Jan. 6, 1959 M. T. MOORE 2,867,157

MACHINE FOR FORMING PACKAGE TRAYS

Filed Sept. 27, 1954

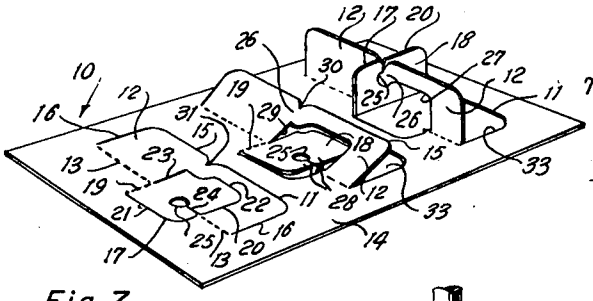


Fig. 7

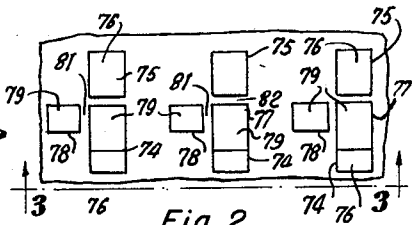


Fig. 2

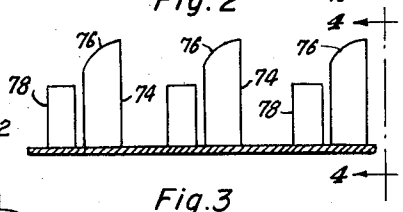


Fig. 3

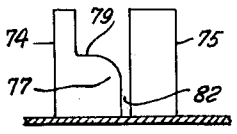


Fig. 4

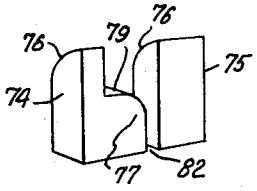


Fig. 5

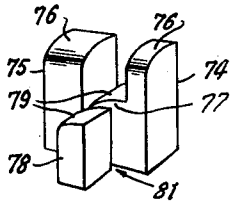


Fig. 6

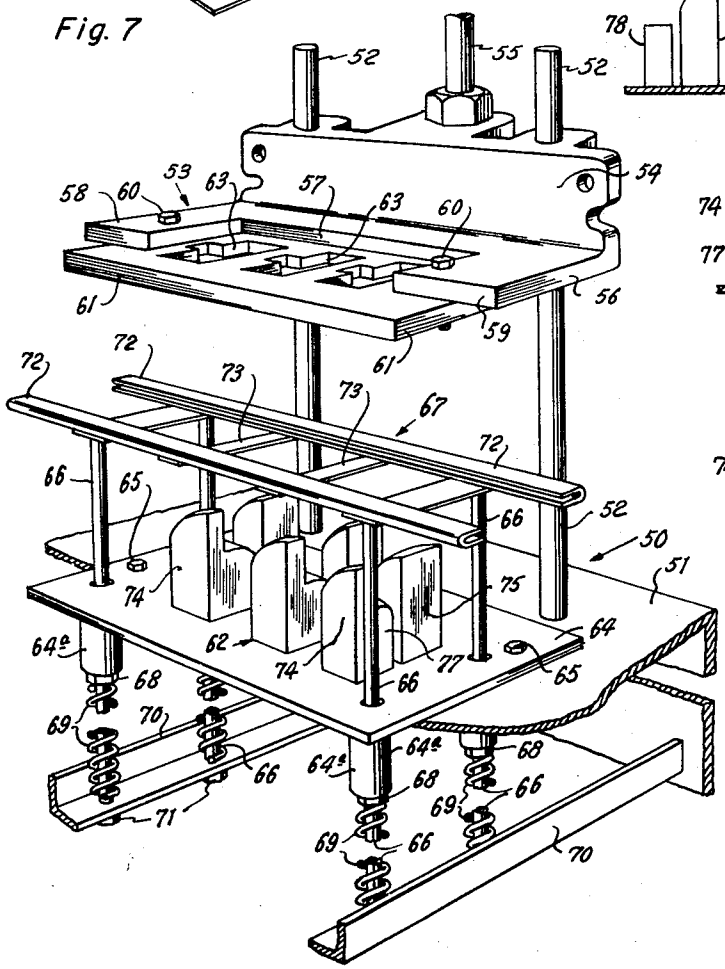


Fig. 1

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MACHINE FOR FORMING PACKAGE TRAYS

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Application September 27, 1954, Serial No. 458,338

12 Claims. (Cl. 93—37)

This invention relates to package trays and more particularly to a machine for forming pre-cut blanks into package trays.

