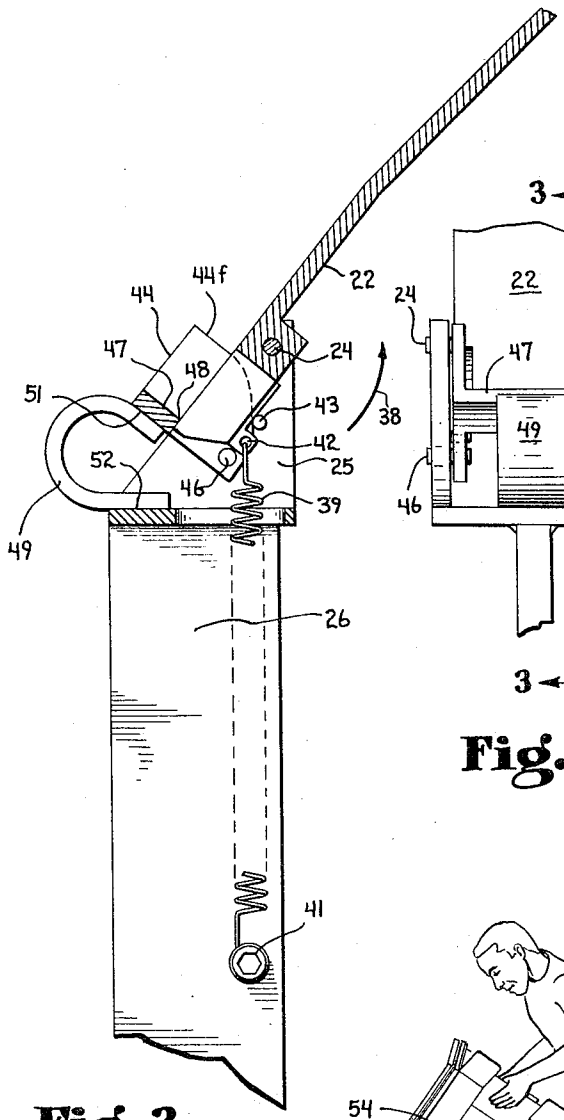


Fig. 3.

Fig. 2.

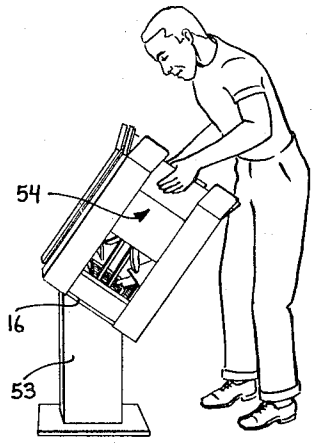


Fig. 5.

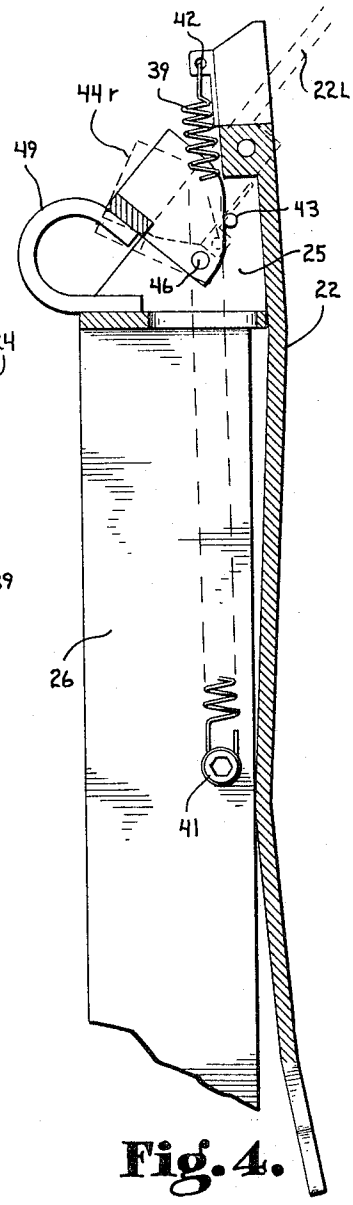


Fig. 4.

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BOX CLOSING DEVICE

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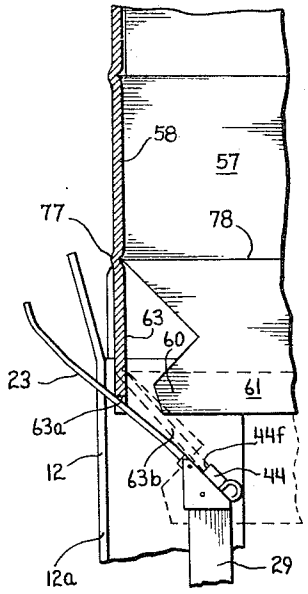


Fig. 6.

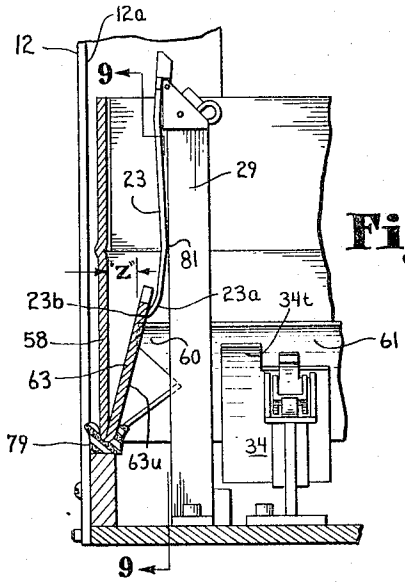


Fig. 8.

