

Dec. 30, 1947.

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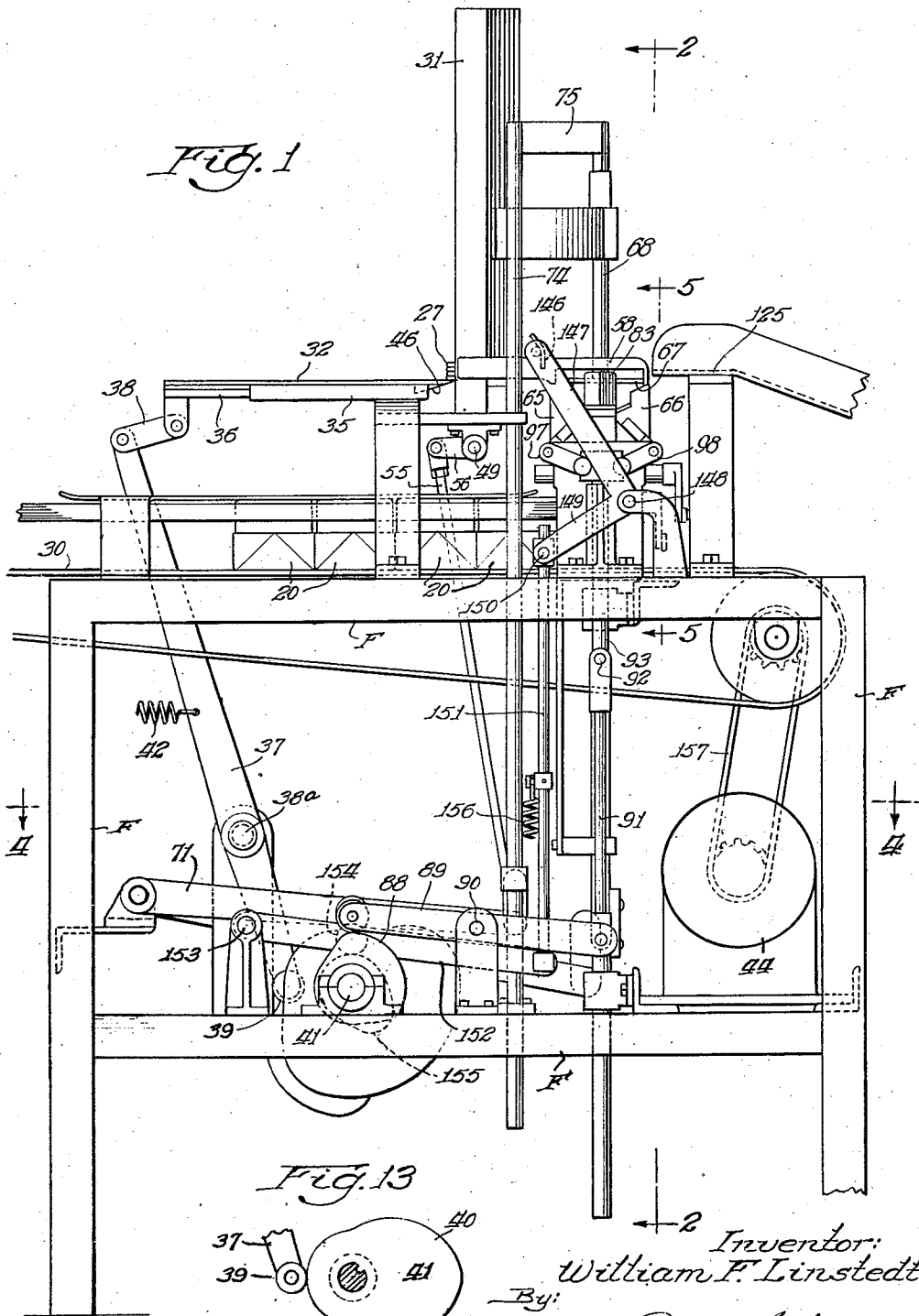
2,433,701

APPARATUS FOR DISTENDING PREFABRICATED BOX COVERS

AND APPLYING THE SAME TO FILLED BOXES

Filed Nov. 26, 1943

8 Sheets-Sheet 1



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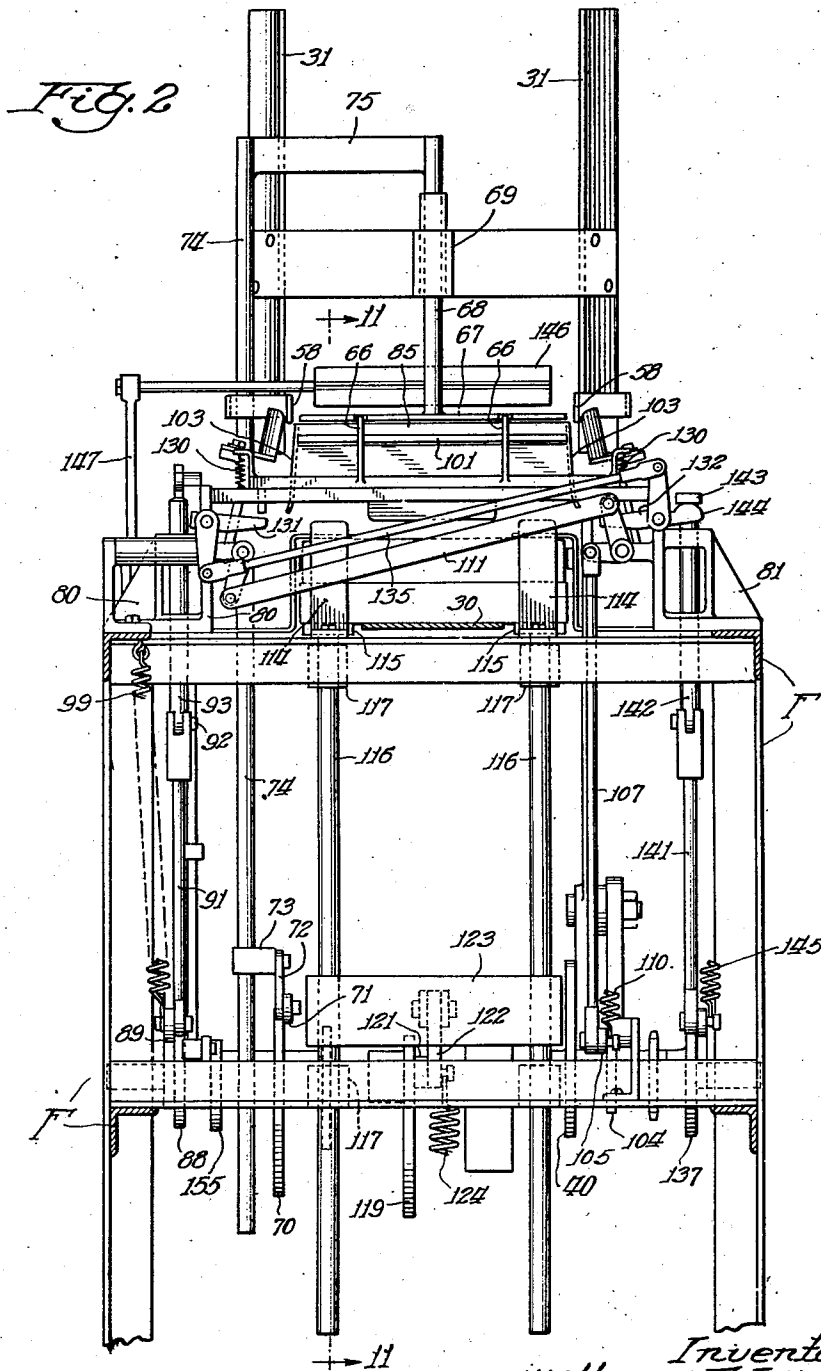
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8 Sheets-Sheet 2



