June 3, 1958 E. J. PAGENDARM 2,837,013

MACHINE FOR ASSEMBLING FOLDING BOX SHELLS AND INSERTING LINERS INTO THE SHELLS

Filed April 20, 1955 8 Sheets-Sheet 1

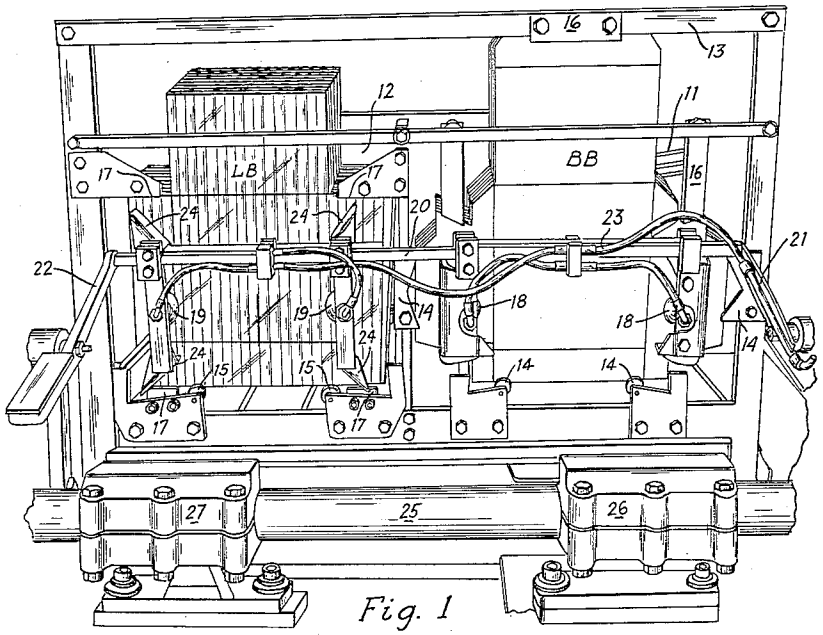


Fig. 1

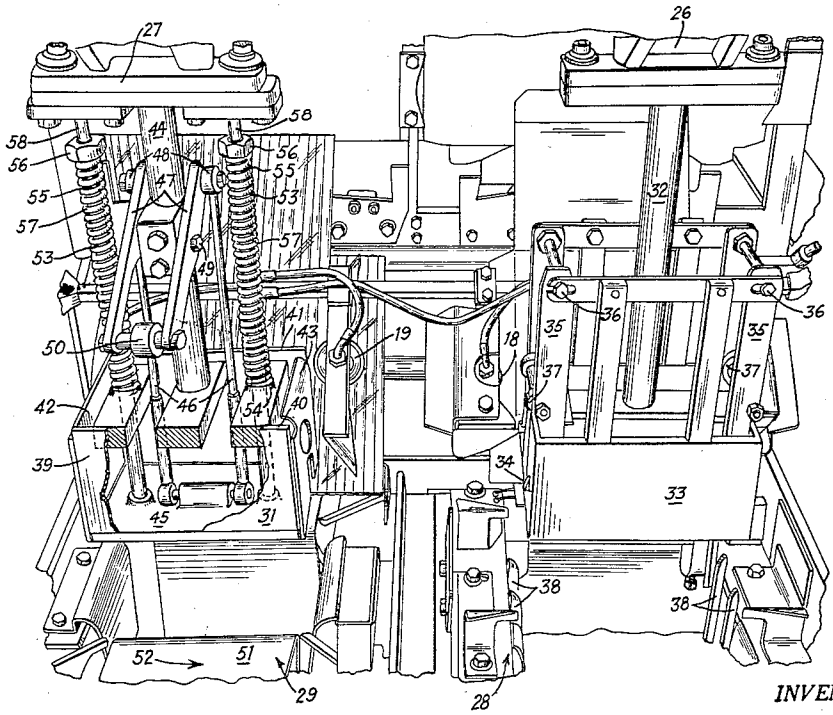


Fig. 2

INVENTOR.
EDWARD J. PAGENDARM
BY
Howard E. Russell
his ATTORNEY

June 3, 1958 E. J. PAGENDARM 2,837,013

MACHINE FOR ASSEMBLING FOLDING BOX SHELLS AND INSERTING LINERS INTO THE SHELLS

Filed April 20, 1955 8 Sheets-Sheet 2

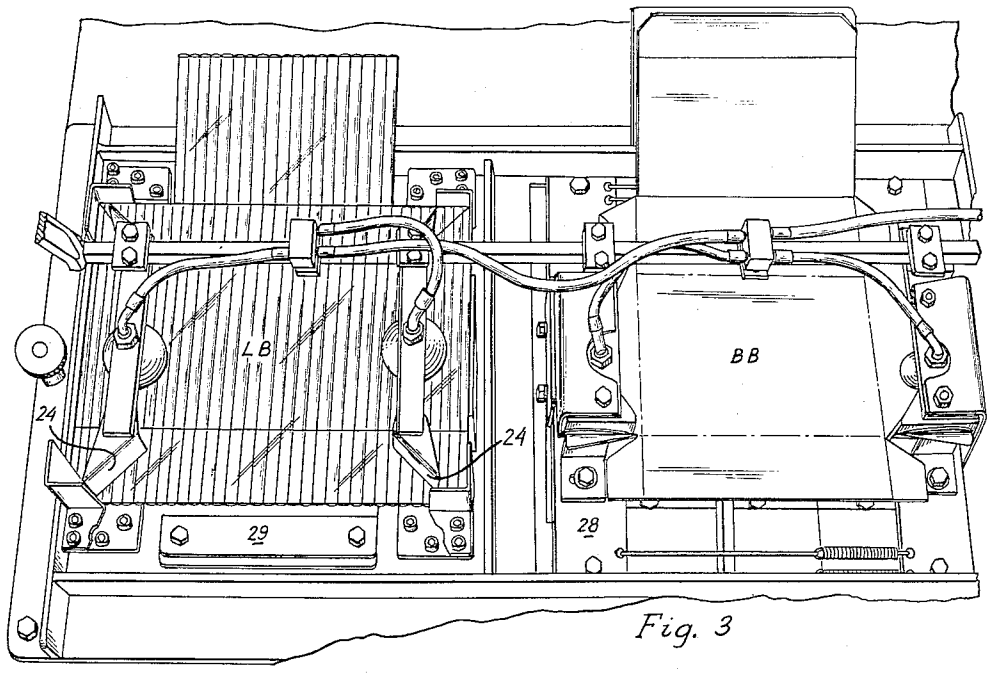