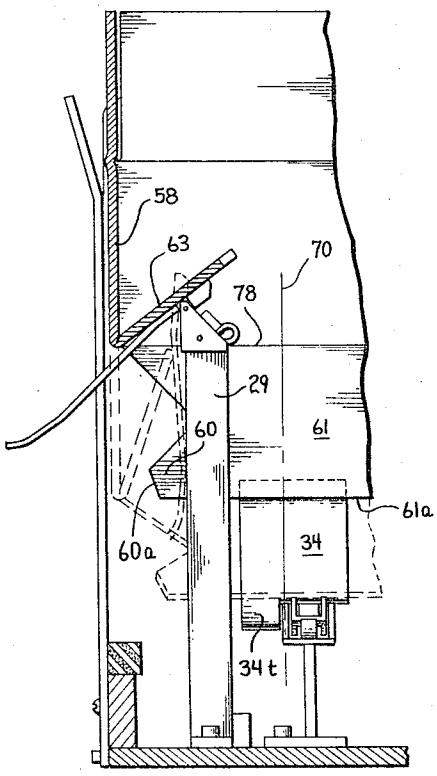


Fig. 7.

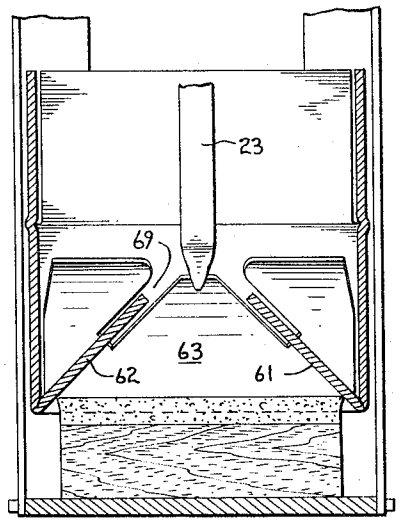


Fig. 9.

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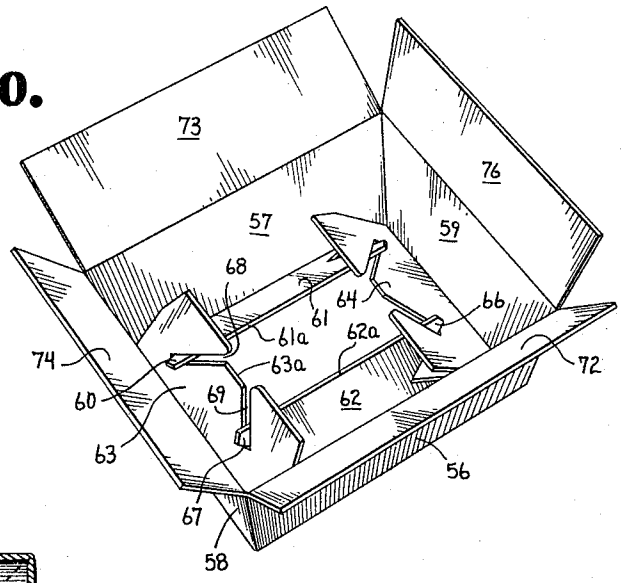
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BOX CLOSING DEVICE

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Fig. 10.



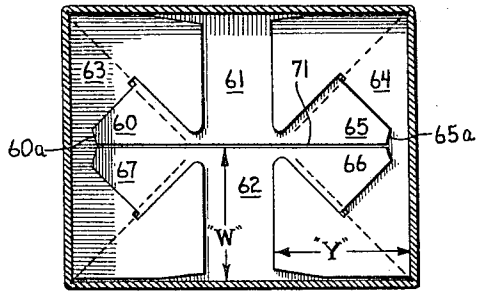


Fig. 11.

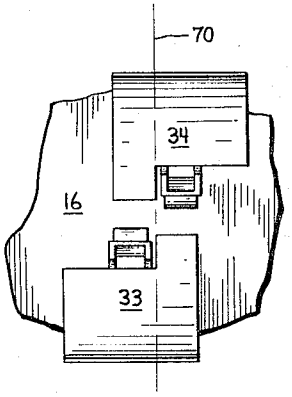


Fig. 13.

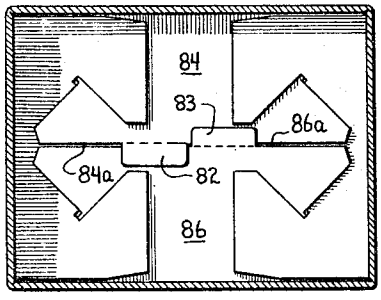


Fig. 12.

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United States Patent Office

3,301,144

Patented Jan. 31, 1967

3,301,144

BOX CLOSING DEVICE

Robert E. Reeves, Indianapolis, Ind., assignor to Inland Container Corporation, Indianapolis, Ind., a corporation of Indiana

Filed Sept. 4, 1964, Ser. No. 394,525

11 Claims. (Cl. 93—36)

This invention relates generally to self-locking fibreboard boxes, and more particularly to a device which quickly closes and locks the flaps of such boxes.

Self-locking boxes are well known and frequently used where equipment for setting up and closing regular slotted containers is not available, and it is undesirable, for obvious reasons, to maintain an inventory of completely set-up slotted containers.