One object of the invention is to provide a new and improved machine for forming pre-cut blanks into package trays.

Another object is to provide a new and improved machine for forming pre-cut blanks into package trays having interlocked transversely and longitudinally disposed vertical partitions.

Still another object is to provide a machine, of the type described, which has cams for initially bending certain portions of the blank upwardly to form the transverse partitions and then bending other portions of the blank upwardly to form longitudinal partitions and which interlock with the transverse partitions.

A further object of the invention is to provide a new and improved machine of the type described which will form the package tray in a single cycle of operations.

A still further object of the invention is to provide a new and improved machine of the type described which is of simple construction, and simple quick operation whereby the package trays may be formed quickly, easily and economically.

Additional objects and advantages of the invention will be readily apparent from the reading of the following description of a device constructed in accordance with the invention, and reference to the accompanying drawings thereof, wherein:

Figure 1 is a perspective view of a machine for forming pre-cut blanks into package trays, certain portions of the machine being broken away;

Figure 2 is a top plan view of the bending cams;

Figure 3 is a side view of the bending cams taken along the line 3—3 of Figure 2;

Figure 4 is an end view of the bending cams taken along the line 4—4 of Figure 3;

Figure 5 is a perspective view of a single set of the bending cams;

Figure 6 is another perspective view of a single set of the bending cams; and

Figure 7 is a perspective view of a pre-cut blank showing certain of the partitions bent or erected and interlocked, and others partially erected and interlocked.

Referring now especially to Figure 7, the reference numeral **10** indicates a pre-cut blank which has been illustrated and described in my co-pending application, Serial Number 393,285, filed November 20, 1953, and which consists of a rectangular flat blank of carboard or other sheet material. This blank is slitted along substantially U-shaped lines **11** to form transverse tabs or partitions **12** which may be bent along the transverse fold lines **13** into erect positions in which they extend perpendicularly from the main portion **14** of the blank which then forms the bottom of a tray. The U-shaped slit lines have transverse portions **15** and parallel spaced longitudinal leg portions **16**.

The blank is also slitted along lines **17**, which are likewise substantially U-shaped, to form longitudinal tabs or partitions **18** which may be bent along the longitudinal fold lines **19** into erect positions in which they extend perpendicularly from the main portion **14** of the blank.

The slit lines **17** have a longitudinal main portion **20**, parallel spaced transverse leg portions **21** and **22**, and a substantially longitudinal portion **23** which is a continuation of the leg portion **22** and of the fold line **19**.

Transverse slits **24** extend along the fold lines **13** between the main portions **20** of the slits **17** and a circular opening **25** in the longitudinal partition, and these transverse slits are adapted to receive the narrow curved portions **26** of the transverse partitions **12**.

It will be seen that the transverse partitions, when erect, have apertures **27** through which the longitudinal partitions extend, the slits **24** and openings **25** permitting the longitudinal partitions **18** to be of the same height as the transverse partitions **12** since the narrow portions **26** of the transverse partitions are engaged in said transverse slits and openings.

The blank **10** may be provided with the various slits and the openings by a single die-cutting operation which may also score the fold lines **13** and **19** to facilitate the bending or folding of the partitions.

When it is desired to use one of the trays, the transverse partitions are bent upwardly along the lines **13** from the main portion or bottom **14** until they are vertical to the bottom, as shown in Figures 1, 3 and 4. The longitudinal partitions are then bent along the fold lines **19** upwardly from the main portion or bottom **14** of the blank until they are also vertical to the bottom.

During the latter portions of such upward bending movement of the longitudinal partitions, the narrow curved portions **26** of the transverse partitions pass through the slits **24** and enter the openings **25**, the tab portions **28** of the longitudinal partitions adjacent the slits **24** bending outwardly to permit such passage of the curved narrow portions **26** of the transverse partitions into the openings **25**. These tab portions snap back into their original positions when the portions **26** are in the apertures. When the longitudinal partitions are in vertical positions, their sides about the vertical edges **29** of the transverse tabs, which thus limit movement of the longitudinal tabs in that direction. The tab portions **28** engage the curved edge **30**, formed by the notches **31** in the upper edges of the transverse partitions, to limit movement of the longitudinal tabs in the opposite direction. Thus, the longitudinal partitions are restrained or locked in upright or vertical position to the transverse partitions.