Fig. 3

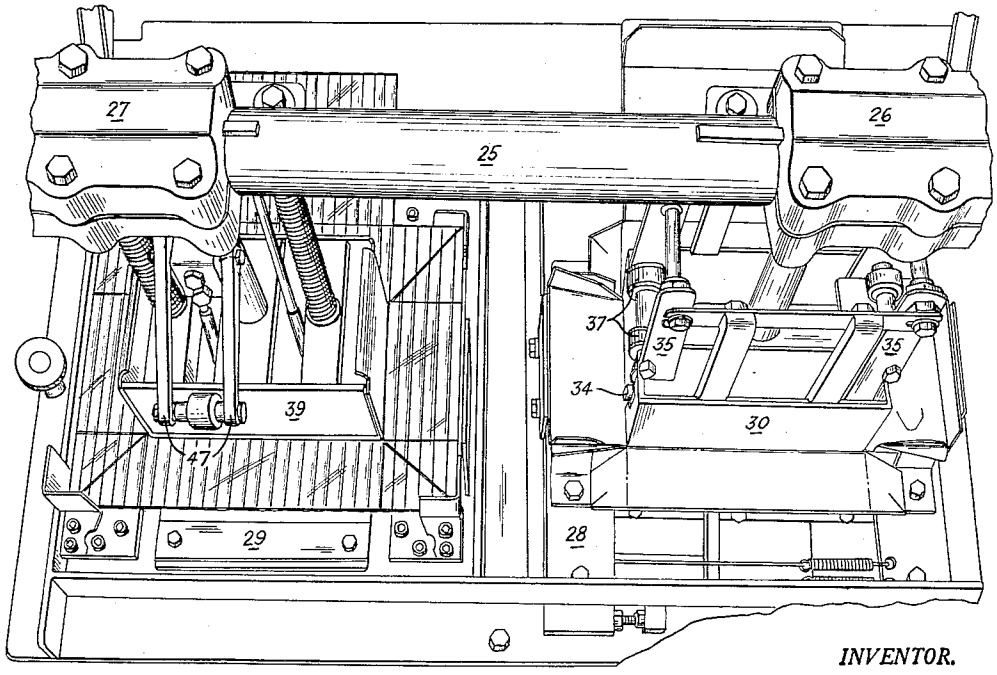


Fig. 4

INVENTOR.
EDWARD J. PAGENDARM
BY
Howard G. Russell
ATTORNEY

June 3, 1958 E. J. PAGENDARM 2,837,013

MACHINE FOR ASSEMBLING FOLDING BOX SHELLS AND INSERTING LINERS INTO THE SHELLS

Filed April 20, 1955 8 Sheets-Sheet 3

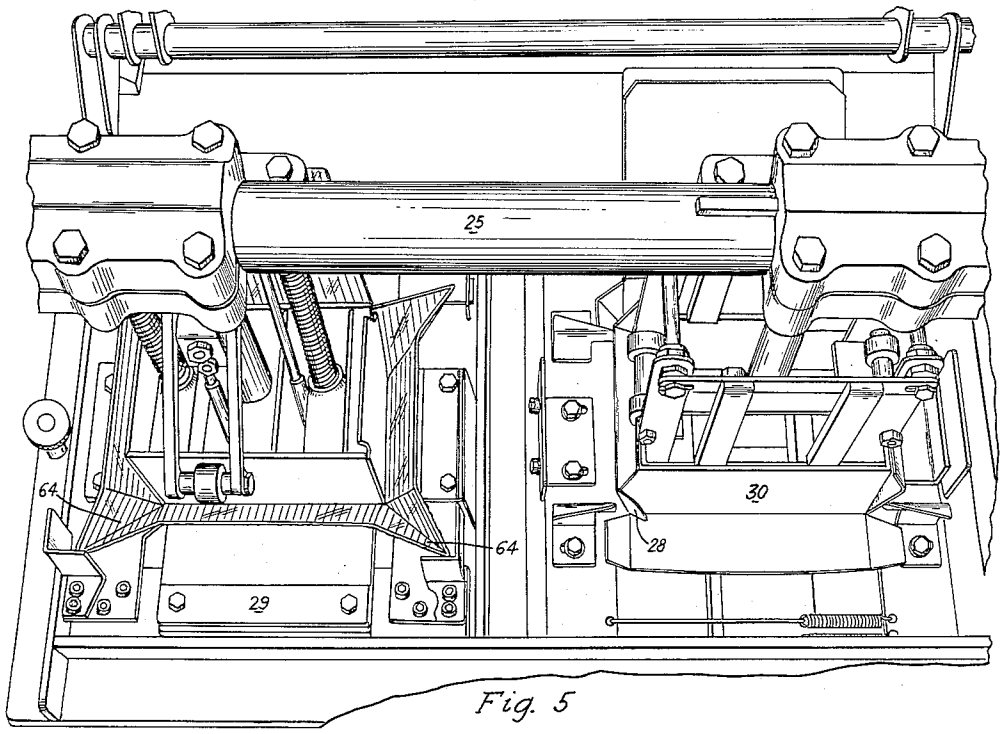


Fig. 5

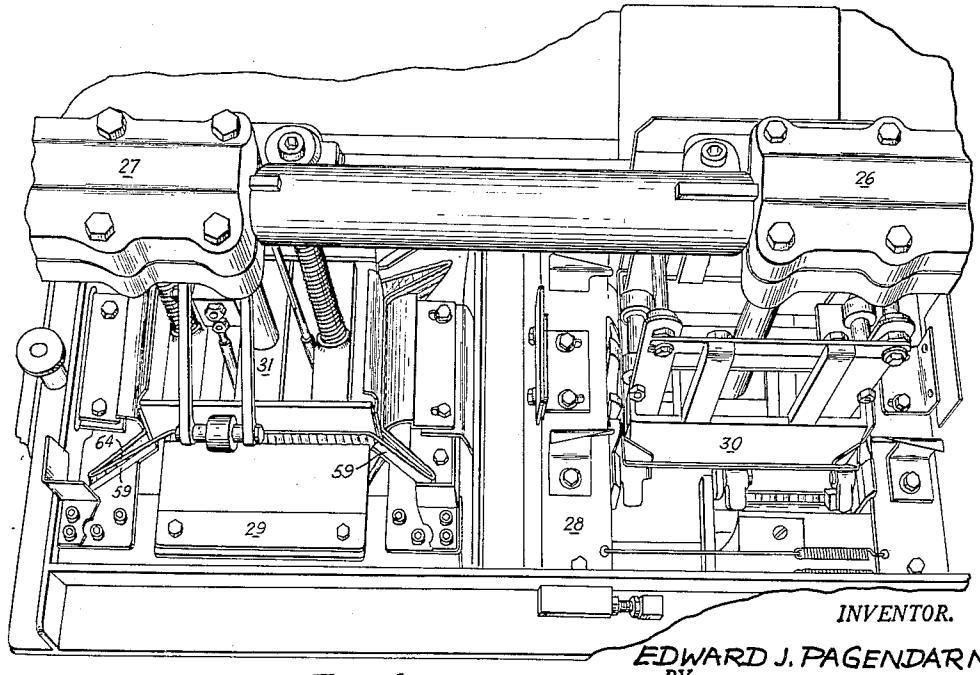


Fig. 6

INVENTOR.
EDWARD J. PAGENDARM
BY
Howard G. Russell
his ATTORNEY

June 3, 1958 E. J. PAGENDARM 2,837,013

MACHINE FOR ASSEMBLING FOLDING BOX SHELLS AND INSERTING LINERS INTO THE SHELLS