In many instances, where self-locking boxes are used, workmen are required whose only job it is to set up the the boxes which are then furnished to the workmen ("box packers") who remove commodities from a conveyor line and pack the boxes. This arrangement requires more manpower than is desirable. Moreover, the flaps of the boxes are frequently damaged or mutilated to some extent when they are set up and the ends closed.

It is, therefore, a general object of the present invention to provide a device for closing and locking the flaps in self-locking boxes.

A further object is to provide such a device which can be easily operated by unskilled laborers without damage to the flaps.

A further object is to provide a device which will permit packers to easily set up their own boxes.

A further object is to provide a device of a type which can be easily manufactured and lends itself readily to adjustable types of construction for use with boxes of various sizes.

Described briefly, a typical embodiment of the present invention includes a support member which can be mounted on a stand to support the device at an angle facilitating its use by a box packer. Four elongated guides are provided in parallel spaced relation, each of the guides having an angular cross section to receive the corner of a box blank inserted into the device at the free ends of the guides. The guides define a polygonal space in which the box blank is received during the flap closing operation.

Two upper fingers are supported in the space within the guides and extend upwardly and outwardly therefrom to intercept the end flaps of a box blank as it is inserted into the device. They are supported to break the end flap scores and begin to fold the end flaps inwardly as the box is inserted in the device.

Latches are provided on the upper folders so that when the latches are struck by the lower margins of the end flaps as the box is pushed further into the fixture by the packer, the upper folders can pivot downwardly and allow the supports for the folders to further turn the end flaps inwardly and then upwardly as the box blank is pushed further into the device.

Two lower folders are provided in a manner similar to the upper folders and are disposed to intercept the side flaps of the box blank when the end flaps have been turned inwardly to an angle of ninety degrees with respect to the end walls of the box blank. As the box blank is pushed still further downwardly into the device, the side flaps are turned inwardly by the lower folders. The lower folders are also provided with latches engageable by the lower margins of the side flaps which then release the lower folders and allow the side flaps to be turned still further inwardly and upwardly as the box blank is pushed still further into the device.

Stops are provided so that when the flaps are positioned properly for inter engagement, the inward movement of the box blank into the device will be halted whereupon the blank can be withdrawn sharply from the device and the flaps will move into their proper locked relationship during withdrawal. The upper folders are formed to facilitate the quick and reliable locking action during the initial movement in withdrawal of the box blank from the device.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

FIG. 1 is a perspective view of a typical embodiment of the present invention.

FIG. 2 is an enlarged fragmentary elevational view illustrating details of the upper folder mounting and latching means.

FIG. 3 is a fragmentary section taken along the line 3—3 in FIG. 2 and viewed in the direction of the arrows.

FIG. 4 is identical to FIG. 3 with the exception that it shows the upper folder in its original position by the dotted outline and in its pivoted position by the solid outline, the latch being shown in its unlatching condition by the dotted outline.

FIG. 5 is a reduced scale view of the device secured to a floor mounted stand and showing a packer pushing a box blank down into the device.

FIG. 6 is a fragmentary elevational view illustrating the initial flap folding event.

FIG. 7 is a view similar to FIG. 6 and showing more of the device and illustrating subsequent flap folding events.

FIG. 8 is a view like FIG. 7 and showing a still later stage in the operation.

FIG. 9 is a sectional view taken along the line 9—9 in FIG. 8 and showing the parts at the same stage in FIG. 8.

FIG. 10 is a perspective view of a typical box closable by the present invention, showing the flaps at the beginning of their interlocking action.

FIG. 11 is a plan view of the bottom of the closed box as it appears inside the box.

FIG. 12 is a view like FIG. 11 but showing a box having a modified flap construction which is also closable by the device of the present invention.

FIG. 13 is a fragmentary view looking down into the fixture showing the offset relationship of the latches on the lower folders.

Referring now to the drawings in detail, and particularly FIG. 1 thereof, four elongated guides **11**, **12**, **13**, and **14**, the latter being partially broken away in the drawing, have their lower ends secured to the rectangular plate **16** by any suitable means such as screws **17**, for example. Each of these guides has a ninety degree angular cross section, and the guides are disposed in parallel spaced relationship to each other. Therefore the inside faces of the guides define two pairs of parallel guide planes. One of these guide planes defined by guides **13** and **14** is tangent the edge of **18** of the plate **16**, the plane parallel to this first plane being defined by the inside faces **11***a* and **12***a* of the guides **11** and **12** respectively. The third and fourth parallel guide planes are tangent the edges **19** and **21** respectively of the plate **16**, these guide planes being normal to the first and second guide planes.

In the illustrated embodiment, the spacing of the first and second guide planes is fixed and is just slightly greater than the overall outside dimensions between the end wall panels of the box whose bottom flaps are to be closed by the device. Similarly, the spacing between the third and fourth guide planes is just slightly greater than the overall outside dimension between the side wall panels of the box to be closed by the device. The upper ends of

the guides are flared outwardly slightly so as to readily receive a box blank into the guides. Facing edges of guides, such as edges **11***b* and **12***b* of the guides **11** and **12** respectively, for example, are spaced apart to accommodate pivotal action of the flap folders and also facilitate the pushing of the box blank into the device and removal therefrom by the man setting up the box, the present invention making it possible for this man to be the box packer himself.