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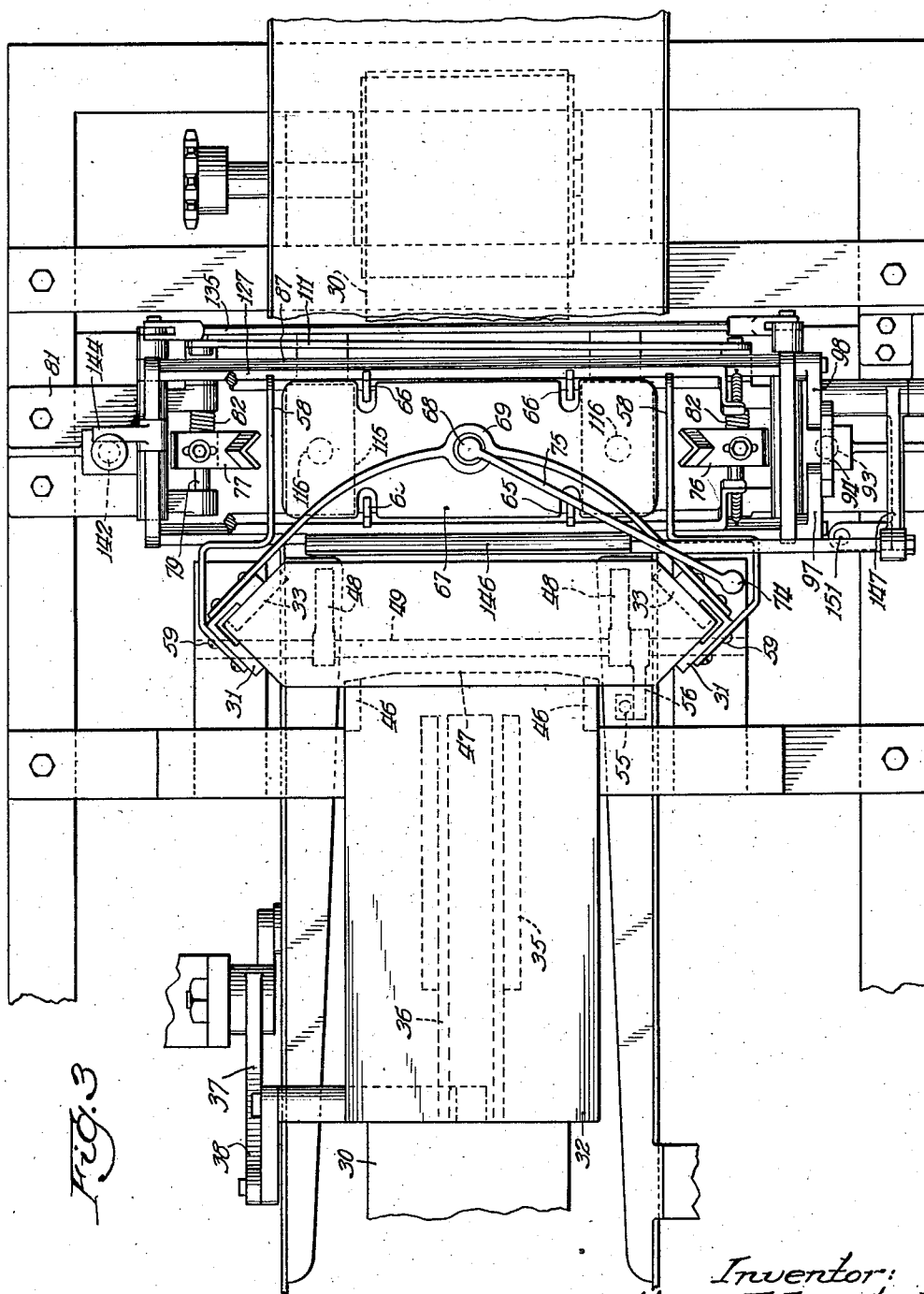
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Filed Nov. 26, 1943

8 Sheets-Sheet 3



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Fig. 1

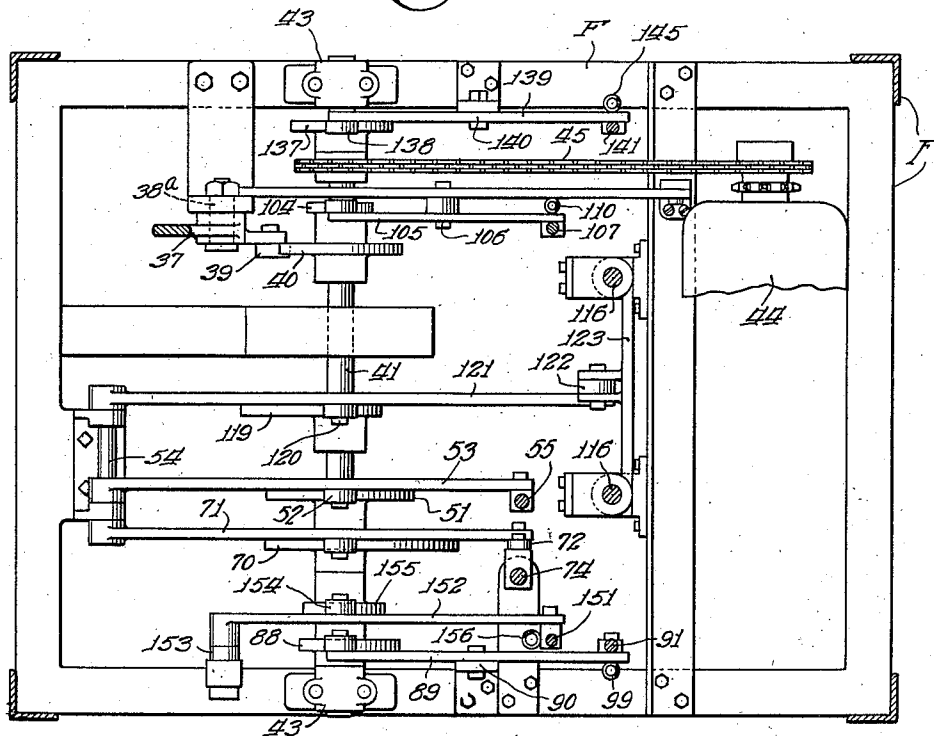


Fig. 15

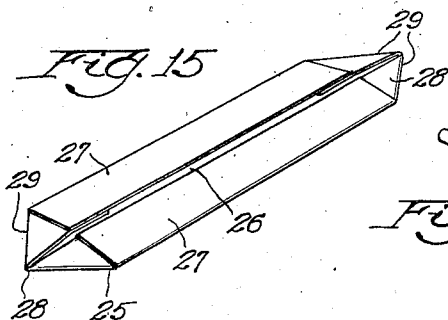


Fig. 16

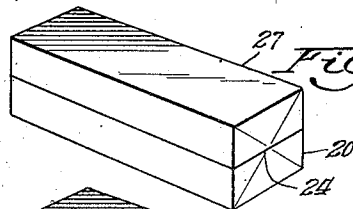
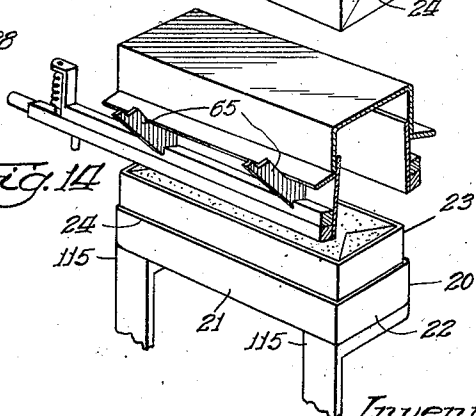


Fig. 14



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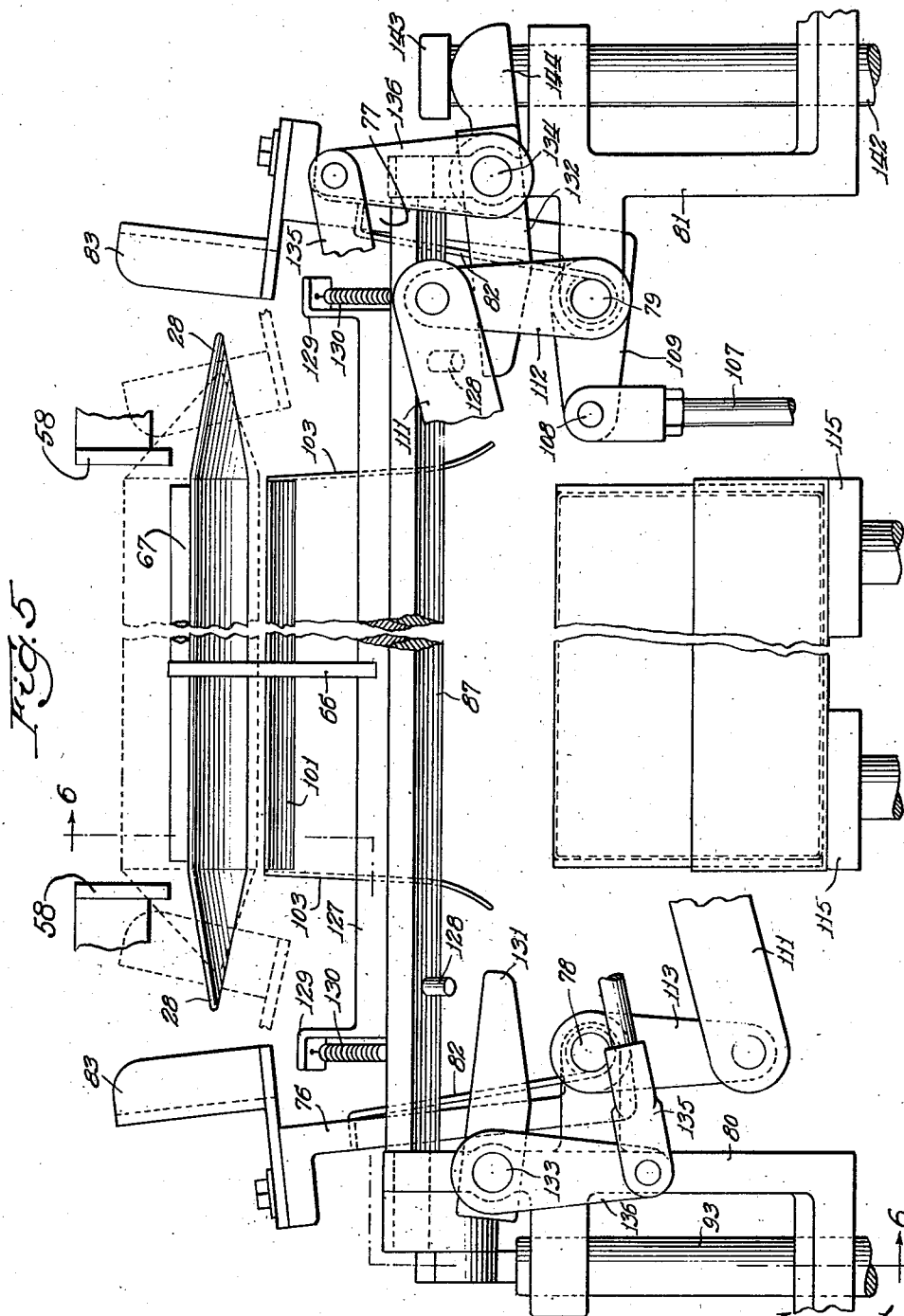


Fig. 5

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Fig. 6.