Filed April 20, 1955 8 Sheets-Sheet 4

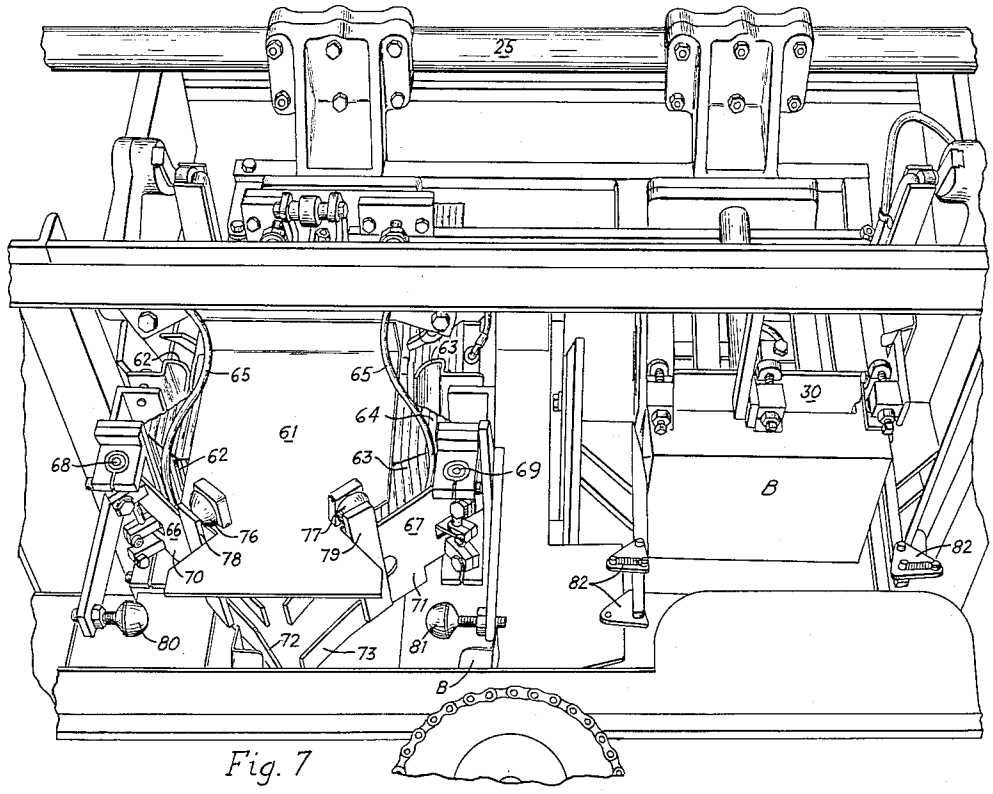


Fig. 7

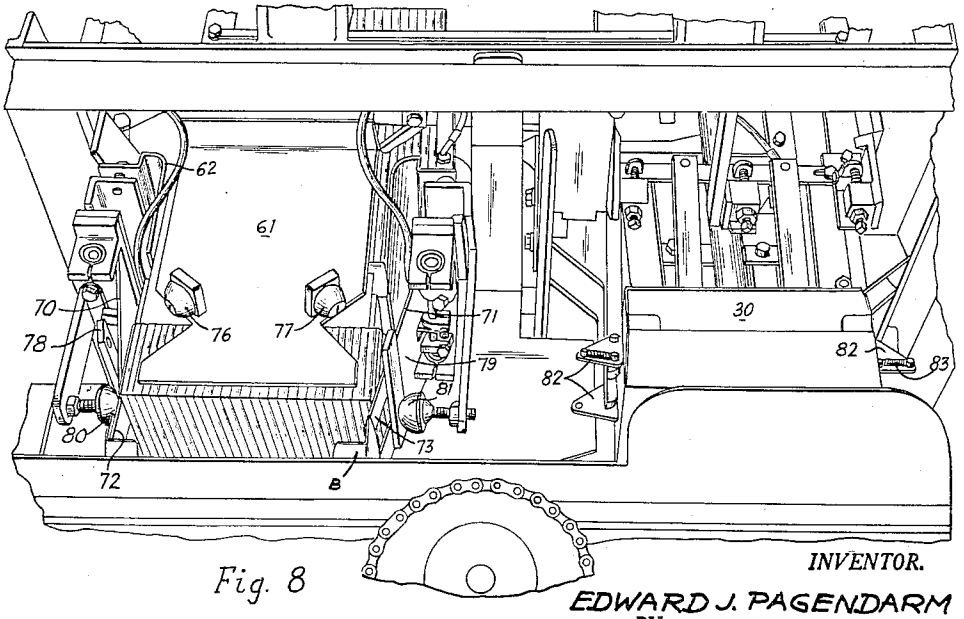


Fig. 8

INVENTOR.
EDWARD J. PAGENDARM
BY
Howard S. Russell
his ATTORNEY

June 3, 1958 E. J. PAGENDARM 2,837,013

MACHINE FOR ASSEMBLING FOLDING BOX SHELLS AND INSERTING LINERS INTO THE SHELLS

Filed April 20, 1955 8 Sheets-Sheet 5

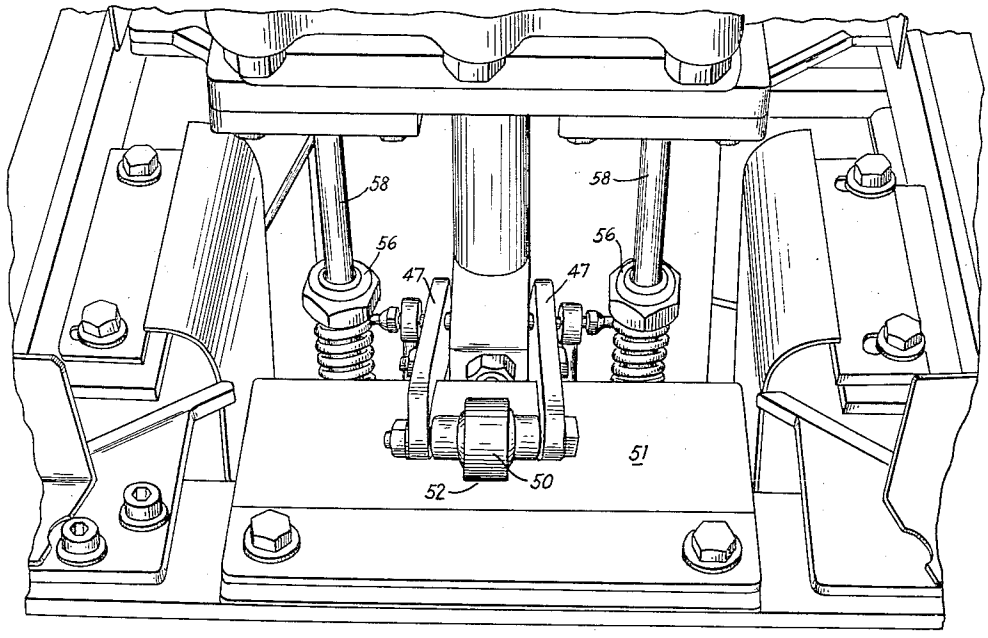


Fig. 9

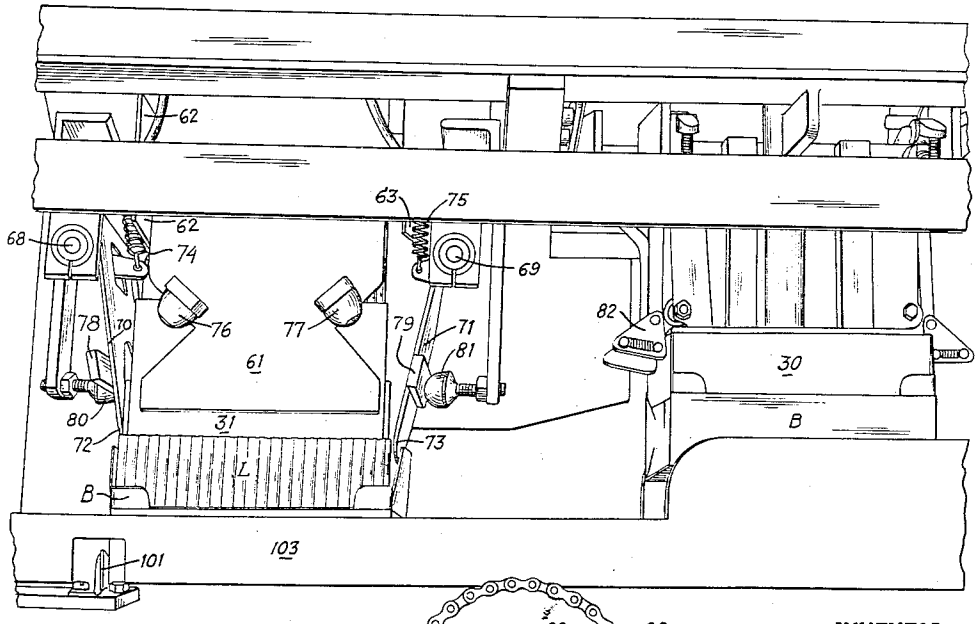
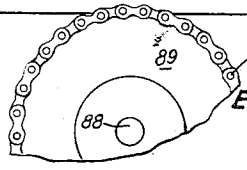