First and second upper flap folders are provided in the form of elongated fingers **22** and **23**, each of which is mounted to a support post secured to plate **16** and extending upwardly therefrom in the space between the guide planes. Finger **22** is pivotally mounted on a horizontal axis pin **24** mounted to the post **26** secured to the base plate **16**. Finger **24** is pivotally mounted at the pin **27** to the bracket **28** which is secured to the upper end of the support post **29** whose lower end is secured to the base plate **16**. The posts **26** and **29** are spaced approximately equidistantly between the third and fourth guide planes. Their thickness X is made as small as possible at the notches **31** and **32** in order to accommodate turning action of the side flaps of the box during use of the device which will be described. The posts are set in from the first and second planes a distance sufficient to allow proper turning action of the side flaps during the use of the device.

Two more flap folders are provided in the form of plates **33** and **34**. These plates are for turning the side flaps of the box blank and these plates are pivotally mounted to their respective support posts in the same manner as the fingers **22** and **23** are pivotally mounted to the support posts **26** and **29**, respectively. While the folder fingers **22** and **23** will sometimes be referred to as the upper folders, the plates **33** and **34** will be referred to as the lower folders. The upper and lower folders may have configurations other than those shown, but certain advantages are derived from making the upper folders in the form of the fingers shown, as will be explained hereinafter. The mounting details of the illustrated folders will now be described, particular reference being made to FIGURES 2, 3, and 4. Referring particularly to FIGURE 3, the finger **22** is pivotally mounted by means of the pin **24** to the bracket **25** which is secured to the upper end of the support post **26**. The finger is biased to rotate in the direction of the arrow **38** by means of the coil spring **39** whose lower end is secured to the post **26** by the anchor bolt **41** and whose upper end is hooked through an aperture **42** at the lower end of the finger **22**. A stop pin **43** secured to the bracket **25**, or other suitable means may be employed to limit the travel of the finger **22** in the direction of the arrow **38**.

To prevent rotation of the finger opposite to the arrow **38**, a latch **44** is employed which is pivotally mounted to the bracket **25** by means of the pins **46**. The latch **44** has a cross bar **47** which extends across the front edge portion **48** of the finger **22**, the overlapping of the lower face of the bridge **47** and the upper face of the finger **22** at the portion **48** serving to lock the finger **22** in the position shown. Though the latch **44** is pivotal on the pin **46**, any force applied to the bridge portion **47** thereof by the finger **22** would be in a direction radially outwardly from the axis of the pin **46** and would be ineffective to release the latch. The latch is normally held in position by a U-shaped resilient spring **49** which may typically be made of rubber, for example, the upper end thereof being secured at **51** to the bridge **47** and the lower end thereof being secured at **52** to the bracket **25**. Adhesive attachment means is adequate for this purpose. The bias thereby provided on the latch urges it against the stop pin **43**.

FIGURE 4 shows by the dotted outline **44***r* a released position of the latch **44** whereupon the finger **22** can be pivoted from the position shown by the dotted outline **22L** downwardly to the position shown by the solid outline. After the finger **22** is pivoted away from the position shown by the dotted outline **22L**, the latch biasing member **49** will move the latch back against the stop **43**. A separate stop means for the latch and the finger can be employed, if desired.

FIGURE 5 shows the device in use, the base plate **16** thereof being secured to a stand **53** which is mounted securely to the floor. The workman has inserted the box blank **54** into the device and has initiated the folding of the side and end flaps by pushing downwardly on the box. The box is disposed at an elevation and angle which make it convenient for the workman to use the device, as it permits him to push the box blank generally downwardly into the device.

Referring now ot FIGURES 10 and 11, the former of which shows the bottom of the box partially closed and the latter of which shows it completely closed, there are the side panels **56** and **57**, end panels **58** and **59**, which form the sides and the ends of the completed box. The bottom of the box, when the bottom is closed, is formed of the flaps **61** and **62** which are mounted to the lower margins of the side panels, and which will hereinafter be referred to as the side flaps. The bottom is completed by the flaps **63** and **64** mounted to the lower margins of the end panels **58** and **59**, respectively, and these will hereinafter be referred to as the end flaps. As shown in FIGURE 10, the ears **66** and **67** of the side flap **62** project slightly into the slots **68** and **69** of the end flaps **64** and **63**, respectively. When the bottom is completely closed, the ears extend completely through the slots, as shown in FIGURE 11. The other side flap **61** also has ears extending in the slots provided therefore in the end flaps.

The length of the side flaps, that is the dimension W in FIGURE 11, is such that the marginal edges **62***a* and **61***a* of the flaps **62** and **61** meet at the line **71** at the center of the bottom. The length of the end flaps, that is dimension Y in FIGURE 11, can be varied considerably, as desired.

The flaps **72**, **73**, **74**, and **76** may be the usual rectangular flaps typically found in regular slotted cartons. However they can have other configurations, if desired.

OPERATION

The operation of the device can best be understood by referring to FIGURES 6 through 9. The lower end of the box blank is inserted into the upper end of the fixture with the side and end flaps being coplanar with the side and end wall panels, respectively. As shown in FIGURE 6, the end flap **63** is coplanar with the end panel **58**, and the side flap **61** is coplanar with the side panel **57**. The end flap score **77** is unbroken and the side flap score **78** is unbroken.

As the box blank is pushed downwardly into the fixture the lower marginal edge **63***a* of the end flap **63** engages the upper surface of the finger **23**. Simultaneously, the lower marginal edge of the end flap **64** engages the upper surface of the finger **22**, although this is not shown in the drawing, in order to conserve space.

Upon pushing the box blank further down into the device, the fingers **22** and **23** remain secure against their stops and will force the end flaps inwardly as the box blank is pushed down further. This is represented by the dotted outline **63***b* in the FIGURE 6. When the box blank has reached the position indicated by the dotted outline in FIGURE 6, the side flaps have not encountered any obstacle and remain coplanar with the side panels of the device.