Similarly, the transverse partitions are held in upright or vertical position, since the curved portions **26** of the transverse tabs extend through the openings **25** in the longitudinal partitions. The transverse partitions, therefore, cannot move from their vertical positions until the longitudinal tabs are not in their erect or vertical position. It will thus be seen that each adjacent or associated pair of longitudinal and transverse partitions are interlocked when in erect or vertical positions.

The longitudinal and transverse partitions when in vertical positions act as separators or dividers which divide the package tray into a plurality of compartments. In each of the compartments, an article, or a stack of articles, may be disposed and held by the partitions against movement toward articles in the other compartment. If desired, the package tray may be provided with longitudinal upright flanges (not shown) along each side, or similar upright end flanges, or both, which serve to add rigidity to the tray, and which also may serve to prevent articles in the compartment from sliding off the edges of the bottom.

The described package tray may be inserted in a cellophane or like wrapper or bag, or in a carton box to hold

articles against movement in the container, or the package tray may be used as a container, and such tray and its contents may be covered by a transparent cover so that the articles held by the tray may be easily visible.

The apertures **33** in the bottom **14** of the package tray left when the partitions are bent to vertical positions are of small size as compared to the articles to be held by the trays so that the articles cannot fall through the apertures.

The machine **50** for bending the transverse partitions **12** and the longitudinal partitions **18** into erect positions includes a fixed base plate **51** on which are mounted two posts **52**. A pressure plate assembly **53** is slidably mounted on the posts **52** and includes a substantially L-shaped bolster **54** having suitable apertures through which the two posts extend. The bolster may be secured to the reciprocating ram **55** of a press in the usual manner.

The lower forwardly projecting portion **56** of the bolster is cut away to form a slot **57** and legs **58** and **59**, and a pressure plate **61** is secured by bolts **60** to the legs of said bolster and extends across the slot. The pressure plate **61** is provided with substantially T-shaped apertures **63** whereby the pressure plate may be lowered down over and past a corresponding number of sets of bending cams **62** which thus pass upwardly through the apertures **63** of the pressure plate. The sets of cams **62** are mounted on a plate **64** rigidly but removably secured to the fixed base plate **51** by bolts **65**.

The cam plate **64** is provided with four depending guide sleeves **64***a* having axial bores through which elongate push rods **66** of a blank holder **67** slidably extend. The guide sleeves extend downwardly through suitable apertures in the base plate **51**, and the push rods **66** extend downwardly therebelow through suitable apertures provided in rigid angles **70** carried by the frame of the machine. Helical springs **69** are mounted on the lower portions of the push rods and adjustably confined thereon between the rigid angles **70** and adjusting lock units **68** threaded onto the lower portions of each push rod, whereby the springs bias the push rods and the blank holder **67** carried thereby upwardly. Nuts **71** threaded on the lower ends of the rods adjustably limit their upward movement by engagement with the underside of the angles. The blank holder is mounted on the upper ends of the push rods and includes a pair of parallel spaced opposed inwardly opening channels **72** joined by a plurality of spaced straps or dividers **73** which maintain the channels in rigid spaced relationship.

The cams **62** are disposed in groupings or sets of three, each set including a pair of tall or initially acting cams **74** and **75**, each having at its upper end a downwardly and leftwardly (Figures 2 and 3) curved upper surface **76**, and a pair of low or secondly acting cams **77** and **78**, each of which has at its upper end a downwardly and inwardly curved surface **79**. The cams **74** and **75** are adapted to engage and act upon the transverse partitions or portions **12** of the tray blank, while the cams **77** and **78** are adapted to engage and act upon the longitudinal partitions or portions of said tray blank, in a manner which will be hereinafter more fully explained.

Each set of these cams is grouped in a T pattern, and is adapted to pass through the corresponding T-shaped aperture **63** of the pressure plate **61** when the latter is lowered over the cams. The cam plate has been shown as provided with only three sets of cams, and correspondingly the pressure plate with only three T-shaped apertures, but it will be apparent that only a single set of cams or as many sets of cams may be provided as desired, depending on the size of the tray **10** and the number of partitions pre-cut therein.

In use, the pre-cut blank **10** is slid into the channels **72** of the blank holder **67** until the partitions or tabs **12** and **18** are positioned properly above the cams and below the apertures **63** of the pressure plate. The ram **55** then lowers the pressure plate **61**, which contacts the channels **72** and, as it continues its downward movement, moves the blank holder and blank carried thereby downwardly against the resistance of the springs **69**.