Fig. 10



INVENTOR.
EDWARD J. PAGENDARM
BY
Howard G. Russell
his ATTORNEY

June 3, 1958 E. J. PAGENDARM 2,837,013

MACHINE FOR ASSEMBLING FOLDING BOX SHELLS AND INSERTING LINERS INTO THE SHELLS

Filed April 20, 1955 8 Sheets-Sheet 6

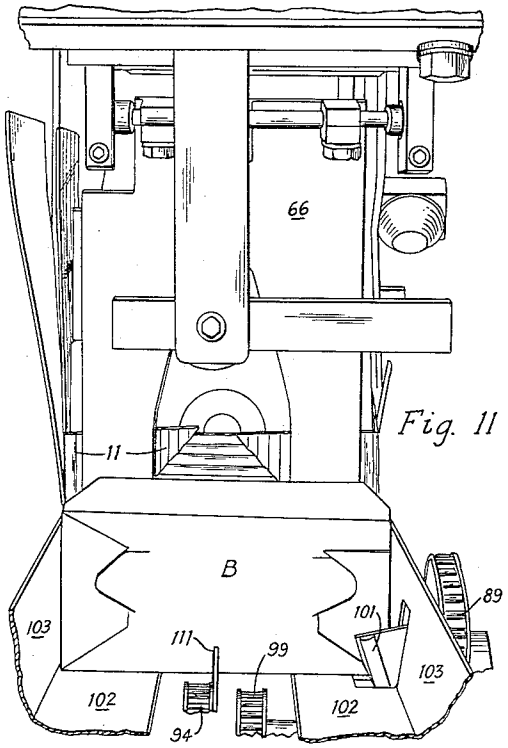


Fig. 11

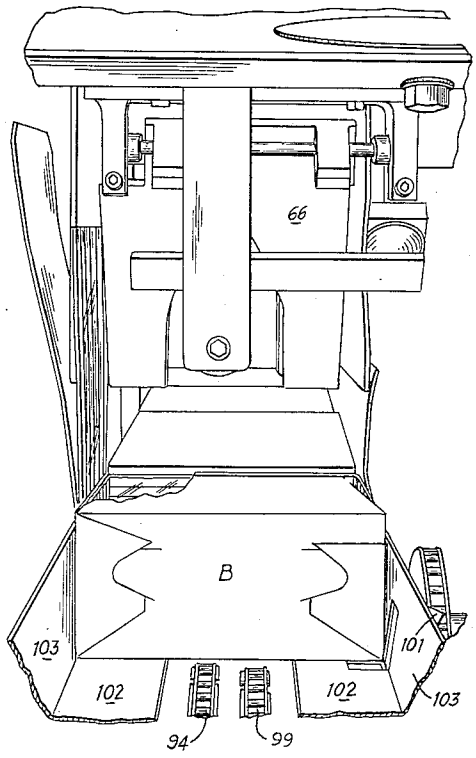


Fig. 12

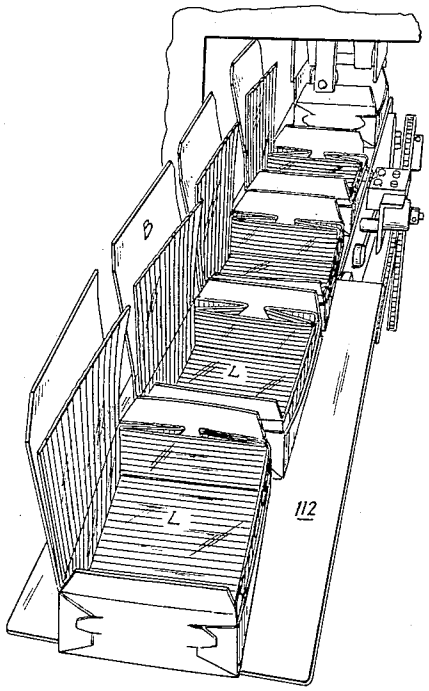


Fig. 13

INVENTOR.
EDWARD J. PAGENDARM
BY
Howard S. Russell
his ATTORNEY

June 3, 1958 E. J. PAGENDARM 2,837,013
MACHINE FOR ASSEMBLING FOLDING BOX SHELLS AND INSERTING LINERS INTO THE SHELLS
Filed April 20, 1955 8 Sheets-Sheet 7