When the box blank has reached the position shown by the dotted outline in FIGURE 6, the lower marginal edge **63***a* of the end flap **63** strikes the front edges **44***f* of the latch **44** which pivot it to a position such as shown by the dotted outline in FIGURE 4. This releases the finger **23** allowing it to begin pivoting downwardly to a condition such as shown in FIGURE 7. Therefore, as

the box blank is pushed further downwardly, this pivoting of the finger **23** will allow the flap **63** to be turned inwardly till it is perpendicular to the first and second guide planes, which may be referred to as the end guide planes.

At any desired time after the end flaps have been turned inwardly to this extent, the side flaps can be folded inwardly. In the illustrated example, the inward folding of the side flaps begins at the time the box blank reaches the position shown in FIGURE 7. At this time, the lower marginal edge **61***a* of the side flap **61** strikes the upper surface of the lower folder plate **34**. Further downward motion of the box blank causes this folder to turn the side flap **61** inwardly breaking the score line **78**. The inward folding continues until the lower marginal edge **61***a* strikes the latch for the folder **34**, this box blank position being designated by the dotted outlines in FIGURE 7. At this time, the flap **63** has been folded so that it forms an upwardly opening acute angle with the side panel **58**.

Further downward motion of the box blank will cause the side flaps to be folded past a position perpendicular to the third and fourth guide planes, the side guide planes, so that when the lower margins of the end flaps contact the resilient stop bars **79**, the side and end flaps have the relationship shown in FIGURES 8 and 9. At this point, the ears of the side flaps are aligned with the slots in the end flaps. This is demonstrated in FIGURE 9.

When the box blank is pulled sharply upwardly from this position, the ears enter the slots and, when the blank has been pulled out of the fixture it may have the configuration shown in FIGURE 10, although the bottom is usually much more completely closed so that, when the first item of the commodity is placed in the box the bottom will be completely closed.

It is during withdrawal of the box blank from the device that the fingers **22** and **23** control the flaps so as to avoid interference with any portion of the support posts and folder mounting brackets. By having the fingers **23** formed in the configuration shown, additional assurance of quick and reliable flap locking is obtained, in a manner which will now be described.

Referring to FIGURE 8, it will be observed that for the greater part of its length, the finger **23** is disposed rather close to the support post **29** when it is pivoted down to the position shown wherein the finger contacts the support post at the point **81**. From the point **81** toward the distal end of the finger, it flares outwardly having an outward curved portion **23***a* adjacent its outer end. The spacing of the support posts **26** and **29**, and the contours of the fingers **22** and **23** are such that when the box blank has been pushed into the fixture to the position shown in FIGURE 8, the end flaps will be allowed to move toward each other enough that the outer tips **60***a* and **65***a* of the side flap **61** will just enter the slots provided therefor in the end flaps **63** and **64**. Likewise the tips of the ears **66** and **67** on the side flap **62** will just enter the slots provided therefor in the end flaps **63** and **64**. This relationship is indicated for the ear **60** and the end flap **63** in FIGURES 8 and 9 of the drawings.

So it is seen, that by proper positioning the outer tips **22***b* and **23***b* of the fingers **22** and **23**, respectively the end flaps **63** and **64** will be allowed to extend inwardly enough that the distance between the slots of the end flaps and the inside face of the end wall panels of the box blank will be greater than the distance Z (FIGURE 8) between the same inside wall faces and the tips of the ears of the side flaps so that as the box is pushed down and the lower folders fold the side flaps upwardly, to a position such as shown in FIGURES 8 and 9, the tips of the ears will actually engage the surface **63***u* of the end flap and push it out toward the inside surface of the end wall **58** until the ears snap into the slots whereupon the flaps **63** will snap back against the tips **23***b* and **22***b* of the fingers **23** and **22**, respectively. Then, as the box blank is pulled out of the device, the fact that the rest of the fingers above the tips is further away from the box and walls, assures that the ears of the side flaps will remain in the slots of the end flaps until the box blank has been removed from the device whereupon the natural tendency of the flaps to return to their initial position will cause the ears to move further into the slots and restore the bottom to a closed position such as shown in FIG. 11. If the restoring forces in the flaps do not of themselves completely close the bottom of the box, only a slight downward pressure is necessary and this can be done either directly by the operator's hand or by placing commodities in the box.

Another feature of the present invention is the provision of the latches for the lower folders **33** and **34** on opposite sides of a plane **70** (FIGS. 7 and 13) parallel to the first and second guide planes and spaced equidistantly between them. Also, each of the lower folders **34** and **33** has a downwardly projecting support tab (**34***t* and **33***t*) coplanar therewith and at the side of the latch portion therefor. The purpose of this arrangement is to facilitate the closing of a self-locking box such as shown in FIG. 12 wherein the side flaps **84** and **86** have the reinforcing tabs **82** and **83** thereon. When such a box is closed, the support tabs **34***t* and **33***t* of the folders support the reinforcing tabs **82** and **83**, respectively, during the inward folding of the side flaps. The offset relationship provides ample clearance for the folding of the flaps and yet the latches are operated by the lower marginal edges **84***a* and **86***a* of the major portion of the flaps as in the previously described operation for the container, and are not operated by the reinforcing tabs. A reverse score **82***b*, **83***b* may be provided at the tabs to allow them to bend downwardly as the side flaps are being turned upwardly, if necessary. However, because the score is a reverse score, these tabs will not bend upwardly with respect to the flaps so their reinforcing function is not destroyed.