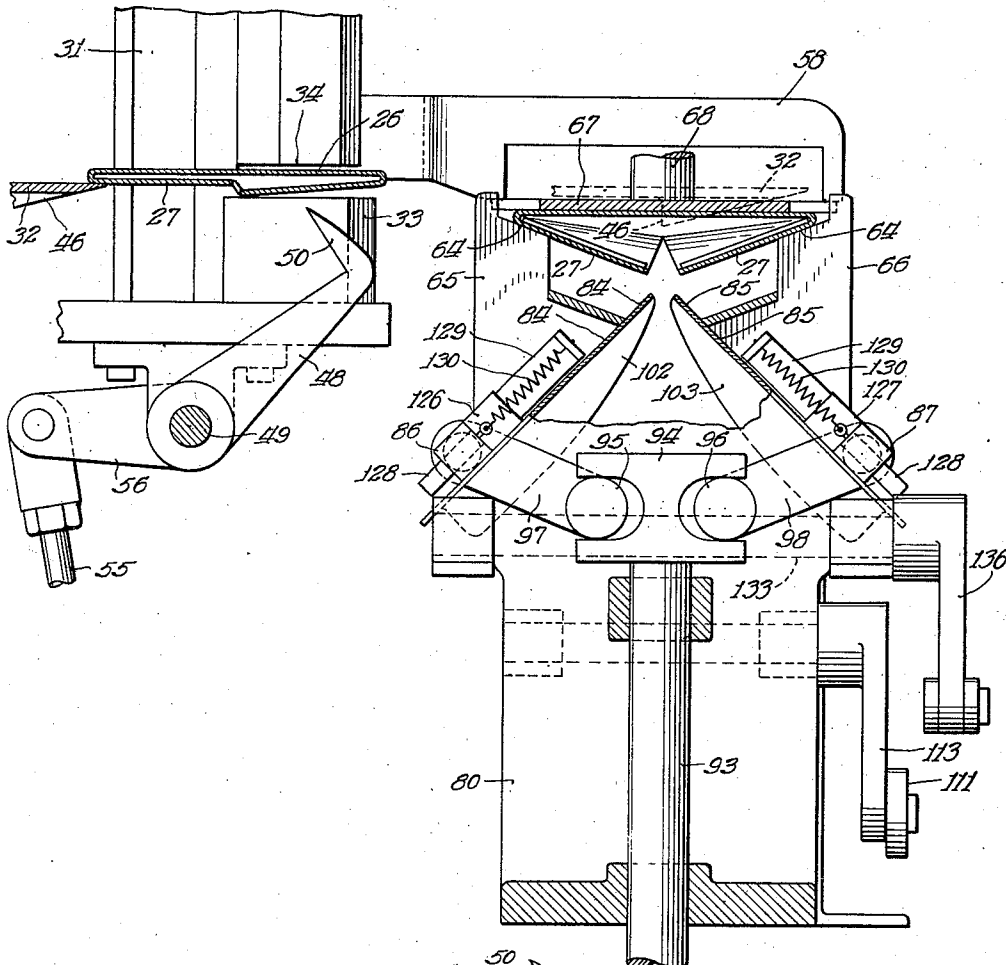
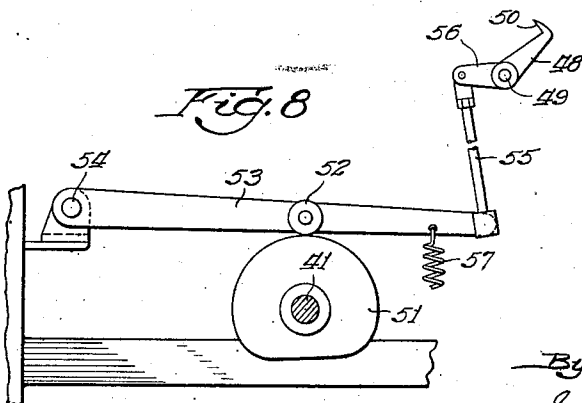


Fig. 8



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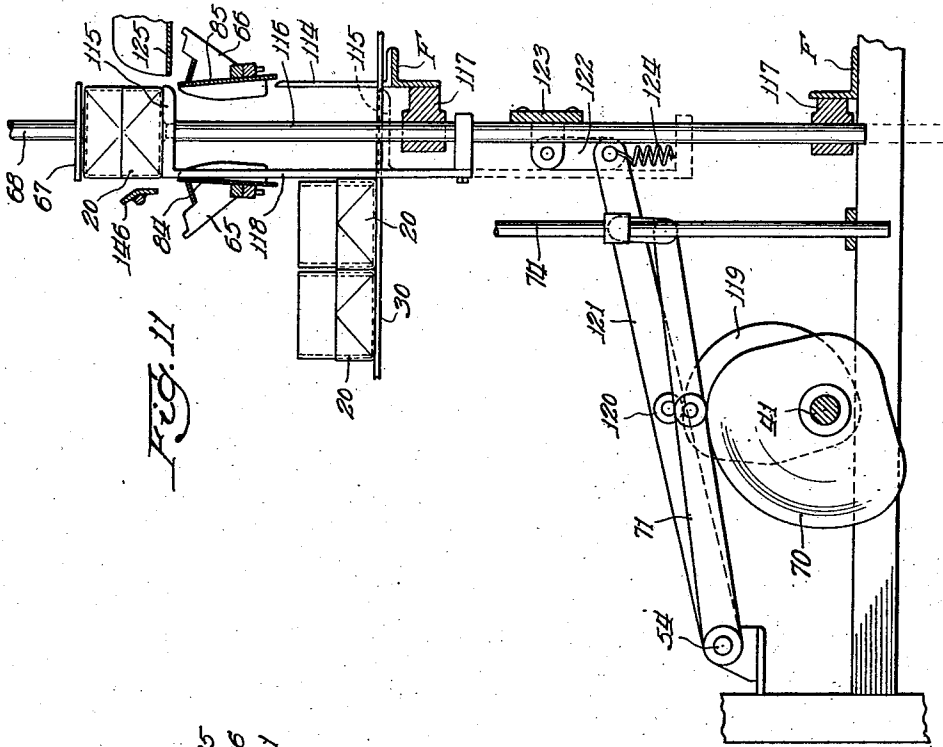