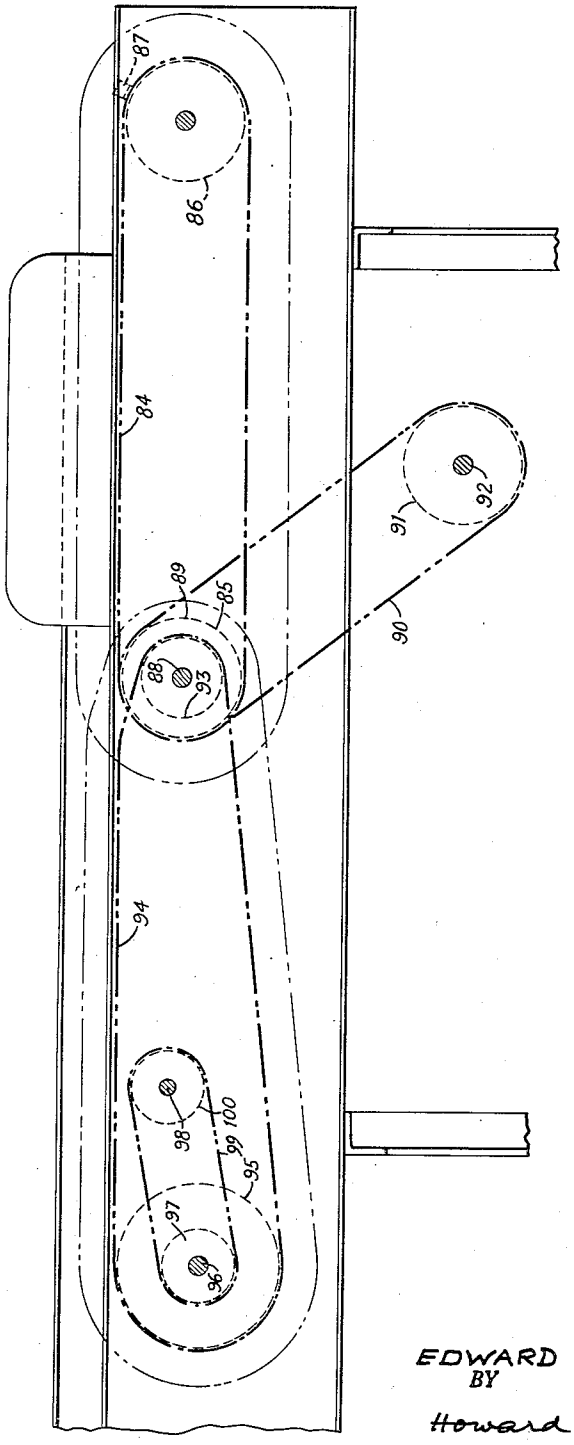


Fig. 14

INVENTOR.
EDWARD J. PAGENDARM
BY
Howard S. Russell
his ATTORNEY

June 3, 1958 E. J. PAGENDARM 2,837,013

MACHINE FOR ASSEMBLING FOLDING BOX SHELLS AND INSERTING LINERS INTO THE SHELLS

Filed April 20, 1955 8 Sheets-Sheet 8

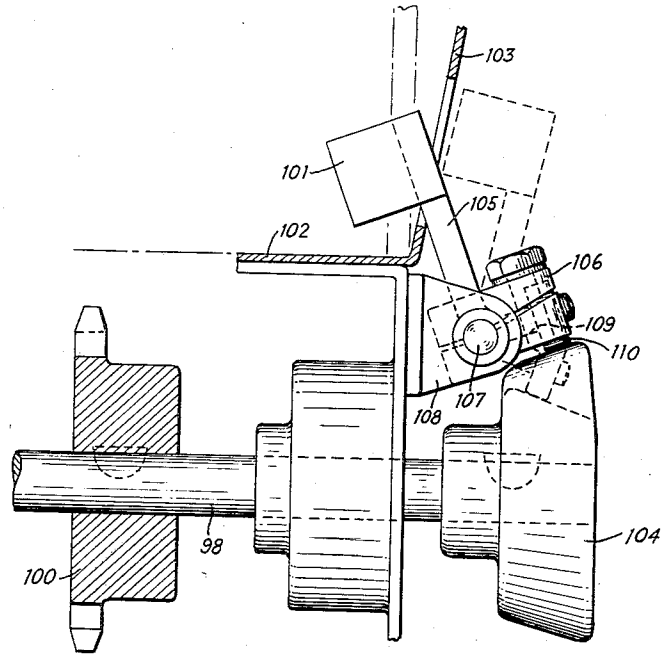


Fig. 15

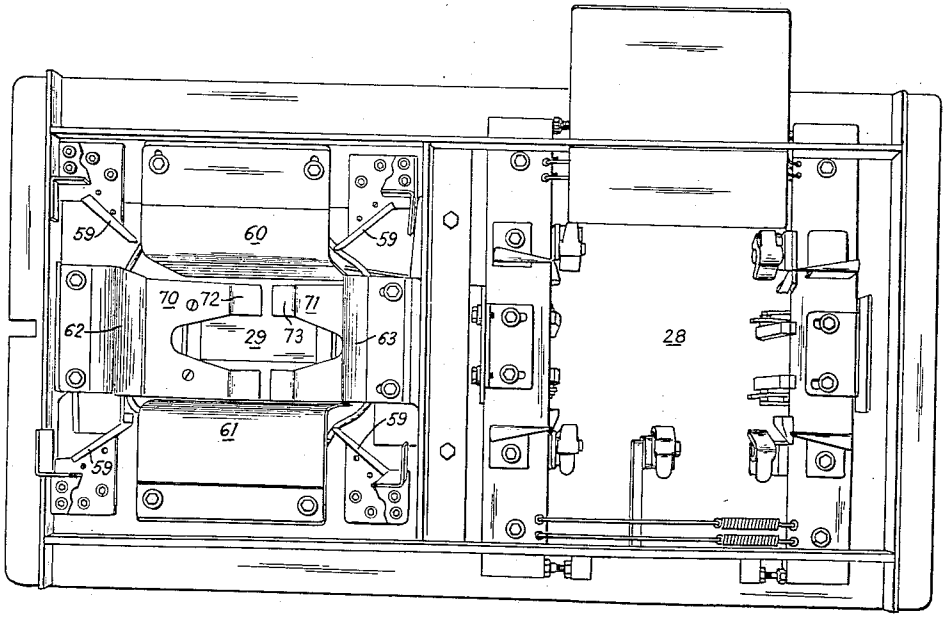


Fig. 16

INVENTOR.

EDWARD J. PAGENDARM

BY

Howard G. Russell

his ATTORNEY

United States Patent Office

2,837,013

Patented June 3, 1958

2,837,013

MACHINE FOR ASSEMBLING FOLDING BOX SHELLS AND INSERTING LINERS INTO THE SHELLS

Edward J. Pagendarm, San Mateo, Calif., assignor, by mesne assignments, to Baljak Corporation, Wilmington, Del., a corporation of Delaware

Application April 20, 1955, Serial No. 502,637

10 Claims. (Cl. 93—36.01)

This invention relates to the art of assembling folding boxes by automatic high speed machinery and has particular application to the manufacture of lined folding boxes of the type in which a liner is inserted into the box shell after completion of the assembly operations on the box shell proper.

The liner may be of the flat-sheet type consisting of paper, metal foil, or plastic sheet material, or it may be of the corrugated type consisting in part, or entirely, of paper, metal foil, or plastic sheet material.

The liner may be open at the corners, or it may comprise gusset or bellows corners to make it liquid and sift tight.

The box shell may be of conventional glued construction, but is preferably of the self-locking glueless type. Such box shells may be assembled by the same machine which forms and inserts the liner, the production rate of the box shell being the same as that of the liner. In such a case the box shell is combined with the liner at the end of the assembly operations of the liner.

In a broader aspect machines incorporating the invention may be considered to complete, modify, or supplement the operations of an automatic box assembly machine by insertion of structural material into the assembled box shell. Such structural material may be a liner, as previously mentioned, thus forming a part of the package, but it may also be part of the merchandise for which the box is designed. In either event the characteristic feature is that the insertion is accomplished in a predetermined timed relationship with the assembly operations of the box shell, preferably as a tandem operation to the box assembly operation.

The invention also provides numerous improvements pertaining to the handling of liner material, for example, improvements which insure perfect shaping and inserting of the liner, and it provides improved and advantageous elements for handling and shaping the flexible and foldable sheet material in the course of its conversion from flat blank form into hollow box-like shape.

The various objects, features and advantages of the invention will appear more fully from the detailed description which follows accompanied by drawings showing, for the purpose of illustration, the application of the invention to a machine which sets up a box shell of self-locking, glueless construction and, in a tandem operation, forms a corrugated liner of the gusset corner type, and then combines both box shell and liner. The product of the illustrated machine is a box structure ready for filling and closing. The invention also resides in certain new and original features of construction and combination of elements hereinafter set forth and claimed.