From the foregoing description, it can be readily appreciated that if the support posts are arranged for mounting to the members providing the guide planes with which they must cooperate, an adjustable fixture can readily be attained. Such a fixture could be used for various sizes of boxes. In other words, if the folder supports were secured to guides, the relationship between folders and the guides with which they cooperate would remain constant and the guides could be adjusted to handle several box sizes.

If it is desired to hold the box blank stationary and move the folders into the box blank to close the flaps, this can also easily be done within the scope of the present invention. The flap scores of a conventional box can also be broken by the device of the present invention if desired.

Therefore, while the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative and not restrictive in character, as other modifications may readily suggest themselves to persons skilled in this art and within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. A box flap closing device comprising: a support member (**16**); four elongated guides (**11, 12, 13, 14**) secured to said support member and extending upwardly therefrom in parallel spaced relation, each of said guides having an angular cross section to receive a corner of a box blank inserted into the device, the upper ends of said guides being flared outwardly to facilitate entrance of a box blank into said guides, said guides establishing first and second guide planes in parallel spaced relationship to each other and third and fourth parallel spaced guide planes perpendicular to said first and second guide

planes; first and second support posts (29, 26) secured to said support member and extending upwardly therefrom parallel to said third and fourth planes and spaced equidistantly from said third and fourth planes; first and second flaps folding members, each of said members being an elongated flap folding finger (23, 22), each finger having a lower and pivotally mounted to one of said support posts, and each finger being spring biased into normal position extending upwardly from the pivotal mounting thereof and outwardly through one of said first and second planes; a first latch (44) pivotally mounted to said first post and having an abutment portion (44*f*) projecting upwardly from the upper surface of said first finger (23), the distance from said abutment portion to said first plane intercepted by said first finger and measured along said first finger being less than the length of a box flap (63) to be folded by said first finger, the box flap length being measured from a score line (77) on the box blank to the marginal edge (63*a*) of the flap parallel to the score line, said score line being the one to be broken by said first finger during movement of the blank into the device, said latch normally preventing pivoting of said first finger downwardly when said finger is engaged by said box flap, whereby said score line is broken and said flap is turned inwardly as said box blank is moved toward said support member, the abutting engagement of said marginal edge with said abutment as said flap is turned inwardly being operative to pivot said latch to release position as said box blank is moved further toward said support member whereupon said first finger is pivotable downwardly to permit upward turning of said flap by said first support post as said blank is moved further toward said support member; a second latch pivotally mounted to said second post (22) and having an abutment projecting upwardly from the upper surface of said second finger and operable to release said second finger in the same manner as said first latch is operable to release said first finger; said first and second fingers being aligned with said first and second posts respectively for arresting engagement of said fingers with said posts after pivoting of said fingers to positions generally parallel to said posts; third and fourth support posts (36, 37) secured to said support member (16) and extending upwardly therefrom between said planes; third and fourth flap folding members (33, 34) each having a lower end pivotally mounted to one of said third and fourth posts, and each being spring biased into normal position extending upwardly from the pivotal mounting thereof and outwardly through one of said third and fourth planes; a third latch pivotally mounted to said third post and having an abutment projecting upwardly from the upper surface of said third member, the distance from said abutment portion of said third latch to said third plane and measured along said third member being less than length of another box flap (62) to be folded by said third member, said third latch normally preventing pivoting of said third member downwardly when said third member is engaged by said another box flap during movement of said box blank toward said support member, whereby said another flap is turned inwardly as said box blank is moved toward said support member, the abutting engagement of a marginal edge of said another flap with the abutment portion of said third latch as said box blank is moved toward said support member being operative to pivot said third latch to a release position whereupon said third folding member is permitted to pivot downwardly to permit upward turning of said another flap by said third post as said blank is moved further toward said support member; a fourth latch normally preventing pivoting of said fourth member and operable to release said fourth member in the same manner as said third latch is operable to release said third member; and stop means (79) secured to said support member and positioned for abutting engagement by the lower margins of wall forming portions of said

blank to stop movement of said blank toward said support member when said blank is in a position where all of said flaps are inclined upwardly, two of said support posts (29, 37) being spaced from guide planes faced thereby to permit said another flap (62) to deflect said one flap (63) outwardly slightly as said blank approaches said stop means.

2. A box flap closing device as set forth in claim 1 wherein: said first finger is formed with a main portion extending from the pivot and with a control portion at the distal end, said control portion projecting in a direction outwardly from said first support post toward said first guide plane when the principal portion of said first finger is parallel to said first post, to deflect said one flap still further outwardly after the flap has passed the pivotal mounting of said first finger as said box blank is moved toward said support member.