FIG. 11

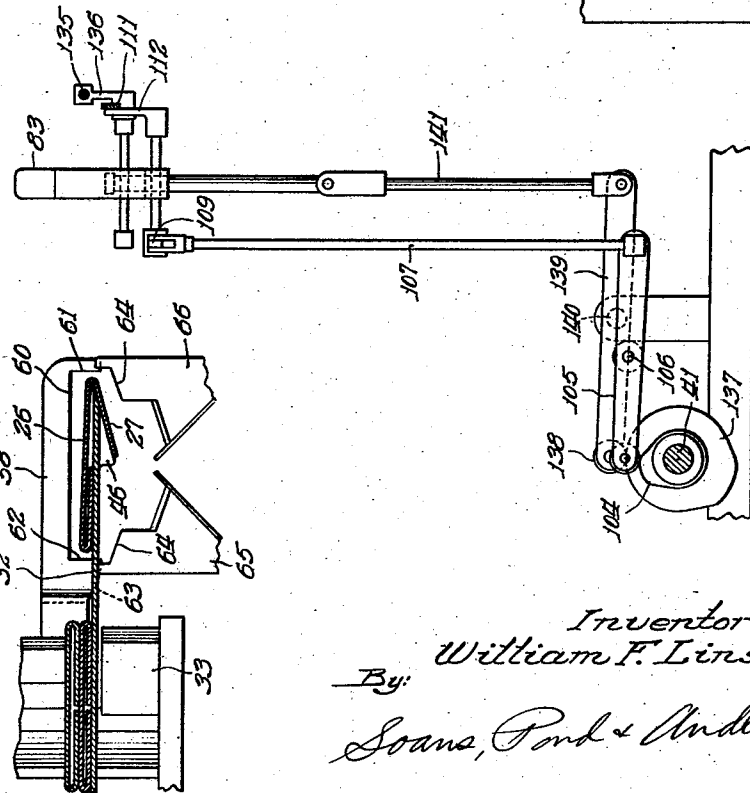


FIG. 12

FIG. 7

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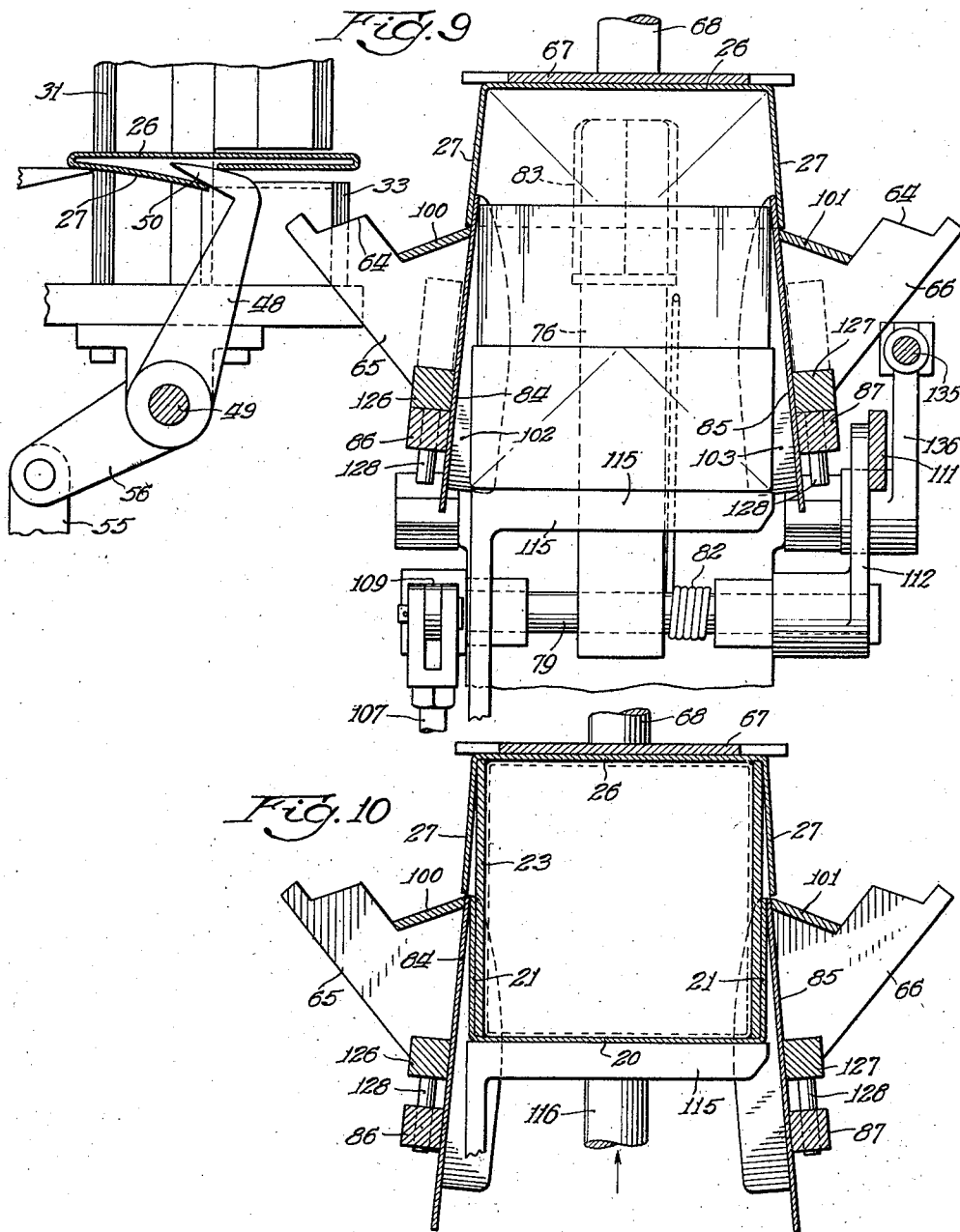
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8 Sheets-Sheet 8



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UNITED STATES PATENT OFFICE

2,433,701

APPARATUS FOR DISTENDING PREFABRICATED BOX COVERS AND APPLYING THE SAME TO FILLED BOXES

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Application November 26, 1943, Serial No. 511,812

18 Claims. (Cl. 93—55.1)

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This application is concerned with mechanism or apparatus employed in connection with the packaging of products in a box comprising a lower box portion and a cover portion having side walls telescopically fitting around the side walls of the box. The box may be a rigid pre-fabricated box, or it may be a collapsible or foldable box which has been preliminarily unfolded and filled with material to be packaged. The cover, which the apparatus herein to be described is to apply to the box, is a collapsible or foldable cover consisting of a top wall and side walls, two opposite walls of which are initially folded inwardly into overlapping relation to the top panel, and the other two of which are initially folded outwardly and also refolded upon themselves as an incident to the inward folding of the first mentioned pair of walls. The cover is supplied to the apparatus to be described, in the collapsed form indicated, is automatically distended and then applied to the box.

The main objects of the present invention are to provide apparatus for distending collapsed box covers and applying same to a box in a rapid, wholly automatic operation; to provide such apparatus which will be relatively simple in character, efficient, reliable and durable in operation; to provide such apparatus which will operate to automatically distend box covers and apply the same to boxes one by one, in successive, automatic and rapid operations; to provide such apparatus which may be readily associated and synchronized with other apparatus which serves to fill the box and deliver the filled box to the cover-applying mechanism; and, in general, it is the object of the invention to provide improved apparatus of the character indicated.

Other objects and advantages of the invention will be understood by reference to the following specification and accompanying drawings (8 sheets) wherein there is disclosed apparatus for the purpose indicated, and embodying a selected form of construction.

In the drawings, Fig. 1 is a side elevation; Fig. 2 is a section on the line 2—2 of Fig. 1; Fig. 3 is a plan; Fig. 4 is a plan section on the line 4—4 of Fig. 1; Fig. 5 is a section on the line 5—5 of Fig. 1; Fig. 6 is a section on the line 6—6 of Fig. 5; Fig. 7 is a detail illustration corresponding to a portion of Fig. 6, but showing certain parts in a position which they occupy before reaching the position shown in Fig. 6; Fig. 8 is an illustration in side elevation of the means for operating a part of the mechanism shown in Fig. 6; Figs. 9 and

10 are sectional illustrations corresponding to a part of Fig. 6, but showing successively changed positions of the structure; Fig. 11 is a section on the line 11—11 of Fig. 2; Fig. 12 is a fragmentary sectional illustration of the means for actuating certain parts of the mechanism; Fig. 13 is a detail illustration of certain parts of the mechanism shown in Fig. 1 for actuating parts of the apparatus; Fig. 14 is a perspective illustrating certain parts of the mechanism to more clearly illustrate the manner in which the distended cover is applied to the package; Fig. 15 is a perspective illustration of a collapsed cover such as is distended and applied to a box by the mechanism, and Fig. 16 is a perspective of the completed or covered package or box.

The boxes to which covers are applied by the mechanism herein described, may be in the form of a more or less conventional rectangular box having a bottom and upwardly extending side walls. In this instance, the box shown consists of a lower, or tray section 20, which embodies side walls 21 and end walls 22, and a tubular side wall structure 23, which consists of a strip of suitable cardboard folded to form a rectangular tube open at both ends, and inserted into the distended tray 20 to provide a box of considerably greater depth than the depth of the tray 20. As shown in Fig. 14, the box thus formed has a shoulder or seat 24 formed by the upper edges of the side and end walls around the outside of the tubular wall body 23. In the particular box and cover structure herein contemplated, the shoulder or seat 24 is located midway between the top and bottom of the completed box, and the cover member to be applied may be of the same construction as the bottom tray 20. A cover member 25 is illustrated in Fig. 15 in its prefabricated, collapsed condition. As shown in Fig. 15, the cover embodies a top wall 26, inwardly folded side walls 27—27, and outwardly folded end walls 28—28. The side and end walls of the cover are foldably connected along lines which will form the side wall corners of the cover when distended, and said end walls, incident to the collapsing of the cover, are refolded upon themselves along diagonally extending lines 29.

When the cover 27 is opened up, or distended, and applied to the box structure shown in Fig. 14, the finished package will appear as shown in Fig. 16, from which it will be seen that the lower edges of the cover side walls engage the shoulder or seat 24 of the box, the side and end walls of the cover telescopically fitting around the por-

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tions of the tubular wall structure 23 which extend above the shoulder or seat 24. It is preferred that the depth of the cover be substantially the same as the vertical dimension of the tubular wall structure portion, which extends above the shoulder 24.

Referring now to Fig. 1 of the drawings, a series of filled boxes 20 are delivered to the apparatus of this application by means of a conveyor belt 30, which may be a continuously driven belt. The filled packages may be delivered to the belt 30 from the filling mechanism, or any other source, and they may be disposed side to side, as shown. A stack of covers 27 to be applied to the boxes is held in vertical position by means of a pair of vertically extending angle members 31, which are adapted to receive the pointed end portions of the collapsed covers. The covers are arranged in the stack with their folded side and end walls facing downwardly. (See Fig. 7.)

The stack of covers 27 is initially supported at the rear side of the stack by means of a cover feed plate 32 and the forward portions of the ends of the stack are supported by the upper ends of supporting blocks 33. (See Fig. 3.) The front portions of the supporting angles 31 are terminated as indicated at 34 just above the normal plane of the top surface of the lowermost cover member 27, so that the lowermost cover may be fed forwardly or laterally from the bottom of the stack.

The feed plate 32 is horizontally, slidably mounted in a suitable supporting bracket 35, which is mounted on the main frame of the apparatus, all parts of which are designated "F." As will be apparent from an inspection of Figs. 1 and 3, the feed plate 32 is provided near its longitudinal center with an inverted T-shaped bar 36, which is slidably fitted in a correspondingly shaped or under-cut slot in the upper portion of the bracket 35.