Although the characteristic features of this invention which are believed to be novel will be particularly pointed out in the claims appended hereto, the invention itself, its objects and advantages, and the manner in which it may be carried out may be better understood by referring to the following description taken in connection

with the accompanying drawings forming a part of it, in which:

Figs. 1 to 13 are perspective views of a machine incorporating the present invention, the views illustrating successive stages in the operation, more particularly,

Fig. 1 is an elevational perspective view of the two blank magazines of the machine from which blanks are withdrawn by a joint feeder;

Fig. 2 is a view of the feeding mechanism, two plungers and the two folding dies, the feeder being approximately in the half-way position between the magazines and the dies;

Fig. 3 is essentially a perspective top view of the feeder at the instant of deposition of the blanks on the dies;

Fig. 4 shows the two plungers at the instant of engagement with the blanks after withdrawal of the feeder;

Figs. 5 and 6 show successive stages in the folding of the blanks by the plunger entering the dies;

Figs. 7 and 8 are essentially side views of the two dies, showing the plungers in two successive stages of movement;

Fig. 9 is essentially a top view of the liner die illustrating the operation of the liner plunger mechanism;

Fig. 10 is essentially a side view of the two dies, the plungers being near the lowest position of the downstroke;

Fig. 11 is an end view of the liner die and the box conveyor, at the instant of insertion of the liner into the box shell;

Fig. 12 is an end view of the mechanism of Figure 11 after insertion of the liner into the box shell at the instant of advance of the box by the conveyor;

Fig. 13 is a perspective view of the conveyor portion of the machine;

Fig. 14 is a diagrammatic view of the conveyor mechanism;

Fig. 15 is a simplified end view of the stop mechanism of the conveyor; and

Fig. 16 is essentially a top view of the two folding dies removed from the machine.

In the following description and in the claims various details will be identified by specific names for convenience. These names are intended to be generic in their application. Corresponding reference characters refer to corresponding parts in the several figures of the drawings.

The drawings accompanying and forming part of this specification disclose certain specific details of the invention for the purpose of explanation of broader aspects of the invention, but it is understood that the details may be modified in various respects without departure from the broad principles of the invention, and that the invention may be applied to other structures than the one shown.

The machine in which the invention is incorporated is a folding box machine of the plunger-and-die type comprising a folding die and plunger assembly for setting up self-locking boxes in which the corners of the box blank are mechanically interlocked without the use of additional fastening means, such as adhesive or staples.

The prior patent to Thomas R. Baker and Frank M. Lefief, No. 2,655,843, dated October 20, 1953, discloses such a machine in detail. The machine comprises basically a blank magazine, a folding die, a plunger movable through the die, a mechanism for feeding blanks from the magazine to the folding die, and a supporting framework within which the various elements of the machine are mounted. The machine illustrated in the accompanying drawings differs from the machine illustrated in the aforementioned Patent No. 2,655,843 in that two magazines, two dies and two plungers are employed, mounted in tandem arrangement. The two magazines and fold-

ing dies are served by a joint feeder mechanism which carries blanks from both magazines to both dies simultaneously.

Referring to Figure 1 a box blank magazine **11** and a liner blank magazine **12** are mounted in a common frame **13**. The box blanks BB and the liner blanks LB rest on rods **14** and **15** and are prevented from falling out of the magazines in the direction of the observer by gate elements **16** and **17** which overlap marginal portions of the blanks and retain the blanks in the magazine unless the blanks are slightly flexed and pulled past the retaining gate elements by the feeder.

Details of a blank feeding mechanism of the general type illustrated in the accompanying drawings are disclosed in the prior patent to Baker and Pagendarm, No. 2,624,249, issued January 6, 1953. The feeding mechanism basically comprises one or a plurality of vacuum powered suction cups which are moved by a mechanical mechanism in such a way as to pick up individual blanks at the magazine gate, withdraw them past the retaining overlapping elements of the gate, and move them along a prescribed and controlled path to a predetermined position on the folding die where the blanks are deposited.

In the illustrated form of feeding mechanism suction cups **18** for handling box blanks and suction cups **19** for handling liner blanks are mounted on a common bar **20**. The ends of the bar **20** are secured to arms **21** and **22** of the actuating mechanism which moves the suction cups from a pick-up position in front of the magazines to a deposit position on the folding dies. The dies are not visible in this figure. A typical actuating mechanism is disclosed in the aforementioned Patent 2,624,249 and an improved mechanism for high speed operation is disclosed in the patent to Frank M. Lefief, No. 2,805,060, (application Serial No. 501,462, filed April 15, 1955).

The suction cups are connected by flexible ducts **23** to a suitable source of low pressure, for example a vacuum pump.

The blank BB is of the self-locking type and corresponds essentially to the style of blank disclosed in the aforementioned Patent 2,655,843. A detailed description of the blank can therefore be dispensed with.

The liner blank LB comprises wall panels which correspond in size to the wall panels of the box shell, and is characterized by bellows or gusset corners. In Figure 1 gusset folding guides **24** engage the liner blank adjacent the diagonal gusset fold lines of the corner structure. The purpose of these folding guides will later become apparent.

In the foreground of Figure 1 a mounting bar **25** is visible on which blank shaping plungers are mounted by means of clamps **26** and **27**. The bar **25** is mounted in the machine for reciprocating movement in a substantially vertical plane.

After contact of the suction cups **18** and **19** with the respective blanks, the blanks are grasped by the cups and are removed from the magazines in the direction of the folding dies **28** and **29** visible in Figure 2. Figure 2 shows the blanks in approximately the half-way position between the magazines and the dies. At this instant the box plunger **30** and the liner plunger **31** are being retracted from the respective dies and are moving in an upward direction.

The box plunger **30** comprises a stem **32** extending from the clamp **26** to the plunger body **33**. The plunger body **33** is provided with movable hook-shaped locking elements **34** which normally protrude beyond the end walls of the plunger and may be retracted to the inside of the plunger body by the arms **35** on which they are mounted. The arms **35** are hingedly supported at **36** and carry rollers **37** which strike cam elements **38** in the die with the result that the arms **35** are swung inwardly against the action of biasing springs (not visible) which tend to move the arms in the opposite direction. Details of the construction of the plunger **33** and details of the die **28** are illustrated and described in the patent to Pagendarm, No. 2,580,189, of December 25, 1951.

The liner plunger **31** also has a body **39** comprising side walls **40**, **41** and end walls **42** and **43**. The body **39** of the plunger is mounted on a stem **44** extending from the mounting clamp **27**. The plunger has a bottom plate **45** which is projectible beyond the plunger body **39** by means of push rod **46** linked to a double armed lever **47** at **48**. The lever **47** is pivotally mounted at **49** and its other end carries a roller **50** which strikes a plate **51** at the point **52** after the plunger **31** has entered the die **29**. The bottom plate **45** has two tubular stems **53** secured to it. These stems extend through bores **54** in the plunger body, and the upper ends of the stems **53** are threaded at **55** and carry nuts **56**. Compression springs **57** bear with their lower ends against the body structure **39** and with their upper ends against the nuts **56** thus tending to pull the bottom plate **45** against the plunger body **39**. Projection of the bottom plate **45** by the aforedescribed lever mechanism **46**, **47**, **50**, causes further compression of the springs **57**. During this movement the tubular stems **53** move freely within the bores **55** and are additionally guided by guide rods **58** extending into the interior of the hollow stems.

Figure 3 illustrates the feeder mechanism in the position in which it deposits the blanks BB and LB on the dies **28** and **29**. At this point the suction is relieved so that the blanks are not disturbed by the return movement of the suction cups.

When the feeder deposits the liner blank on the die, its gusset folding guides **24** cause the blank to be creased slightly at the diagonal fold lines of the corner gussets. This is accompanied by interaction of the folding guides **24** with corresponding rules or edges **59** on the die. These are clearly visible in Figure 16. Pre-breaking or pre-creasing of the diagonal gusset folds insures correct folding of the gussets by the liner plunger.

As the suction feeder is being withdrawn, the two plungers descend and strike the two blanks to force the blanks into and through the throat of the dies **28** and **29**. Figure 4 illustrates this phase of the assembly operation.