3. A box flap closing device comprising: a support member; four elongated guides secured to said support member and extending upwardly therefrom in parallel spaced relation, said guides being formed to receive a corner of a box blank inserted into the device, the upper ends of said guides being flared outwardly to facilitate entrance of a box blank into said guides, said guides establishing first and second guide planes in parallel spaced relationship to each other and third and fourth parallel spaced guide planes perpendicular to said first and second guide planes; first and second support posts extending parallel to said third and fourth planes and spaced equidistantly from said third and fourth planes; first and second flap folders, each of said folders having a lower end pivotally mounted to one of said support posts, and each folder being spring biased into normal position extending upwardly from the pivotal mounting thereof and outwardly through one of said first and second planes; a first latch mounted to said first post and having a portion projecting above the upper surface of said first folder, the distance from said portion to said first plane intercepted by said first folder and measured along said first folder being less than the length of a box flap to be folded by said first folder, the box flap length being measured from a score line on the box blank to the marginal edge of the flap parallel to the score line, said score line being the one to be broken by said folder during movement of the blank into the device, said latch normally preventing pivoting of said first folder downwardly when said first folder is engaged by said box flap, whereby said score line is broken and said flap is turned inwardly as said box blank is moved toward said support member, the engagement of said marginal edge with said latch portion being operative to move said latch to release position as said box blank is moved further toward said support member, whereupon said first folder is pivotable downwardly to permit upward turning of said flap by said first support post as said blank is moved further toward said support member; a second latch mounted to said second post and having a portion projecting above the upper surface of said second folder and operable to release said second folder in the same manner as said first latch is operable to release said first folder; third and fourth support posts extending between said planes; third and fourth flap folders, each having a lower end pivotally mounted to one of said third and fourth posts, and each being spring biased into normal position extending upwardly from the pivotal mounting thereof and outwardly through one of said third and fourth planes; a third latch mounted to said third post and having a portion projecting above the upper surface of said third folder, the distance from said third latch portion to said third plane and measured along said third folder being less than the length of another box flap to be folded by said third folder, said third latch normally preventing pivoting of said third folder downwardly when said third folder is engaged by said another box flap during movement of said box blank toward said support member,

whereby said another flap is turned inwardly as said box blank is moved toward said support member, the engagement of a marginal edge of said another flap with the third latch portion as said box blank is moved toward said support member being operative to move said third latch to a release position whereupon said third folder is permitted to pivot downwardly to permit upward turning of said another flap by said third post as said blank is moved further toward said support member; and stop means secured to said support member and positioned for engagement by the lower margins of wall forming portions of said blank to stop movement of said blank toward said support member when said blank is in a position where all of said flaps are held upwardly by at least one of said support posts such that each of said flaps makes an acute angle with the wall forming portion to which it is attached.

4. A box flap closing device comprising: a support member; elongated guides secured to said support member and extending upwardly therefrom in parallel spaced relation, the upper ends of said guides being flared outwardly to facilitate entrance of a box blank into said guides, said guides establishing first and second guide planes in parallel spaced relationship to each other and third and fourth parallel spaced guide planes perpendicular to said first and second guide planes whereby a rectangular box blank is guided for rectilinear movement toward said support member; first and second support posts extending parallel to said third and fourth planes and spaced equidistantly from said third and fourth planes; first and second flap folders, each of said folders having a lower end pivotally mounted to one of said support posts, and each folder being biased into normal position extending upwardly from the pivotal mounting thereof and outwardly through one of said first and second planes; a first latch normally engaging said first folder and said first support post and preventing pivoting of said first folder downwardly when said folder is engaged by a box flap, whereby a score line between the flap and a box wall forming panel to which the flap is attached is broken and said flap is turned inwardly as said box blank is moved toward said support member, said first latch having a portion projecting above the upper surface of said first folder, engagement of a marginal edge of the flap with said latch portion being operative to move said latch to release position as said box blank is moved further toward said support member, whereupon said first folder is pivotable downwardly to permit upward turning of said flap by said first support post as said blank is moved further toward said support members; a second latch normally engaging said second folder and said second support post and having a portion projecting above the upper surface of said second folder and operable to release said second folder in the same manner as said first latch is operable to release said first folder; third and fourth support posts extending between said planes; third and fourth flap folders each having a lower end pivotally mounted to one of said third and fourth posts, and each being biased into normal position extending upwardly from the pivotal mounting thereof and outwardly through one of said third and fourth planes; a third latch normally engaging said third folder and said third post and having a portion projecting above from the upper surface of said third folder, said third latch normally preventing pivoting of said third folder downwardly when engaged by another box flap during movement of said box blank toward said support member, whereby said another flap is turned inwardly as said box blank is moved toward said support member, the engagement of a marginal edge of said another flap with said third latch portion as said box blank is moved toward said support member being operative to move said third latch to a release position whereupon said third folder is permitted to pivot downwardly to permit upward turning of said another flap by said third post as said blank is moved further toward said support member; and stop means secured to said support member and positioned for engagement by the lower margins of wall forming portions of said blank to stop movement of said blank toward said support member when said blank is in a position where all of said flaps are inclined upwardly at a predetermined desired interrelationship.

5. A box flap closing device comprising: a support member; elongated guides secured to said support member and extending upwardly therefrom in parallel spaced relation, said guides establishing first and second guide planes in parallel spaced relationship to each other and third and fourth parallel spaced guide planes perpendicular to said first and second guide planes for guiding a rectangular box blank during movement in said guides; first and second support means connected to certain ones of said guides and disposed in the spaced bounded by said guide planes; first and second flap folders, each of said folders being pivotally mounted to one of said support means, and each folder being biased into normal position extending upwardly from the pivotal mounting thereof and outwardly through one of said first and second planes; latch means normally engaging said folders and preventing pivoting thereof downwardly when said folders are engaged by a first pair of downwardly projecting flaps of a box blank as the box blank is moved in said guides toward said support member, whereby said flaps are turned inwardly by said folders as said box blank is moved toward said support member and said flaps travel along said folders, said latch means including latch operator means engageable by said flaps after a predetermined extent of travel along said folders, said latch operator means being operable when so engaged to move said latch means to release position as said box blank is moved further toward said support member, whereupon said folders are pivotable downwardly to permit upward turning of said flaps by said support means as said blank is moved further toward said support member; third and fourth support means connected to certain ones of said guides and closer to said support member than said first and second support means and disposed in the space bounded by said guide planes; third and fourth flap folders, each of said third and fourth folders being pivotally mounted to one of said third and fourth support means, and each of said third and fourth folders being biased into normal position extending upwardly from the pivotal mounting thereof and outwardly through one of said third and fourth planes; additional latch means normally engaging said third and fourth folders and preventing pivoting thereof downwardly when said third and fourth folders are engaged by a second pair of downwardly projecting flaps of the said box blank during movement of said box blank toward said support member, whereby said flaps of said second pair are turned inwardly after the flaps of the first pair as said box blank is moved toward said support member, said additional latch means including additional latch operator means engageable by the flaps of said second pair after a predetermined extent of travel along said third and fourth folders as said box blank is moved toward said support member, and operable when so engaged to move said additional latch means to a release position whereupon said third and fourth folders are permitted to pivot downwardly to permit upward turning of said flaps of said second pair by said third and fourth support means as said blank is moved further toward said support member.