The feed plate 32 is automatically reciprocated by means of a lever 37, the upper end of which is connected by means of a link 38 to the rear end of the feed plate 36. The lever 37 is pivotally mounted intermediate its ends as indicated at 38a on a suitable frame-supported bracket. The lower end portion of the lever 37 carries a roller or cam follower 39, which is acted against by a rotary plate cam 40 carried by a cam shaft 41. A spring 42 connected to a portion of the lever 37 and a conveniently accessible frame part serves to normally urge the feed plate 36 to move rearwardly, and to maintain the cam follower 39 in operative engagement with the cam 40. The cam 40 is, of course, appropriately shaped to effect operative movement of the feed plate 36 in properly synchronized relation to other operating parts of the apparatus, and so as to permit the feed plate 36 to remain at rest in a retracted position during certain portions of the operating cycle.

The cam shaft 41 is journaled in suitable bearing brackets 43, carried by the frame of the mechanism, and it may be continuously driven by connection to any available source of power. In this instance, it is illustrated as being driven by means of an electric motor 44 through a driving chain 45.

In the fabrication of the collapsed trays, adhesive is employed for joining flaps which extend from the ends of the end walls into overlapping relation to the inside of the adjacent portions of the side walls. It is found that it often happens that a small amount of adhesive is squeezed out

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from between the glue flap and wall portion, with the result that the side walls are sometimes adhesively bonded in their collapsed condition to the inside of the top wall. This bond, which inadvertently occurs, is usually not very strong. It is important that it be broken so as to free the side walls from the inside surface of the top panel, in order that the side walls may be unfolded or opened to their distended condition.

For the purpose of breaking any such bonds as may exist in the collapsed carton, the feed plate 32 is provided near its opposite sides with wedge-shaped elements 46 secured to the underside of the plate as shown in Figs. 1, 3 and 6. By examination of Fig. 6, it will be understood that the wedges 46, together with the leading end portion of the feed plate 32 are operative to enter between the forward side wall portion 27 and the top panel 26 of the cover, to pry the same apart as an incident to the feeding of the lowermost cover member from the bottom of the stack thereof, to mechanism for unfolding the cover and applying it to a box. By inspection of Fig. 7, it will be understood that the front wall 27 of the lowermost box in the stack usually sags downwardly to the extent permitted by the end supports 33, so that the leading end portion of the feed plate 32 will readily enter between the leading side wall 27 and the top panel 26 of the cover. It should be understood that the sagging of the front wall 27 is the result not only of its weight, but also of the normal resiliency of the paper board from which the covers are made, such resiliency tending to effect unfolding or opening of the cover. It will also be understood that such sagging or preliminary opening occurs from end to end of the cover member, and that it is fairly uniform throughout the central part of the side wall, but that at the ends thereof, there is an inclined portion extending from the central portion to the supported end wall portions of the cover. To insure entrance of the leading edge of the feed plate 32 into the space between the front wall 27 and panel 26, the leading edge of the feed plate is convexly arched, approximately as indicated at 47 in Fig. 3.

To effect similar breaking of any bond between the rear wall 27 and the top panel of the cover, there is provided a pair of arms 48 mounted on a rock shaft 49 which is suitably journaled in bearings carried by the frame of the apparatus. The upper end of each arm 48 is provided with a pointed, hook-like extension 50, which, when the arm is properly rocked, will enter between the rear wall 27 and the top panel 26 of the lowermost cover member, to break any existing bond therebetween. (See Fig. 9.) The rock shaft 49 and the bond-breaking arms 48 are actuated just prior to the feed movement of the feed plate 32, and said arms 48 are, of course, retracted to the position illustrated in Fig. 6 in time to permit the operation of the feed plate 32.

The rock shaft 49 and its arms 48 are actuated by means of a cam 51 (see Fig. 8) which is secured to the cam shaft 41. The cam 51 acts against a cam follower 52 carried by a lever or arm 53 pivoted at one end as indicated at 54 to a frame-supported bracket member, and it has its other end pivotally connected to the lower end of a rod or link 55, the other end of which is connected to an arm 56, which is secured to the rock shaft 49. A spring 57 stretched between a portion of the arm 53, and a part of the main frame serves to resist movement of the arm 53

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by the cam 51, and maintains the cam follower 52 in operative engagement with the cam.

After the bond-breaking arms 48 have been operated and retracted, the feed plate 32 moves forwardly. Because of the support supplied by the forward end portion of the feed plate 32 for the rear side wall 27 of the cover, said rear side wall will be substantially restored to its parallel relation to the top wall 26, substantially as shown in Fig. 6, as soon as the spreader, or bond-breaking finger 50 has been retracted. Thus, the fact that said rear wall portion 27 was temporarily offset downwardly does not interfere with the proper operation of the feed plate 32.

As shown in Fig. 7, the feed plate 32 is in its most advanced position wherein it has delivered a collapsed box cover into the zone of operation of mechanism which opens the collapsed cover and applies it to a package. To prevent the cover from following the feed plate back towards the stack of covers when the feed plate returns to its initial position, there is provided a pair of stationary arms 58 (see Figs. 3 and 6) which have end portions secured as indicated at 59, to the cover stack supporting angle bars 31. The free end portions of the arms 58 are recessed as indicated at 60, so as to provide front and rear shoulders 61 and 62 respectively, which extend downwardly to approximately the plane of the lower surface of the feed plate 32, as best shown in Fig. 7. The lower edge portion of each arm 58, which leads to the lower end of the rear shoulder 62, is inclined as indicated at 63 in such a manner that the end portions of the collapsed carton will be deflected downwardly below the lowermost edge portion of the member 58, until the cover passes the shoulder 62. Thereupon, the normal resiliency of the cover structure causes the end portions to again spring upwardly so that further movement of the collapsed cover would be stopped by engagement with either the front or the rear shoulders 61 or 62. Thus, when the feed plate 32 is retracted, the shoulder 62 will be operative to strip the cover from the feed plate to thereby leave the cover in the zone of operation of the mechanism about to be described.

When the feed plate 32 is retracted, the collapsed cover will drop downwardly a short distance, and come to rest on angularly disposed shoulders or seats 64—64 formed on the upper ends of pairs of plate-like arms 65 and 66 respectively. (See Figs. 2, 3 and 6.) At about the same time, a horizontal plate 67 is moved downwardly into engagement with the top panel of the cover to control upward displacement of the same, incident to the succeeding operations which open, or distend the cover.

The top plate 67 is carried by a vertically disposed rod 68, which is vertically, slidably mounted in a suitable bearing 69 (see Figs. 2 and 3), which is carried by arms secured to and supported by upstanding cover stack supporting angles 31.

Vertical movement of the plate 67 and rod 68 are controlled by a cam 70 (see Fig. 4) carried by the cam shaft 41. The cam 70 acts against a cam follower carried by an arm 71, which is pivoted at one end on frame-supported pivot shaft 54, and the other end of said arm is connected by means of a short link 72 to an attaching block 73, which is secured to a vertically, slidably mounted rod 74. The rod 74 is slidably supported in appropriate bearings carried by the frame structure, and the upper end of said

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rod 74 is rigidly connected by means of a cross arm 75 to the upper end of the plate rod 68 (see Fig. 2). The weight of the rod 74 and parts connected thereby, is adequate to maintain the cam follower in operative engagement with the cam 70, but, if desired, a spring or equivalent means may be provided to insure downward movement of the parts. The cam 70 is appropriately shaped to permit downward movement of the top plate 67, and to cause upward movement thereof, in accordance with the requirements of downward and upward movement of the cover during the various operations affecting the same.

At about the time that the collapsed cover is deposited on the upper end seats 64 of the pairs of arms 65 and 66, or immediately thereafter, a pair of rock arms 76 and 77 respectively disposed in longitudinal alignment with the pointed ends of the collapsed cover, are actuated to press inwardly on said pointed ends, to thereby exert a force which tends to unfold, or distend, the cover. The rock arms 76 and 77 (see Figs. 3 and 5) are respectively secured to rock shafts 78 and 79 which are suitably journaled in bearings formed in frame-supported brackets 80 and 81 respectively. Suitable torsion springs 82 are associated with the rock shafts 78 and 79, and with the rock arms 76 and 77, so as to normally urge the rock arms to move outwardly to the position illustrated in full lines in Fig. 5.

The upper ends of the rock arms 76 and 77 have secured thereto short upstanding angle members 83, which are adapted to engage the pointed ends 28 of the collapsed cover. Such engagement is effected by rocking the arms 76 and 77 inwardly from the position illustrated in full lines in Fig. 5, to approximately the position shown in dotted lines in that figure. As also indicated in Fig. 5, the cover is distended, or opened, to a substantial extent, so that the vertical depth of the cover is increased from the depth of the collapsed cover as initially deposited on the seats 64 of the arm pairs 65 and 66. The inward movement of the rock arms 76 and 77 may conveniently be effected by a cam 104, carried by the cam shaft 41 and acting against a follower carried by one end of a rock arm 105. The rock arm 105 is pivotally mounted intermediate its ends, as shown at 106 (see Fig. 4) on a suitable frame-supported bar or bracket, and the other end of the arm 105 is pivotally connected to the lower end of a link 107, which extends upwardly, and is pivotally connected as shown at 108 (Fig. 5) to an arm 109, which is secured to the rock shaft 79. A spring 110 connected between a part of the rock lever 105 and the supporting frame, serves in cooperation with the torsion springs 82, to normally urge the rock arms 76 and 77 to move outwardly and to maintain the cam follower in operative engagement with the cam 104.