As the plungers **30** and **31** enter the respective dies **28** and **29**, the end panels of the box blank are folded into upright position in the manner described and illustrated in great detail in the aforementioned Patent 2,655,843. The details of this assembly operation are readily understood from the accompanying drawings and have, in addition, become well known in the art by this time. It is therefore not necessary to describe all the details of the folding and locking operations performed on the box blank.

Turning to the liner blank, the side panels of the liner blank are folded into upright position by the side wall members **60** and **61** of the liner die **29** and the end panels of the liner blank are folded into upright position by the end wall members **62** and **63** of the liner die (see Figure 16). The folding of the side panels and end panels of the liner causes the corner portions of the blank to fold into gussets **64** (Figure 5).

Figure 6 shows the plungers and dies in a position in which the corner gussets **64** are practically flat and the side panels and end panels of the liner blank are fully upright. At this point the gussets strike folding guides **65**. These folding guides are visible in Figure 7 and extend from a position outside the side wall members **60** and **61** of the die in a continuous curve downwardly into a position closely adjacent to the path of the liner plunger. The gusset folding guides **65** cause the corner gussets to swing over the erected end panels of the liner. This involves a motion of the gusset panels through an arc of approximately 135 degrees.

Figure 7 illustrates the instance at which approximately half of this arc has been traversed by the gussets.

As is clearly seen from Figure 7, the side wall members 60 and 61 of the liner die are of substantial length and extend considerably below the lower edges of the shorter end wall members 62 and 63. The end wall members 62 and 63 are supplemented by hinged lower end wall engaging blades or vanes 66 and 67. These vanes are pivotally mounted on the liner die assembly at 68 and 69. The upper portions 70 and 71 of the vanes are substantially flat and lower portions 72 and 73 extend at an angle with respect to the upper portions 70 and 71, as is particularly well visible in Figures 8, 10 and 16. The purpose of this shape will presently become apparent.

The vanes are normally urged towards each other by means of springs 74 and 75 visible in Figure 7 and rest in closed position against resilient inner buffers 76 and 77 on the side wall members 60 and 61. For this purpose transverse buffer bars 78 and 79 are secured to the vanes. In fully opened position the buffer bars 78 and 79 bear against outer buffers 80 and 81 on the die assembly.

In extended position in which the vanes are shown in Figure 10 the upper portions 70 and 71 of the vanes are downwardly slanted and form a funnel-like structure, whereas the lower portions 72 and 73 of the vanes are substantially parallel and lie approximately in a continuation of the planes of the end wall members 62 and 63. This relationship is particularly well visible in Figure 10.

The fixed end wall members 62 and 63 also constitute blades over which the corner gussets are being folded by the curved gusset guides 65. As the plunger descends past the ends of the end wall members 62 and 63 of the die, the liner blank with its gussets comes under the action of the hinged vanes 66 and 67 which then press the gussets tightly against the end panels of the liner. This occurs during the phase of plunger motion following the position of Figure 7 and preceding the position of Figure 8.

At this time the box shell has been formed and the corners of the box were locked by the box plunger 30 and the box die 28 in a manner described and illustrated in detail in the aforementioned Patent 2,655,843. In the position shown in Figure 7 the assembly of the box shell is substantially complete, and the box shell is about to enter between the strippers 82 which eventually engage the top edge of the liner shell and strip it off the plunger when the plunger commences its upward stroke.

Figure 8 illustrates the position in which the strippers 82 are deflected outwardly against the action of their biasing springs 83. Figure 10 shows the position of the box in which the strippers 82 are about to engage the upper edge of the dust flaps of the box shell. At this point the plunger 30 is near its lowermost position.

As the liner plunger approaches its lowest position, the roller 50 on the double-armed actuating lever 47 for the bottom plate 45 strikes the point 52 on the side member 51 of the die and causes the bottom plate 45 to be projected beyond its normal position on the plunger body 39 (Figure 9). The bottom plate inserts the folded liner L into the completed box shell B which was moved into alignment with the path of the liner plunger in the following manner:

When the completed box shell B is stripped off the box shell plunger 30 it drops onto a conveyor running underneath the dies. This conveyor comprises essentially (Figure 14) a first conveyor chain 84 trained around sprocket wheels 85 and 86. The chain 84 preferably comprises one or several lugs 87, the number of lugs depending on the length of the chain. The sprocket wheel 85 is fast on a shaft 88 which also carries a further sprocket wheel 89. Wheel 89 forms a part of the conveyor drive. A drive chain 90 extends over the sprocket wheel 89 and over a sprocket pulley 91 on a drive shaft 92. This drive shaft is connected through suitable gears (not shown) with the remainder of the drive mechanism of the machine which also actuates the plunger and the feeder mechanism. In this manner the conveyor movement is timed with respect to the plunger and feeder movement.

A further conveyor sprocket 93 is secured to the driven shaft 88. A second conveyor chain 94 extends over the sprocket wheel 93 and a further sprocket wheel 95 which is fast on a shaft 96 carrying also a small sprocket wheel 97. The latter drives a cam shaft 98 through a chain 99 extending over a sprocket wheel 100.

The conveyor 84 extends underneath the box shell plunger 30 and the conveyor 94 extends underneath the plunger 31 which assembles the liner.

When an assembled box shell is stripped off a box shell plunger 30 (Figure 10) it drops onto the conveyor 84 and is transported beyond the end of the conveyor 84 onto the second conveyor chain 94. The transport of the box by the conveyor 84 is positive by reason of the lug 87 engaging the trailing side panel of the box shell. The conveyor 84 engages the box shell and advances it until the box strikes a flag stop 101 which is moved into, and out of, the path of the boxes, as required. As shown in Figure 11, the boxes B move on a track 102 having raised sides 103, and the flag stop 101 arrests the box B on the track, if projected into the path of the box.

The flag stop is so placed with respect to the path of the liner plunger that the box comes to rest precisely underneath the stroke path of the liner plunger, so that a liner may be inserted.

The mechanism for operating the flag stop is shown in Figure 15 and comprises a cam 104 on the cam shaft 98. The flag 101 is mounted on an arm 105 whose base 106 is clamped on a shaft 107. The shaft 107 is mounted in brackets of which one is visible at 108. The shaft further carries an arm 109 on which a cam follower in the form of a ball bearing 110 is mounted. The cam follower, in following the contour of the cam 104, oscillates the shaft 107 about its axis, thereby moving the flag 101 into and out of the path of the boxes. The cam follower is urged against the cam by a suitable spring (not shown).

The flag stop is moved into arresting position, and a box shell B is arrested on the conveyor 94 shortly before the vanes 66 and 67 are swung downwardly in order to engage the interior of the box shell. The vanes serve a double purpose. Firstly, they serve as a finder and positioning means for the box shell, in the event the box B has for some reason not yet reached the flag 101 of the timed stop. Secondly, the vanes prevent the corner gussets from opening up. The box liner is confined in its downward path by the long side wall members 60 and 61 of the die. These engage the side panels of the liner. The end panels of the liner are engaged by the end wall members 62 and 63 in the upper throat portion of the die and by the vanes 66 and 67 in the lower throat portion of the die.

When the liner plunger 31 approaches its lowest position, the lever mechanism 46, 47, 50 projects the bottom plate 45 of the plunger which then seats the liner in the box shell B. It is quite apparent from Figure 10 that the bottom plate of the liner plunger must for this purpose reach a position immediately above the conveyor chains in order to seat the liner L properly. This position lies a considerable distance below the lowest position reached by the box shell plunger 30 which moves only far enough to bring the top edge of the box shell B safely below the engaging edges of the strippers 82.