The outer portions of the partitions or tabs **12** remote from the transverse fold lines **13** then contact the upper edge portions of the curved surfaces **76** of the tall cams **74** and **75**, and as the pressure plate continues to move downwardly these curved surfaces bend the transverse partitions upwardly into erect positions, the transverse partitions moving upwardly through the apertures **63** of the pressure plate. It will be apparent that the curved surfaces **76** become vertical at a plane spaced above the upper ends of the low cams **77** and **78**, so that the transverse partitions are moved to upright positions before the blank engages the upper ends of the low cams.

After the transverse tabs or partitions **12** are in their upright positions, further downward movement of the pressure plate causes the longitudinal tabs or partitions **18** to come into contact with the curved surfaces **79** of the low cams **77** and **78** at the edges of the longitudinal partitions remote from the fold lines of those tabs. Continued downward movement of the pressure plate will then move the blank down against or near the cam plate **64**, the curved surfaces **79** causing the longitudinal partitions to move into erect positions wherein the partitions are interlocked as has already been explained. The partitions are then erect and extend, together with the cams, between the dividers **73** of the blank holder **67** and through the apertures **63** of the pressure plate. The dividers **73** of the blank holder **67** pass between the low cam **78** of one set of cams and the tall cams **74** and **75** of an adjacent cam set.

The spacing **81** between the low or small cams **77** and **78** and between the low cam **78** and the tall cams permits the narrow portions **26** of the transverse partitions to pass therebetween. Likewise, the spacing **82** between the low cam **77** and the tall cam **75** permits the adjacent portion of the longitudinal partitions to pass therebetween in an upright position.

The ram **55** then moves upwardly, lifting the pressure plate, and as it moves upwardly the springs **69** move the blank holder **67** upwardly until the upward movement of the blank holder is stopped by engagement of the nuts **71** on the lower ends of the rods with the angles **70**. The pressure plate, however, continues to move upwardly to a position wherein the now erect partitions **12** and **18** are clear of the pressure plate. The formed tray is then slid out of the channels **72** of the blank holder and the machine is then ready for another cycle of operations to form another blank into a package tray.

It will be readily apparent that successive pre-cut tray blanks may be fed automatically into the channels of the blank holder by means of suitable automatic feeding machinery. Likewise, it will be seen that a strip of material having the tabs or partitions pre-cut therein might be fed continuously and automatically through the channels of the blank holder, and that the section having the partitions erected might be cut off after such section has passed beyond the ends of the channels.

It will also be apparent that any suitable means may be employed to reciprocate the pressure plate, the ram **55** being capable of being connected to and driven by any reciprocating element of a prime mover or of any suitable mechanical movement for power transmission.

It will therefore be seen that a new and improved machine for forming pre-cut blanks **10** into formed package trays has been illustrated and described, which includes a plurality of sets of cams provided with curved cam surfaces which are adapted to successively engage the transverse partitions **12** and the longitudinal partitions **18** of the pre-cut blank **10** held in the channels **72** of the blank holder to bend these partitions about their fold lines **13** and **19**, respectively, into erect positions as the blank holder is moved downward past the cams by the pressure plate **61**. It will also be seen that the pres-

sure plate is provided with apertures 63 which receive the partitions as the latter are bent into upright erect positions and that the pressure plate helps hold the blank in proper position during the forming operation.

Moreover, it will be apparent that the machine is of simple economical construction, and operates easily and efficiently to form a pre-cut blank into a package tray during each reciprocation of the pressure plate and blank holder.

The foregoing description of the invention is explanatory only, and changes in the details of the method described and of the construction illustrated may be made by those skilled in the art, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. A device of the type described including: a fixed base; a plurality of upwardly extending cams mounted on said fixed base; a blank holder mounted on said base for vertical movement toward said fixed base and downwardly of said cams; means on said blank holder for holding a blank against displacement from said holder in either direction vertically; means biasing said blank holder upwardly away from said cams and fixed base; and a pressure plate reciprocably mounted over said blank holder for engaging the blank holder and moving it down toward the base and over the cams.