6. In a box flap closing device, the combination comprising: guide means establishing a guide plane to support a wall panel of a box blank and a flap of the box blank coplanar with said wall panel; support means disposed in fixed spaced relationship to said guide plane; a first box flap folder movably mounted to said support means and normally disposed and locked to lie generally in a second plane intercepting said guide plane at an acute angle; latch means engaging said support means and said folder and

normally locking said folder in a position extending in said second plane from said support means through said guide plane, said latch means being disposed for engagement by a portion of the box blank upon folding of the box blank flap out of said guide plane in a direction approaching a parallel to said second plane, said latch means being movable when engaged to release said folder and accommodate movement thereof by the box blank to a position accommodating further folding of the box flap by said support means.

7. The combination as set forth in claim 6 and wherein said folder is pivotally mounted to said support means and is movable to a position facing and in generally parallel spaced relation to said guide plane, and said folder has an outwardly projecting portion which projects toward said guide plane when said folder is pivoted to said facing spaced relationship to said guide plane.

8. In a box flap closing device, the combination comprising: locating means establishing a locating plane for a box blank wall panel and flap; support means disposed in fixed spaced relationship to said locating plane; a first box flap folder movably mounted to said support means; latch means engaging said support means and said folder and normally locking said folder in a position extending from said support means and intercepting said locating plane at an acute angle; operator means for said latch means and disposed for engagement by a portion of a box blank upon folding of a box blank flap in a direction away from said locating plane, said latch means being releasable by said operator means to release said folder and accommodate movement thereof by the box blank to a position accommodating further folding of the box flap by said support means.

9. The combination as set forth in claim 8 and wherein said folder is pivotally mounted to said support means and is movable to a position facing and in generally parallel spaced relation to said locating plane, and said folder has an outwardly projecting portion which projects toward said locating plane when said folder is pivoted to said facing spaced relationship to said locating plane.

10. A box flap closing device comprising: box blank locators establishing first and second locating planes in parallel spaced relationship to each other and third and fourth parallel spaced locating planes perpendicular to said first and second locating planes; first and second support means disposed in a space bounded by said locating planes; first and second flap folders, each of said folders being movably mounted to one of said support means, and each folder being biased into normal position extending from the mounting thereof and outwardly through one of said first and second planes; latch means normally preventing movement of said folders relative to said support mean when said folders are engaged by a pair of flaps of a box blank as the said box blank is moved relative to said support means; whereby said flaps are turned inwardly by

said folders; operator means for said latch means and disposed for engagement by a portion of the box blank upon a predetermined degree of inward turning of said flaps, said latch means being releasable by said operator means to release said folders and accommodate movement thereof relative to said support means by the box blank to positions of said folders permitting further folding of said box flaps by said support means; third and fourth support means disposed in the space bounded by said locating planes; third and fourth flap folders, each being movably mounted to one of said third and fourth support means, and each being biased into normal position extending from the mounting thereof and outwardly through one of said third and fourth planes; additional latch means normally preventing movement of said third and fourth folders relative to said support means when said third and fourth folders are engaged by a second pair of flaps of said box blank as said box blank is moved further relative to said support means, whereby said flaps of said second pair are turned inwardly by said third and fourth folders as said box blank is moved further relative to said support means; and additional latch operator means for said additional latch means, said additional operator means being disposed for engagement by a portion of said box blank after inward turning of the flaps of said first pair past a position perpendicular to said locating planes and after a predetermined extend of inward turning of the flaps of said second pair, said additional latch means being releasable by said additional operator means to thereupon release said third and fourth folders and accommodate movement thereof by the box blank to positions accommodating further turning of said flaps of said second pair by said third and fourth support means.

11. A box flap closing device as set forth in claim 10 wherein said third and fourth support means are disposed on opposite sides of a fifth plane perpendicular to said third and fourth planes and equidistant from said first and second planes, and said additional latch operator means include a latch operator for said third folder on one side of said fifth plane and a latch operator for said fourth folder on the other side of said fifth plane, said operators being engageable by the lower marginal edges of the flaps of said second pair, and said third and fourth folders include support fingers adjacent said operators and extending inwardly from the point at which the lower edges of the flaps of said second pair would engage said operators, to support portions of the flaps which extend beyond the regular lower marginal edges thereof.

References Cited by the Examiner

UNITED STATES PATENTS

3,039,370	6/1962	King et al.	93—49
3,165,033	1/1965	Bambra	93—36

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