

Feb. 15, 1938.

C. G. HAYES

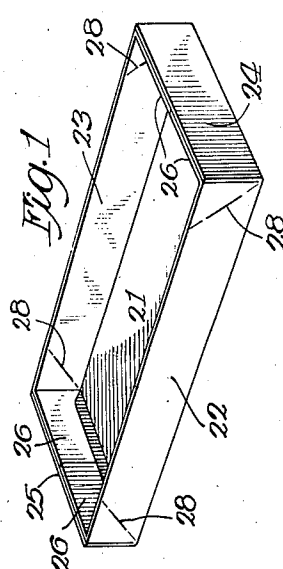
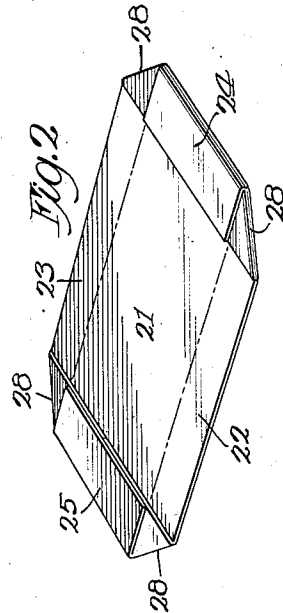
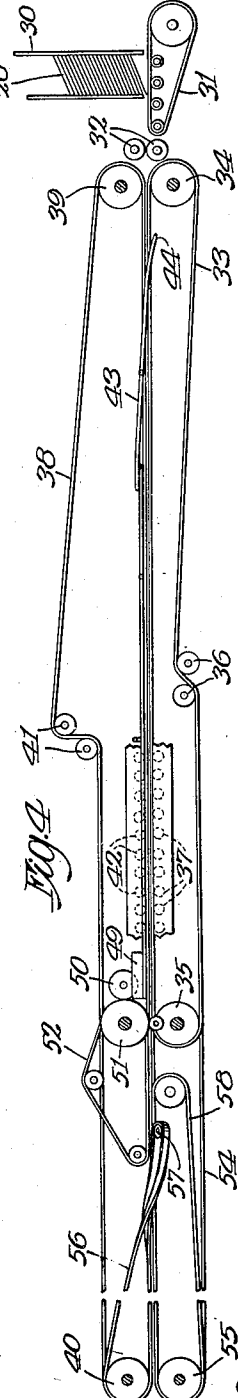
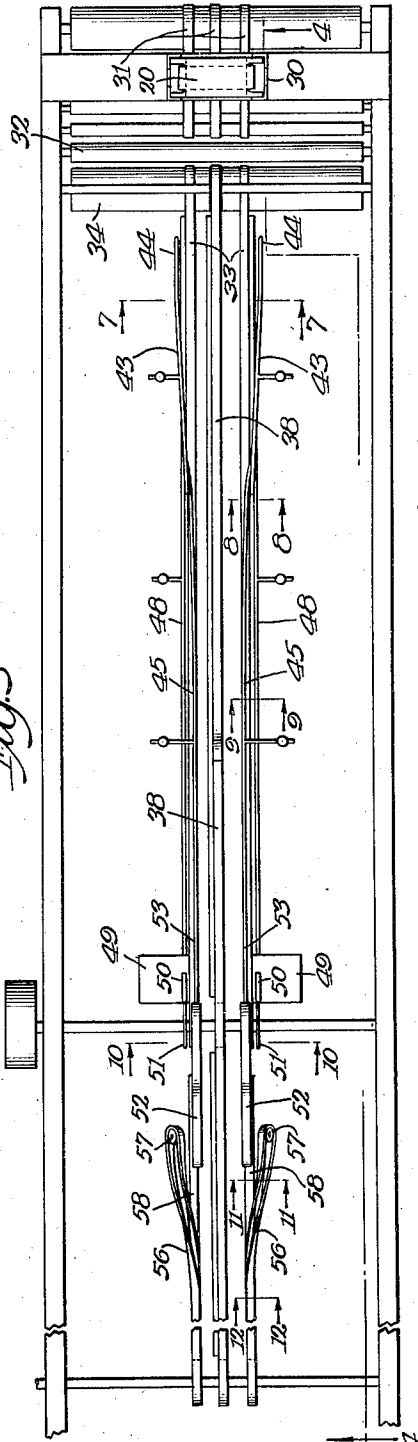
2,108,334