2. A device of the type described including: a fixed base; a plurality of upwardly extending cams mounted on said fixed base; a holder mounted on said base for vertical movement toward said fixed base and over and about said cams; means on said holder for guiding and holding a blank against displacement in either direction vertically out of said holder; means biasing said blank holder upwardly away from said cams and fixed base; and a pressure plate reciprocably mounted over said blank holder for engaging the blank holder and moving it down toward the base and over the cams, said pressure plate having apertures through which said cams are adapted to pass.

3. A machine for bending transverse and longitudinal tabs of flat pre-cut blanks into erect transverse and longitudinal interlocking partitions including: a fixed base; a set of cams projecting upwardly from said fixed base and having curved tab engaging surfaces; and a blank holder mounted on said fixed base above said cams for vertical movement toward said fixed base and past said cams, said cams first engaging the transverse tab of a blank held by said blank holder to move the transverse tab into erect transverse partition forming position, and then engaging the longitudinal tab of the blank to move the longitudinal tab into erect longitudinal partition forming position as said blank holder is moved downward toward the fixed base; said blank holder having means thereon for positively guiding a blank horizontally thereon and for holding said blank against displacement vertically in either direction from said blank holder.

4. A machine for bending transverse and longitudinal tabs of flat pre-cut blanks into erect transverse and longitudinal interlocking partitions including: a fixed base; a set of cams projecting upwardly from said fixed base and having curved tab engaging surfaces; a blank holder mounted on said fixed base above said cams for vertical movement toward said fixed base and past said cams, said cams first engaging the transverse tab of a blank held by said blank holder to move the transverse tab into erect transverse partition forming position, and then engaging the longitudinal tab of the blank to move the longitudinal tab into erect longitudinal partition forming position as said blank holder is moved downward toward the fixed base; means on said blank holder for guiding a blank horizontally of said holder and for holding such blank against displacement in either direction vertically from said holder; and means yieldably biasing said holder away from said fixed base.

5. A machine for bending transverse and longitudinal tabs of flat pre-cut blanks into erect transverse and longitudinal interlocking partitions including: a fixed base; a set of cams projecting upwardly from said fixed base and having curved tab engaging surfaces; a blank holder mounted on said fixed base above said cams for vertical movement toward said fixed base and past said cams, said cams first engaging the transverse tab of a blank held by said blank holder to move the transverse tab into erect transverse partition forming position, and then engaging the longitudinal tab of the blank to move the longitudinal tab into erect longitudinal partition forming position as said blank holder is moved downward toward the fixed base; means on said blank holder for guiding a blank horizontally of said holder and for holding such blank against displacement in either direction vertically from said holder; and a pressure plate mounted above said blank holder for reciprocable movement toward and away from said base for moving said blank holder toward said base.

6. A machine for bending transverse and longitudinal tabs of flat pre-cut blanks into erect transverse and longitudinal interlocking partitions including: a fixed base; a set of cams projecting upwardly from said fixed base and having curved tab engaging surfaces; a blank holder mounted on said fixed base above said cams for vertical movement toward said fixed base and past said cams, said cams first engaging the transverse tab of a blank held by said blank holder to move the transverse tab into erect transverse partition forming position, and then engaging the longitudinal tab of the blank to move the longitudinal tab into erect longitudinal partition forming position as said blank holder is moved downward toward the fixed base; means on said blank holder for guiding a blank horizontally of said holder and for holding such blank against displacement in either direction vertically from said holder; means yieldably biasing said blank holder away from said fixed base; and a pressure plate mounted above said blank holder for reciprocable movement toward and away from said base for moving said blank holder toward said base.

7. A machine for bending transverse and longitudinal tabs of flat pre-cut blanks into erect transverse and longitudinal interlocking partitions including: a fixed base; a sets of cams projecting upwardly from said fixed base and having curved tab engaging surfaces; a holder mounted on said fixed base above said cams for vertical movement toward said fixed base and past said cams, said cams first engaging the transverse tab of a blank held by said blank holder to move the transverse tab into erect transverse partition forming position, and then engaging the longitudinal tab of the blank to move the longitudinal tab into erect longitudinal partition forming position as said blank holder is moved downward toward the fixed base; means on said blank holder for guiding a blank horizontally of said holder and for holding such blank against displacement in either direction vertically from said holder; and a pressure plate mounted above said blank holder for reciprocable movement toward and away from said base for moving said blank holder toward said base, said pressure plate having apertures for receiving said cams and said tabs as said tabs are moved into erect positions.