The rocking movement thus imparted to the rock shaft 79 and rock arm 77 is transmitted to the rock shaft 78 and rock arm 76 by means of a link 111 connected at its ends to the free ends of arms 112 and 113, which are respectively secured to and extend laterally from the rock shafts 79 and 78. As best shown in Fig. 5, the rock arm 112 extends upwardly from its rock shaft 79, and the rock arm 113 extends downwardly from its rock shaft 78, so that the rocking movement of the shaft 79, transmitted to the shaft 78, will be in the opposite direction.

The unfolding, or opening, of the cover is assisted by means of a pair of pivoted plates or

spades 84 and 85, which are in the form of horizontally elongated sheet metal plates. Said spades or plates 84 and 85 are pivotally supported by being attached near their lower ends to transversely extending bars 86 and 87 respectively which, in this instance, are illustrated as being of substantially square cross-section. The bars 86 and 87 are respectively provided at their outer ends with cylindrical bearing portions which are rockable and mounted in appropriate bearings provided in the frame-supported brackets 80 and 81, as best shown in Fig. 5. The bars 86 and 87, and their respective plates 84 and 85 are simultaneously rocked oppositely or outwardly so as to cause the upper ends of the said plates 84 and 85 to enter between the lowermost edges of the cover side walls 27—27 to thereby effect unfolding thereof.

By reference to Fig. 6, it will be understood that when the cover is partially unfolded, or distended by the action of the end pressing members 83, the upper ends of the plates 84 and 85 will be disposed within the partially unfolded side walls 27 of the cover so that the outward rocking movement of said plates will cause the plates to engage the inside of the said walls, and to effect the further opening thereof, as already indicated.

The rocking movement of the bars 86 and 87, and of their respective plates 84 and 85 may conveniently be effected in properly synchronized operation with the other parts of the mechanism by means of a cam 88, carried by the cam shaft 41. Said cam 88 acts against a cam follower carried by one end of a lever 89, pivoted intermediate its ends, as indicated at 90, on a bracket carried by the frame of the apparatus. The other end of said arm 89 is pivotally connected to an upwardly extending link or rod 91, the upper end of which is pivoted, as indicated at 92, to the lower end of a rod 93 (see Figs. 1 and 2). The rod 93 is vertically slidably mounted in suitable bearing openings provided in the frame-supported bracket 80, and the upper end of said rod 93 is provided with a cross-head 94, which is equipped with oppositely facing bifurcations or spaced arms. (See Fig. 6.) The oppositely facing bifurcations of the cross-head 94 embrace rollers or pins 95 and 96, which are carried by the free ends of arms 97 and 98 respectively, which are secured at their other ends to the transverse rock shafts or rods 86 and 87. Thus, it will be seen that the vertical movement of the shaft, or rod 93 upwardly will rock the spreader plates or spades 84 and 85 in opposite directions, to serve the purpose above set forth. Similarly, at the proper time, downward movement of the rod 93 retracts or restores the plates 84 and 85 to their initial position. The downward movement of the rod 93 may conveniently be affected by a tension spring 99, connected between a part of the lever 89 and part of the frame, as best shown in Figs. 2 and 4. The cam 88 is, of course, so shaped as to effect and control the movement of the actuating rod 93, in accordance with the requirements and purposes of the mechanism actuated thereby.

The fully opened or spread position of the cover opening plates 84 and 85 is illustrated in Fig. 9. By reference to that figure, it will be seen that when the plates 84 and 85 are in their fully opened position, the side walls 27—27 of the cover are distended slightly beyond their normal vertical position, relative to the top panel 26. In the drawing, the excess distension is, of course,

somewhat exaggerated for illustrative purposes. The lower edges of the cover walls 27 rest on plates 100 and 101 respectively, carried by the arm pairs 65 and 66, and it will be observed that the plates 84—85 constitute, in effect, a funnel through which a filled box may be inserted into the distended cover. Such insertion of a filled box is further facilitated by providing end flanges 102 and 103 on the ends of the plates 84 and 85 respectively, the same being formed integral with, or otherwise rigidly secured to the ends of the respective plates 84 and 85. The said end flanges 102 and 103 are also preferably angularly disposed so as to converge slightly from their lower ends to their upper ends, as best shown in Figs. 2 and 5; the said end flanges 102 and 103 are thereby made effective to guide the filled box into the distended cover, even though the filled box may be initially slightly offset longitudinally, with respect to the position of the cover.

A filled box 20 is delivered into a position of vertical alignment with the distended cover by means of the conveyor 30. Initially, the leading filled box 20 is delivered by the conveyor 30 against a fixed stop 114 (see Fig. 11), which is carried by a suitable frame part or bracket. When the filled box is disposed against the stop 114, it is supported by a pair of vertically movable platforms 115, which are then in a lowered position, as illustrated in dotted lines. The platforms 115 are respectively disposed at opposite sides of the conveyor belt 30 (see Fig. 2) and they are secured to the upper ends of a pair of rods 116—116, which are vertically, slidably mounted in suitable bearings 117, carried by the frame of the apparatus. Suitable mechanism is provided for effecting vertical movement of the rods and platforms.

When the plates or spades 84 and 85 approach their nearly vertical position, as shown in Figs. 9 and 11, the platforms or elevators 115 begin their upward movement to thereby elevate the filled box 20, and to pass it between the funnel-forming plates 84 and 85, and into the distended cover. During the upward movement of the elevators 115, the other filled boxes 20 on the conveyor belt 30 are held against forward movement by means of a stop plate 118, which depends from the elevators 115, and is secured at its lower end to an intermediate portion of the rod 116. Return, or downward movement of the elevators 115 is, of course, effected before the funnel-forming plates 84 and 85 begin their return movement, so that the elevators 115 will readily pass between the said plates.

Vertical upward movement is imparted to the elevators 115 by means of a cam 119 secured to the cam shaft 41 and acting against a follower 120, which is carried by a lever 121, intermediate its ends. The lever 121 is pivotally mounted at one end on the pivot shaft 54 (see Fig. 4), and the other end of said lever is connected by means of a link 122 to a cross-arm 123, which is suitably clamped or secured to the elevator rods 115. A tension spring 124, stretched between a portion of the lever 121 and a conveniently accessible frame part, serves to effect downward movement of the elevator, to maintain the cam follower 120 in operative engagement with the periphery of the cam 119.

Upward movement of the elevators 115 is continued to such an extent that the filled box is not only inserted into the distended cover, but is also fed upwardly to a position above the upper ends of the funnel plates 84 and 85, substantially

as shown in Fig. 11. In that position, the filled and covered box is supported just slightly above a conveyor or chute 125, to which the package is delivered from the elevators.

In some instances, it may be practicable to rely upon the upward movement of the package by the elevators 115 to strip the cover from the upper marginal portions of the spades or plates 84 and 85. However, where the cover is made a fairly snug fit over the received portion of the box, there may be a strong tendency to tear the cover, especially at its corners, if the filled box were fully inserted into the cover while the cover remains in position over the upper marginal portions of the plates 84 and 85. In order to avoid such a tendency to tear the cover, the cover supporting plates 100 and 101 are moved vertically upwardly in unison with the filled box to strip the cover from the plates 84 and 85 before the filled box is completely inserted into the cover. In one embodiment of the invention, the cover stripping movement of the stripping plates 100 and 101 is initiated when the filled box has been elevated and inserted to the extent of about $\frac{3}{8}$ " into the cover. The upward movement imparted to the strippers 100 and 101 is sufficient to elevate the cover substantially in unison with the upward movement of the filled box, after the filled box has first been introduced into the cover to the extent already indicated.

After the strippers 100 and 101 have effected removal of the cover from the upper end portions of the plates 84 and 85, the upward movement of the filled box is, of course, continued to complete the insertion of the filled box. The top plate 67 is, of course, actuated during the operations just mentioned, so as to co-operate with the strippers 100 and 101 and the elevators 115.

To permit the relative movement of the stripper plates 100 and 101, and the funnel-forming plates 84 and 85, required by the above described stripping operation, the said stripper plates and their supporting members 65 and 66 are secured to the rock shafts or bars 86 and 87, for vertical adjustment relative thereto.

By reference to Figs. 5, 9 and 10, it will be seen that the mounting plates 65 and 66 are secured at their lower ends to square bars or rods 126 and 127 respectively, and that the said bars or rods 126 and 127 are vertically slidably mounted on respectively adjacent rock shafts 86 and 87, through the agency of pairs of pins 128. The pins 128 are respectively rigidly secured to the bars 126 and 127, near their ends, and project downwardly therefrom through suitable holes provided in the rock shafts 86 and 87. At their ends, the bars 126 and 127 are provided with upstanding and laterally outwardly extending ears 129—129, and tension springs 130—130 are connected between the laterally extending portions of said ears 129 and the respective rock shafts 86 and 87, to normally hold the bars 126 and 127 in lowered position in which they are seated on rock shafts 86 and 87, as shown in Fig. 9. The upward movement of the respective bars 126 and 127, and the stripper plates 100 and 101, is effected in synchronized relation to the other movements of the various parts by means of pivoted arms, such as indicated at 131 and 132 (Fig. 5). The arm 131 is pivotally mounted as indicated at 133 on a short shaft journaled in a bearing provided in the frame bracket 89, and the arm 132 is similarly pivotally mounted on a short shaft 134, which is journaled in a suitable bearing opening provided in the frame bracket

81. The pivoted arms 131 and 132 are caused to move simultaneously by means of an inter-connecting link 135, one end of which is pivoted to one end of an arm 136, which depends from the pivot shaft 133, and the other end of which link is pivoted to an arm 136, which is secured to, and extends upwardly from the other pivot shaft 134.