BOX MAKING APPARATUS

Filed June 23, 1936

4 Sheets-Sheet 1

FIG. 3



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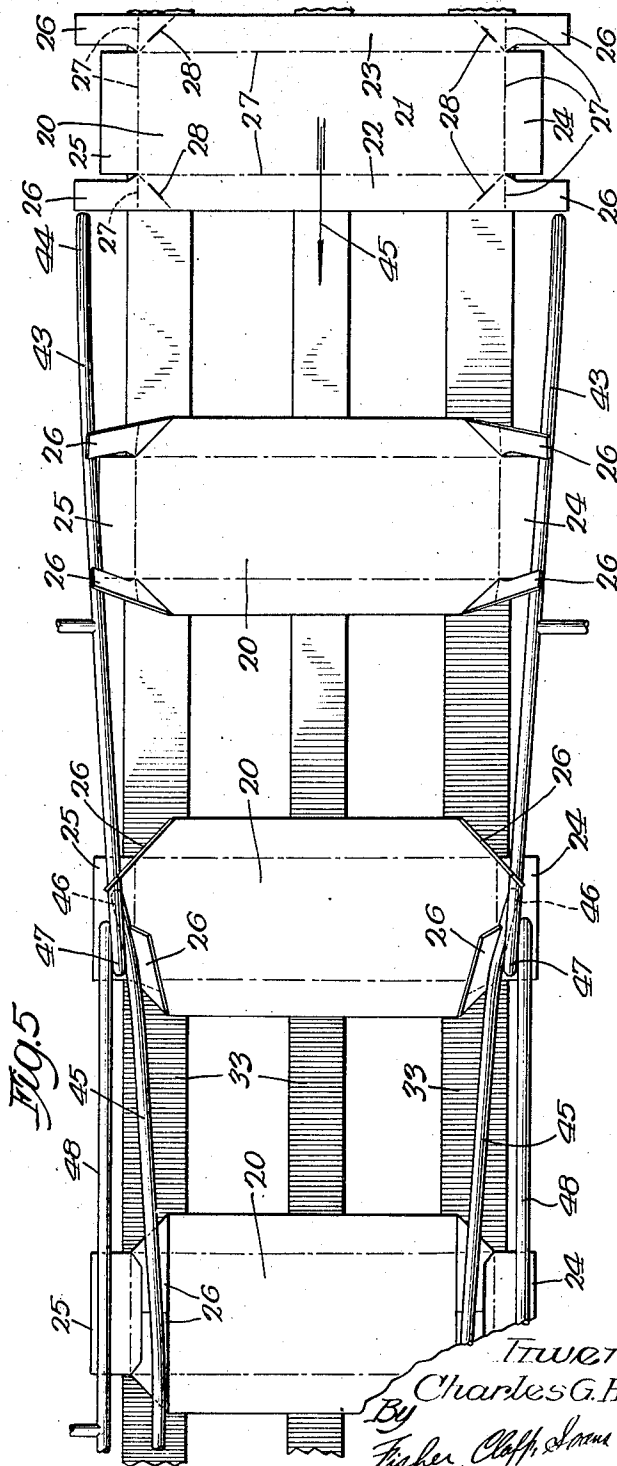
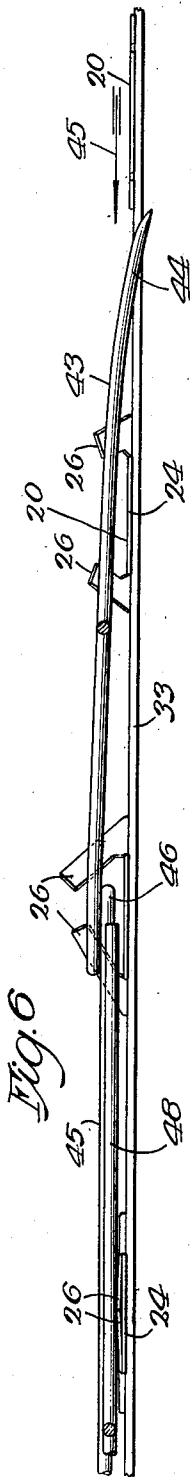
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BOX MAKING APPARATUS