After insertion of the liner L into the box shell B both plungers 30, 31 are retracted. As soon as the liner plunger 31 and its bottom plate clear the lined box shell, the flag stop 101 is retracted and the conveyor chain 94 advances the box. In order to move the boxes positively, the conveyor chain 94 may be equipped with lugs. One of these lugs is visible at 111 in Figure 11. The spacing

of the lugs **111** is greater than the length of the box to permit the conveyor chain **94** to move continuously during the time a box is arrested by the stop **101**.

Figure 12 illustrates the instant at which the box B begins to resume its travel after withdrawal of the flag stop **101**. At this moment the vane **66** has just cleared the dust flaps of the box.

Figure 13 shows an extension **112** on which the lined boxes accumulate after removal from the machine by the conveyor **94**.

Obviously the present invention is equally advantageous if used in connection with glued box shells as it is with gluelessly assembled boxes.

What is claimed is:

1. A folding box machine comprising, in combination, a first die; a first plunger movable through said first die for setting up box blanks in box form by passage through said die; a second die; a second plunger movable through said second die; a first conveyor having lugs for positively feeding boxes discharged by said first die towards said second die; a second conveyor in line with said first conveyor for frictionally advancing boxes delivered by said first conveyor into the path of said second plunger underneath said second die; and means operable in timed relationship with said second plunger for arresting boxes on said second conveyor in a position in line with the stroke path of the second plunger, the stroke of the second plunger being sufficiently long that in its bottommost position the second plunger extends into the respective box arrested underneath said second die.

2. A folding box machine comprising, in combination, a first die; a first plunger movable through said first die for setting up box blanks into box form by passage through said die; a second die; a second plunger movable through said second die; a conveyor for feeding boxes discharged by said first die into the path of said second plunger underneath said second die; a projectible and retractable finder element on said second die for engaging and aligning boxes on said conveyor in line with the stroke path of said second plunger; and means for operating said finder element in timed relationship with said second plunger.

3. A folding box machine comprising, in combination, a first die; a first plunger movable through said first die for setting up box blanks into box form by passage through said die; a second die; a second plunger movable through said second die; means for jointly supporting and reciprocating both said plungers along parallel plunger paths of equal stroke length; a conveyor for feeding boxes discharged by said first die into the path of said second plunger; a projectible and retractable element mounted on said second plunger; and means operative at the end of the stroke for projecting said element beyond the end position of the second plunger proper into the path of boxes moving on said conveyor.

4. A folding box machine comprising, in combination, a first die; a first plunger movable through said first die for setting up box blanks into box form by passage through said die; a second die; a second plunger movable through said second die; means for jointly supporting and reciprocating both said plungers along parallel plunger paths of equal stroke length; a conveyor for feeding boxes discharged by said first die into the path of said second plunger; a projectible and retractable element mounted on said second plunger; means for projecting said element for movement beyond the end position of the second plunger proper into the path of boxes moving on said conveyor; and means for periodically arresting boxes on said conveyor in a position underneath said element.

5. A folding box machine comprising, in combination, a box blank magazine; a folding die; a blank feeder for moving blanks from said magazine to said folding die; a first plunger movable through said die for setting up said box blanks into box form by passage through said die; a second plunger; a common reciprocable mounting element for supporting and moving both plungers; power means for reciprocating said mounting element; a conveyor for moving boxes discharged by said die into the path of said second plunger; and means for amplifying the stroke of at least a portion of said second plunger sufficiently that in its bottommost position the second plunger extends into the interior of boxes on said conveyor.

6. A folding box machine comprising, in combination, a box blank magazine; a folding die; a blank feeder for moving box blanks from said magazine to said folding die; a first plunger movable through said die for setting up said box blanks into box form by passage through said die; a second plunger; a common reciprocable mounting element for supporting and moving both plungers; power means for reciprocating said mounting element; a conveyor for feeding boxes discharged by said die into the path of said second plunger; and means for amplifying the stroke of at least a portion of said second plunger sufficiently to extend into the interior of boxes on said conveyor, said conveyor including means timed with regard to the movement of said second plunger for arresting boxes in a position in line with the stroke path of the second plunger.

7. A folding box machine comprising, in combination, a box blank magazine; a first folding die; a blank feeder head including suction cups for moving box blanks to said first folding die; a first plunger movable through said first die for setting up box blanks into box form by passage through said die; a second magazine for liner blanks; a second folding die; a second blank feeder head including suction cups for moving liner blanks from said second magazine to said second folding die; a second plunger movable through said second die for folding liner blanks into box-like form by passage through said second die; a common reciprocable first bar supporting said feeder heads for joint parallel motion between the respective magazines and dies; a common reciprocable second bar supporting said plunger for joint parallel motion through the respective dies; common power means for moving said bars in timed relationship; a conveyor advancing in a direction substantially parallel to said bars for moving boxes discharged by said first die into the path of said second plunger, the stroke of said second plunger comprising two portions; a first portion imparted by said second bar during which said second plunger moves through said second die to shape the liner, and means for imparting to said second plunger a second stroke portion after passage of the second plunger through the die, said second stroke portion being sufficiently long for the second plunger to extend into the interior of boxes on said conveyor, said conveyor including means timed with regard to the movement of the second plunger for arresting boxes in a position in line with the stroke path of said second plunger.

8. A folding box machine comprising, in combination, a first box blank magazine and a second liner blank magazine arranged side by side; a first box folding die and a second liner folding die arranged side by side; a joint feeding mechanism including certain suction elements for moving box blanks, and other suction elements for moving liner blanks from the respective magazine to said first and to said second folding die; a first plunger and a second plunger mounted for joint reciprocating movement side by side, said first plunger being movable through said first die for setting up box blanks into box form by passage through said first die, the second plunger being movable through said second die for folding liner blanks into box-like form by passage through said second die; a conveyor for moving boxes discharged by said first die into the path of said second plunger, the stroke of said second plunger comprising two portions, a first portion during which said second plunger moves through said second die to shape the liner, and a second portion after passage of the second plunger through the die, said sec-

ond stroke portion being sufficiently long to extend into the interior of boxes on said conveyor, said conveyor including means timed with regard to the plunger movement for arresting boxes in a position in line with the stroke path of said second plunger.

9. A folding box machine comprising, in combination, a first box blank magazine and a second liner blank magazine arranged side by side; a first box folding die and a second liner folding die arranged side by side; a joint feeding mechanism including certain suction elements for moving box blanks and other suction elements for moving liner blanks from the respective magazine to said first and to said second folding die; a first plunger and a second plunger mounted for joint reciprocating movement side by side, said first plunger being movable through said first die for setting up box blanks into box form by passage through said first die, the second plunger being movable through said second die for folding liner blanks into box-like form by passage through said second die; means for moving boxes discharged by said first die into a position underneath said second die; projectible and retractable guiding vanes underneath said second die for engaging boxes moved by said conveying means, said guiding vanes being operated in timed relationship to the movement of said second plunger; and an ejector element mounted on said second plunger for movement beyond the end position of said second plunger proper into the interior of a box engaged by said guiding vanes.

10. A folding box machine as defined in the preceding claim 9 in which the ejector element is a bottom plate on said second plunger including means operated by the movement of said second plunger through said second die for projecting said bottom plate into a position below the remainder of the second plunger.

References Cited in the file of this patent

UNITED STATES PATENTS

2,568,382	Buckley et al.	Sept. 18, 1951
2,643,592	Geffroy	June 30, 1953
2,655,843	Baker et al.	Oct. 20, 1953