Movement is imparted to the inter-connected arms 131 and 132 by means of a cam 137, carried by the cam shaft 41 (see Figs. 2 and 4). Said cam 137 acts against a follower 138, carried by a lever 139 pivotally mounted intermediate its ends, as indicated at 140. The other end of said lever 139 is pivoted to the lower end of an upwardly extending link 141, the upper end of which is pivoted to a rod 142. The rod 142 is vertically slidably mounted in suitable bearings provided in the frame bracket 81 (see Figs. 2 and 5). The upper end of the rod 142 is provided with an enlarged head 143, a portion of which overlies a part of a short lever 144, which extends from and is secured to the pivot shaft 134 (see also Fig. 3). A spring 145 stretched between a part of the lever 139 and a conveniently accessible part of the frame serves to yieldingly urge the link 141 and rod 142 to move upwardly, and to maintain the cam follower 138 in engagement with the periphery of the cam 137.

When the cam 137 effects downward movement of the link 141 and rod 142, the arm 144 is, of course, rocked downwardly, thereby rocking the arm 132 upwardly, and through the link connection 135, the arm 131 upwardly. The extent of rocking movement thus imparted to the arms 131 and 132 is such that the outer end portions of the arms 131 and 132 will engage the adjacent ends of the pins 128, and move the same upwardly through the rock shaft 87, thereby effecting the described upward movement of the stripper plates 100 and 101. The cam 137 is, of course, so formed and so timed with reference to the other mechanisms as to effect the stripping operation in the desired synchronized relation to the operation of the package elevator structure, and other operating parts. The spring 145 will, of course, serve to return the rod 142 to its upward limited movement, so as to thereby permit the springs 130, and the weight of the parts, to effect return, or downward movement of the stripper mechanism.

Feeding of the completed package from its elevated position, as shown in Fig. 11, to the chute 125, is effected by a pusher 146. The pusher 146 is carried by the upper end of an arm 147, which is one arm of a bell crank lever pivoted as indicated at 148 on a bracket extending upwardly from a part of the frame. The other arm 149 of said bell crank is pivotally connected as shown at 150 to the upper end of a link 151, the lower end of which is pivotally connected to one end of an arm 152 (see Figs. 1 and 4). The other end of said arm 152 is pivoted, as indicated at 153, on a suitable frame-supported bracket and intermediate its ends, said arm 152 being provided with a cam follower 154 which engages the periphery of a cam 155 secured to the cam shaft 41. A spring 156 stretched between an intermediate portion of the link 151 and a conveniently accessible frame part, serves to normally urge the link 151 to move downwardly and to thereby maintain the cam follower 154 in engagement with the periphery of its operating cam 155. It will be seen that rocking movement of the bell crank levers 147 and 149 in a clock-wise direction, as seen in Fig. 1, effected

by the described cam mechanism, will be operative to move the pusher 146 to the right, to thereby feed the completed package from the elevators 115 to the chute 125.

The apparatus above described may be associated with other apparatus which sets up the box and delivers the same to mechanism which fills the box with the desired product and from which filling mechanism the filled boxes are delivered by the conveyor 30 to the described cover-applying mechanism. The conveyor 30 may be an extension of a conveyor forming a part of the box filling apparatus, or it may be a separate conveyor which receives the filled boxes from the filling mechanism. In this instance, the conveyor 30 is illustrated (see Fig. 1) as being a continuation or extension of the filling machine conveyor. It is accordingly operated in synchronized relation to the filling mechanism, and it may be driven by suitable driving connection to the motor 44 of the cover-applying mechanism. As shown in Fig. 1, the conveyor 30 is driven by a chain drive 157 from the motor 44. The described cover-applying mechanism is completely automatic in its operation, and does not require more than normal machine maintenance attention in order to keep it in proper and efficient operating condition. The mechanism is of relatively simple character, involves no highly critical adjustments, and is correspondingly durable and efficient in operation.

Changes in the details of construction may be made without departing from the principles of the invention, as set forth in the following claims.

I claim:

1. Apparatus of the class described, comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls folded to collapsed position under and substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to distended tray-forming position, stack supporting means underlying the forward portion of the stack of trays and spaced downwardly from the normal plane of the bottom thereof so as to permit the forward side wall of the lowermost tray to spring to a partially unfolded position, a forwardly and rearwardly movable feeder for ejecting the lowermost tray from the stack, and means for reciprocating said feeder, said feeder being operative in such a plane that when moved forwardly, it will advance under the rearward portion of the stack and enter the lowermost tray between its main panel and partially unfolded side wall so as to engage the tray in the corner between said panel and partially unfolded side wall to thereby eject the tray from the stack.

2. Apparatus of the class described, comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls folded to collapsed position under and substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to distended tray-forming position, stack supporting means underlying the forward portion of the stack of trays and spaced downwardly from the normal plane of the bottom thereof so as to permit the forward side wall of the lowermost tray to spring to a partially unfolded position, a forwardly and rearwardly movable feeder for ejecting the lowermost tray from the stack, and means for reciprocating said feeder, said feeder underlying the stack and serving, when in retracted position, to support the rearward portion of the stack and being operative, upon forward movement, to enter the lowermost tray

between its main panel and partially unfolded side wall so as to engage the tray in the corner between said panel and partially unfolded side wall to thereby eject the tray from the stack.

3. Apparatus of the class described, comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls folded to collapsed position under and substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to distended tray-forming position, stack supporting means underlying the forward portion of the stack of trays and spaced downwardly from the normal plane of the bottom thereof so as to permit the forward side wall of the lowermost tray to spring to a partially unfolded position, a forwardly and rearwardly movable feeder for ejecting the lowermost tray from the stack, means for reciprocating said feeder, said feeder being operative in such a plane that when moved forwardly, it will advance under the rearward portion of the stack and enter the lowermost tray between its main panel and partially unfolded side wall so as to engage the tray in the corner between said panel and partially unfolded side wall, to thereby eject the tray from the stack and fixed means for receiving said ejected tray and stripping the same from said feeder upon rearward movement thereof.

4. Apparatus of the class described, comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls folded to collapsed position under and substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to distended tray-forming position, stack supporting means underlying the forward portion of the stack of trays and spaced downwardly from the normal plane of the bottom thereof so as to permit the forward side wall of the lowermost tray to spring to a partially unfolded position, a forwardly and rearwardly movable feeder for ejecting the lowermost tray from the stack, means for reciprocating said feeder, said feeder being operative in such a plane that when moved forwardly, it will advance under the rearward portion of the stack and enter the lowermost tray between its main panel and partially unfolded side wall so as to engage the tray in the corner between said panel and partially unfolded side wall to thereby eject the tray from the stack, and fixed means for receiving said ejected tray and stripping the same from said feeder upon rearward movement thereof, said receiving and stripping means comprising an element having a cam surface for camming a portion of the tray from its normal path of movement, and a shoulder beyond said cam surface for engaging the rearward edge of the tray when advanced past said element and restored to its normal plane of movement.

5. Apparatus of the class described, comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls folded to collapsed position under and substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to distended tray-forming position, stack supporting means underlying the forward portion of the stack of trays and spaced downwardly from the normal plane of the bottom thereof so as to permit the forward side wall of the lowermost tray to spring to a partially unfolded position, a forwardly and rear-

wardly movable feeder for ejecting the lowermost tray from the stack, means for reciprocating said feeder, said feeder being operative in such a plane that when moved forwardly, it will advance under the rearward portion of the stack and enter the lowermost tray between its main panel and partially unfolded side wall so as to engage the tray in the corner between said panel and partially unfolded side wall to thereby eject the tray from the stack, and means carried by said feeder for effecting further unfolding movement of the forward side wall as an incident to the tray feeding operation.

6. Apparatus of the class described, comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls folded to collapsed position under and substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to distended tray-forming position, means for effecting such unfolding of the collapsed tray, means for feeding the lowermost tray from said stack to said unfolding means, and means acting on the lowermost tray in the stack for effecting a preliminary partial unfolding movement of one of its side walls for facilitating the operation of said unfolding means.

7. Apparatus of the class described, comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls folded to collapsed position under and substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to distended tray-forming position, means for effecting such unfolding of the collapsed trays, means for feeding the lowermost tray of the stack from said stack to said unfolding means, and means for effecting a preliminary partial unfolding movement of the side walls of the tray before it is delivered to said unfolding means.

8. Apparatus of the class described, comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls folded to collapsed position under and substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to distended tray-forming position, means for unfolding said trays, means for feeding the lowermost tray in the stack to said unfolding means, and means operative on the lowermost tray in the stack before feeding the same to said unfolding means for effecting preliminary unfolding of the rearward side wall, said preliminary unfolding means comprising a pivoted arm having a laterally extending end portion adapted to enter between the rear side wall and main panel to effect said preliminary unfolding operation, and means for rocking said arm so as to cause said laterally extending end portion to enter the lowermost tray as aforesaid.