8. A machine for bending transverse and longitudinal tabs of flat pre-cut blanks into erect transverse and longitudinal interlocking partitions including: a fixed base; a sets of cams projecting upwardly from said fixed base and having curved tab engaging surfaces; a holder mounted on said fixed base above said cams for vertical movement toward said fixed base and past said cams, said cams first engaging the transverse tab of a blank held by said blank holder to move the transverse tab into erect transverse partition forming position, and then engaging the longitudinal tab of the blank to move the longitudinal tab into erect longitudinal partition forming position as

said blank holder is moved downward toward the fixed base; means on said blank holder for guiding a blank horizontally of said holder and for holding such blank against displacement in either direction vertically from said holder; means yieldably biasing said blank holder away from said fixed base; and a pressure plate mounted above said blank holder for reciprocable movement toward and away from said base for moving said blank holder toward said base; said pressure plate having apertures for receiving said cams and said tabs as said tabs are moved into erect positions.

9. A machine for bending transverse and longitudinal tabs of flat pre-cut blanks into erect transverse and longitudinal interlocking partitions including: a fixed base; a sets of cams projecting upwardly from said fixed base and having curved tab engaging surfaces; and a blank holder mounted on said fixed base above said cams for vertical movement toward said fixed base and past said cams, said cams first engaging the transverse tab of a blank held by said blank holder to move the transverse tab into erect transverse partition forming position, and then engaging the longitudinal tab of the blank to move the longitudinal tab into erect longitudinal partition forming position as said blank holder is moved downward toward the fixed base; said blank holder including a pair of opposed inwardly facing channels into which a flat blank may be slid and guided horizontally of said blank holder, said channels holding said blank against displacement vertically in either direction from said holder.

10. A machine for bending transverse and longitudinal tabs of flat pre-cut blanks into erect transverse and longitudinal interlocking partitions including: a fixed base; a sets of cams projecting upwardly from said fixed base and having curved tab engaging surfaces; a blank holder mounted on said fixed base above said cams for vertical movement toward said fixed base and past said cams, said cams first engaging the transverse tab of a blank held by said blank holder to move the transverse tab into erect transverse partition forming position, and then engaging the longitudinal tab of the blank to move the longitudinal tab into erect longitudinal partition forming position as said blank holder is moved downward toward the fixed base; and means yieldably biasing said blank holder away from said fixed base; said blank holder including a pair of opposed inwardly facing channels into which a flat blank may be slid and guided horizontally of said blank holder, said channels holding said blank against displacement vertically in either direction from said holder.

11. A machine for bending transverse and longitudinal tabs of flat pre-cut blanks into erect transverse and longitudinal interlocking partitions including: a fixed base; a sets of cams projecting upwardly from said fixed base

and having curved tab engaging surfaces; a holder mounted on said fixed base above said cams for vertical movement toward said fixed base and past said cams, said cams first engaging the transverse tab of a blank held by said blank holder to move the transverse tab into erect transverse partition forming position, and then engaging the longitudinal tab of the blank to move the longitudinal tab into erect longitudinal partition forming position as said blank holder is moved downward toward the fixed base; means yieldably biasing said blank holder away from said fixed base; said blank holder including a pair of opposed inwardly facing channels into which a flat blank may be slid and guided horizontally of said blank holder, said channels holding said blank against displacement vertically in either direction from said holder; and a pressure plate mounted above said blank holder for reciprocable movement toward and away from said fixed base and engageable with said channels of said blank holder for moving said blank holder toward said base.

12. A machine for bending transverse and longitudinal tabs of flat pre-cut blanks into erect transverse and longitudinal interlocking partitions including: a fixed base; a sets of cams projecting upwardly from said fixed base and having curved tab engaging surfaces; a holder mounted on said fixed base above said cams for vertical movement toward said fixed base and past said cams, said cams first engaging the transverse tab of a blank held by said blank holder to move the transverse tab into erect transverse partition forming position, and then engaging the longitudinal tab of the blank to move the longitudinal tab into erect longitudinal partition forming position as said blank holder is moved downward toward the fixed base; means yieldably biasing said blank holder away from said fixed base; said blank holder including a pair of opposed inwardly facing channels into which a flat blank may be slid and guided horizontally of said blank holder, said channels holding said blank against displacement vertically in either direction from said holder; and a pressure plate mounted above said blank holder for reciprocable movement toward and away from said fixed base and engageable with said channels of said blank holder for moving said blank holder toward said base; said pressure plate having apertures for receiving said cams and said tabs as said tabs are moved into erect positions.

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