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4 Sheets-Sheet 2



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BOX MAKING APPARATUS

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4 Sheets-Sheet 3

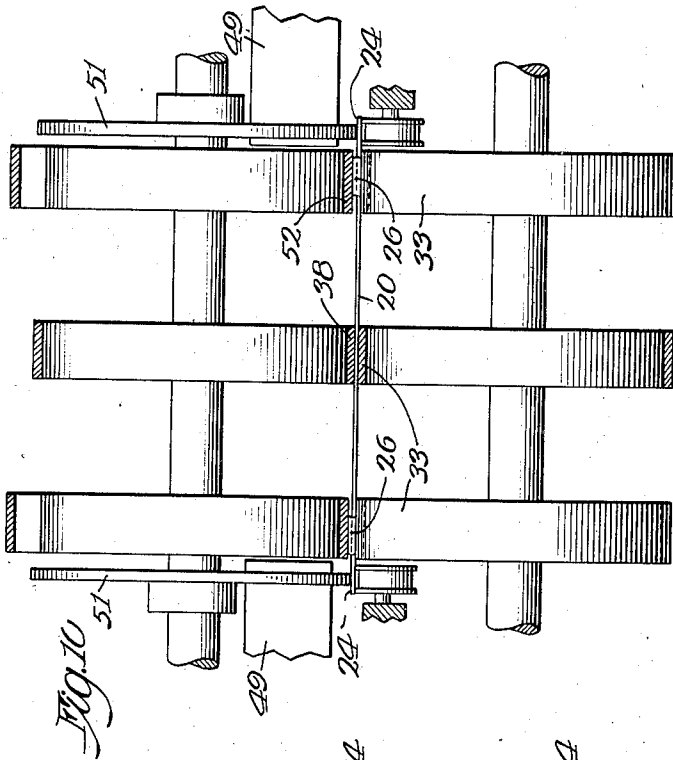


Fig. 7

Fig. 10

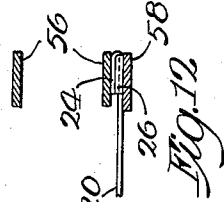


Fig. 11

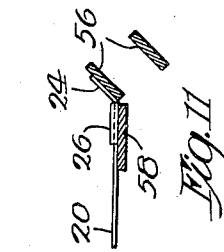


Fig. 12

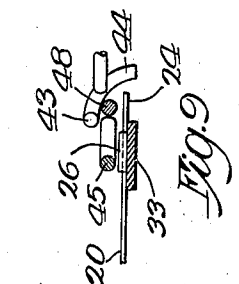


Fig. 8

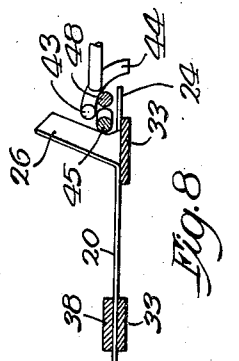


Fig. 9

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BOX MAKING APPARATUS

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4 Sheets-Sheet 4

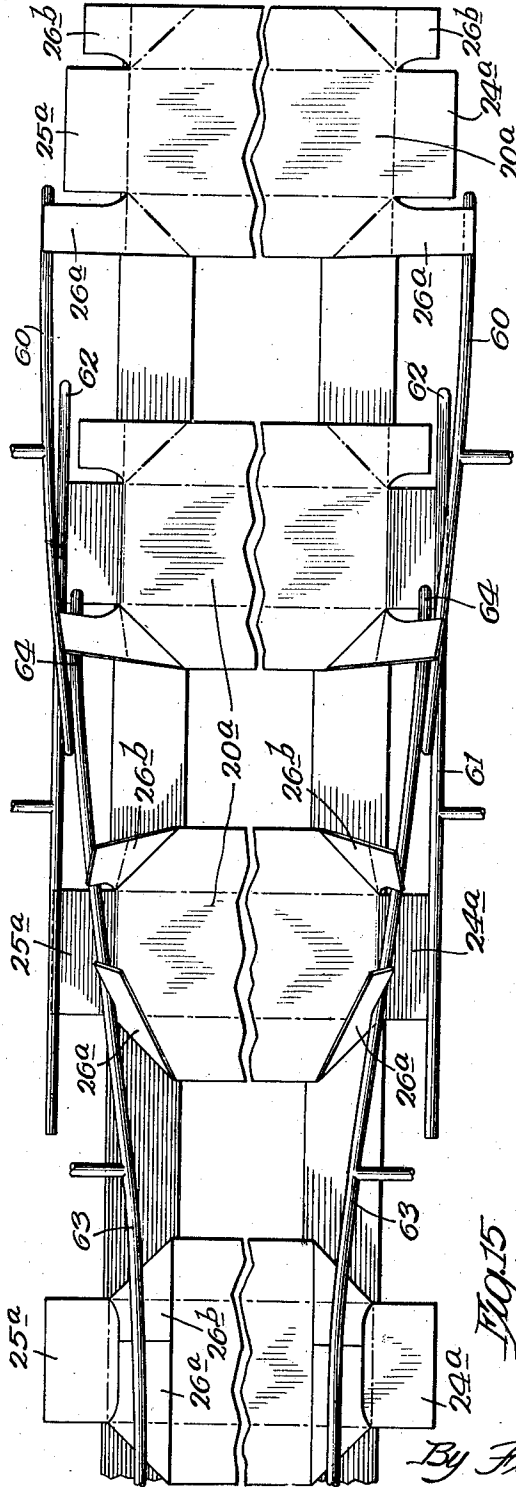


FIG. 15

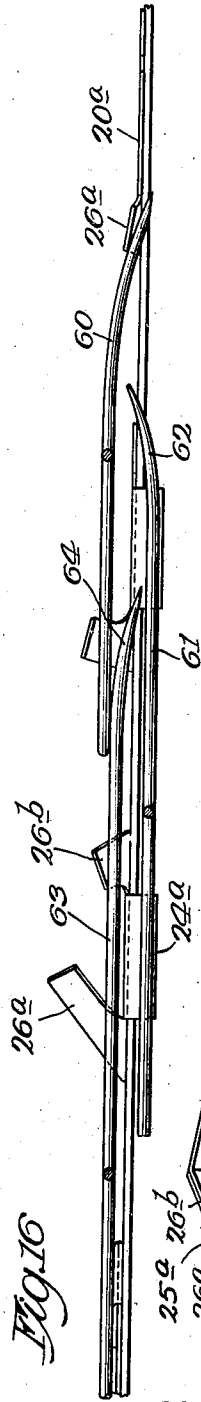


FIG. 16

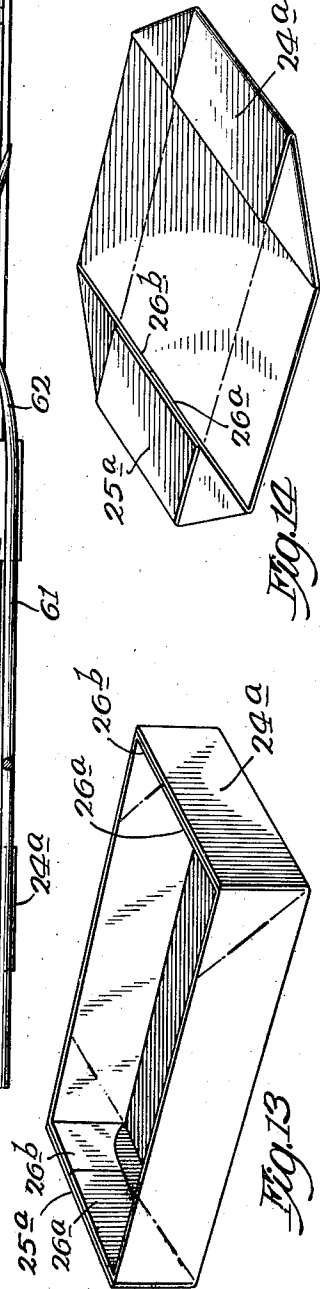


FIG. 17

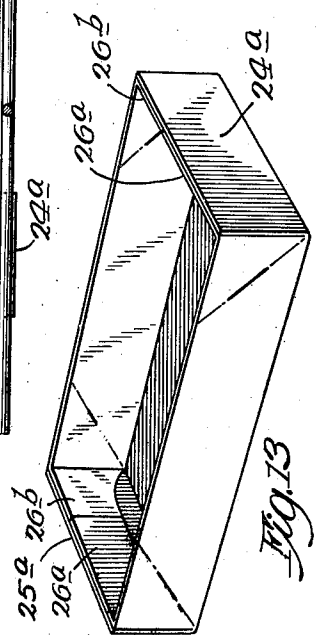


FIG. 18

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UNITED STATES PATENT OFFICE

2,108,334

BOX MAKING APPARATUS

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Application June 29, 1936, Serial No. 87,853

3 Claims. (Cl. 93—52)