9. Apparatus of the class described, comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls folded to collapsed position substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to distended tray-forming position, means for unfolding said trays, and means for feeding the trays successively from said holder to said unfolding means, said unfolding means comprising means for receiving the trays from said holder in such a manner as to permit the side walls to spring to a partially opened position as

an incident to the inherent resiliency of the paper board, a pair of pivotally mounted plates adapted to enter between said partially unfolded side walls, said plates being pivoted for rocking movement respectively in opposite directions about axes disposed substantially parallel with the fold line connections between said main panel and said partially unfolded walls, and means for rocking said plates to complete the unfolding of said side walls.

10. Apparatus of the class described comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls foldably connected to said main panel and having their adjacent ends foldably inter-connected, the side walls being folded inwardly of said panel, and the end walls being folded outwardly therefrom and refolded upon themselves as an incident to their connection to the ends of said side walls and the inward folding thereof, means for unfolding said trays, and means for feeding said trays to said unfolding means, said unfolding means comprising members engageable with, and movable inwardly of the folded end walls of the tray to effect inward unfolding movement thereof, plates pivotally mounted for rocking movement about axes substantially parallel to the fold line connecting the side walls of the tray to the main panel thereof, said plates being respectively adapted to enter between the inwardly folded side walls and to move outwardly thereof in opposite directions so as to effect unfolding of said side walls, and means for effecting said movement of said pivoted plates.

11. Apparatus of the class described comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls foldably connected to said main panel and having their adjacent ends foldably inter-connected, the side walls being folded inwardly of said panel, and the end walls being folded outwardly therefrom and refolded upon themselves as an incident to their connection to the ends of said side walls and the inward folding thereof, means for unfolding said trays, and means for feeding said trays to said unfolding means, said unfolding means comprising members movable inwardly of the tray and the said folded end walls to effect inward unfolding movement thereof, thereby to also effect partial unfolding of said side walls, a pair of pivotally mounted plates adapted to enter between the partially unfolded side walls and to move outwardly so as to effect further unfolding of said side walls, said plates being pivoted for said movement about axes which are substantially parallel with the fold line connections between the respective side walls and said main panel, means for effecting said outward movement of said pivoted plates, and means carried by said plates for engaging the free edges of said side walls to limit the extent to which said plates enter the tray.

12. Apparatus of the class described comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls foldably connected to said main panel and having their adjacent ends foldably inter-connected, the side walls being folded inwardly of said panel, and the end walls being folded outwardly therefrom and refolded upon themselves as an incident to their connection to the ends of said side walls and the inward folding

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thereof, means for unfolding said trays, and means for feeding said trays to said unfolding means, said unfolding means comprising members movable inwardly of the tray and engageable with said folded end walls to effect inward unfolding movement thereof, thereby to also effect partial unfolding of said side walls, a pair of pivotally mounted plates adapted to enter between the partially unfolded side walls and to move outwardly so as to effect further unfolding of said side walls, means for effecting said outward movement of said pivoted plates, means for moving a box between said plates and into the unfolded tray and for effecting unitary movement of said box and tray to a position clear of said unfolding means, and means for discharging said covered box from said cleared position.

13. Apparatus of the class described comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls foldably connected to said main panel and having their adjacent ends foldably inter-connected, the side walls being folded inwardly of said panel, and the end walls being folded outwardly therefrom and refolded upon themselves as an incident to their connection to the ends of said side walls and the inward folding thereof, means for unfolding said trays, and means for feeding said trays to said unfolding means, said unfolding means comprising members movable inwardly of the tray and engageable with said folded end walls to effect inward unfolding movement thereof, thereby to also effect partial unfolding of said side walls, a pair of pivotally mounted plates adapted to enter between the partially unfolded side walls and to move outwardly so as to effect further unfolding of said side walls, means for effecting said outward movement of said pivoted plates, means for feeding a box between said pivoted plates and into the tray unfolded thereby, and means for stripping the tray from said pivoted plates during a portion of the movement of the box into the tray.

14. Apparatus of the class described comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls foldably connected to said main panel and having their adjacent ends foldably inter-connected, the side walls being folded inwardly of said panel, and the end walls being folded outwardly therefrom and refolded upon themselves as an incident to their connection to the ends of said side walls and the inward folding thereof, means for unfolding said trays, and means for feeding said trays to said unfolding means, said unfolding means comprising members movable inwardly of the tray and engageable with said folded end walls to effect inward unfolding movement thereof, thereby to also effect partial unfolding of said side walls, a pair of pivotally mounted plates adapted to enter between the partially unfolded side walls and to move outwardly so as to effect further unfolding of said side walls, means for effecting said outward movement of said pivoted plates, means for feeding a box between said pivoted plates and into the tray unfolded thereby, means for stripping the tray from said pivoted plates during a portion of the movement of the box into the tray, said stripping means comprising strippers mounted on said pivoted plates for movement toward the ends thereof which enter the tray, and means

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for effecting stripping movement of said strippers after the box has partially entered the tray and before the box is fully inserted into said tray.

15. Apparatus of the class described comprising a holder for a stack of collapsed paper board trays, each of said trays embodying a main panel and side and end walls foldably connected to said main panel and having their adjacent ends foldably inter-connected, the side walls being folded inwardly of said panel, and the end walls being folded outwardly therefrom and refolded upon themselves as an incident to their connection to the ends of said side walls and the inward folding thereof, means for unfolding said trays, and means for feeding said trays to said unfolding means, said unfolding means comprising members movable inwardly of the tray and engageable with said folded end walls to effect inward unfolding movement thereof, thereby to also effect partial unfolding of said side walls, a pair of pivotally mounted plates adapted to enter between the partially unfolded side walls and to move outwardly so as to effect further unfolding of said side walls, means for effecting said outward movement of said pivoted plates, means for feeding a box between said pivoted plates and into the tray unfolded thereby, means for stripping the tray from said pivoted plates during a portion of the movement of the box into the tray, strippers respectively associated with said plates and mounted for movement toward and from the ends of the plates which enter the tray, said strippers being adapted to engage the free edges of the tray sides unfolded by said pivoted plates, and means for effecting stripping movement of said strippers relative to said plates before the box is fully inserted into the tray but after partial insertion has been effected.

16. Apparatus of the class described, comprising a holder for a stack of collapsed paperboard trays, each of said trays embodying a main panel and side and end walls folded to collapsed position under and substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to downwardly extending tray-forming position relative to said main panel, means for unfolding said side and end walls, and means for feeding the folded trays successively from said holder to said unfolding means, said unfolding means comprising a pair of members for effecting downward and inward unfolding movement of the end walls of the tray, and a pair of members for effecting downward and outward unfolding movement of the side walls of the tray, said end unfolding members being disposed outwardly of the area of the tray when unfolded, and said side unfolding members being plate-like members engageable with the inner faces of said side walls and having smooth, unobstructed inside surfaces constituting, when the tray walls are unfolded, funnel-like means through which a package may be guided upwardly into the tray, and means for propelling a package upwardly through said funnel-like means and into the distended tray.

17. Apparatus of the class described, comprising a holder for a stack of collapsed paperboard trays, each of said trays embodying a main panel and side and end walls folded to collapsed position under and substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to downwardly extending tray-forming position relative to said main panel,

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means for unfolding said side and end walls, and means for feeding the folded trays successively from said holder to said unfolding means, said unfolding means comprising a pair of members for effecting downward and inward unfolding movement of the end walls of the tray, and a pair of members for effecting downward and outward unfolding movement of the side walls of the tray, said end unfolding members being disposed outwardly of the area of the tray when unfolded, and said side unfolding members being plate-like members engageable with the inner faces of said side walls and having smooth, unobstructed inside surfaces constituting, when the tray walls are unfolded, funnel-like means through which a package may be guided upwardly into the tray, and means for propelling a package upwardly through said funnel-like means and into the distended tray, said plate-like members having laterally extending end flanges formed to constitute funnel-like means at the ends of the tray to guide the package at its ends inside the ends of the tray.

18. Apparatus of the class described, comprising a holder for a stack of collapsed paperboard trays, each of said trays embodying a main panel and side and end walls folded to collapsed position substantially parallel to the plane of said main panel, said side and end walls being adapted to be unfolded to laterally extending tray-forming position relative to said main panel, means

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for unfolding said side and end walls, and means for feeding the folded trays successively from said holder to said unfolding means, said unfolding means comprising a pair of members for effecting inward unfolding movement of the end walls of the tray, and a pair of members for effecting outward unfolding movement of the side walls of the tray, said end unfolding members being disposed outwardly of the area of the tray when unfolded, and said side unfolding members being plate-like members engageable with the inner faces of said side walls and having smooth, unobstructed inside surfaces constituting, when the tray walls are unfolded, funnel-like means through which a package may be guided into the tray.

WILLIAM F. LINSTEDT.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,784,571	Bergstein	Dec. 9, 1930
1,868,873	Bergstein	July 26, 1932

FOREIGN PATENTS

Number	Country	Date
475,516	Germany	Apr. 26, 1929
640,895	France	Apr. 7, 1928

Certificate of Correction

Patent No. 2,433,701.

December 30, 1947.

WILLIAM F. LINSTEDT

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Column 14, line 49, after the words "the tray and" insert *engageable with*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of April, A. D. 1948.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.