This invention relates to an improvement in apparatus for the construction of paper board boxes or trays embodying bottom and side wall portions.

5 Paper boxes or trays of the type referred to are ordinarily formed from a blank in which certain side-wall-forming portions are provided with tabs or flaps which are secured by adhesive or otherwise to certain other wall-forming portions to thereby form, in effect, continuous side wall portions extending upwardly from a bottom-forming portion.

10 The main objects of this invention are to provide apparatus for making boxes or trays such as described whereby the wall-forming portions of the tray may be connected to each other through the agency of tabs or flaps such as referred to, by automatic mechanism which will operate at high speed on the blanks from which the trays are formed; to provide such apparatus which will operate efficiently, quietly and rapidly; so as to be capable of producing the trays in large numbers much faster than has heretofore been practicable; to provide apparatus for the purpose indicated which will be simple in construction and durable in operation and which may be adjusted to facilitate operation of the mechanism upon tray-forming blanks of various sizes and patterns.

15 Other objects and advantages of the invention will be understood by reference to the following specification and accompanying drawings (4 sheets), wherein there is illustrated the improved apparatus.

20 In the drawings:

Fig. 1 is a perspective showing a tray embodying the improved construction.

Fig. 2 is a perspective showing the tray in its collapsed or flattened condition.

25 Fig. 3 is a plan view illustrating mechanism for forming the tray.

Fig. 4 is a section on the line 4—4 of Fig. 3.

Fig. 5 is a fragmentary plan corresponding to a portion of Fig. 3, but on an enlarged scale.

30 Fig. 6 is a side view of the mechanism illustrated in Fig. 5.

Figs. 7, 8, 9, 10, 11 and 12, are sections, respectively, on the lines 7—7, 8—8, 9—9, 10—10, 11—11 and 12—12, of Fig. 3.

35 Figs. 13 and 14 are perspectives, respectively, corresponding to Figs. 1 and 2, but illustrating one modified arrangement, and

40 Figs. 15 and 16 are plan and side views, respectively, corresponding to Figs. 5 and 6, but

showing apparatus modified to produce the modified tray constructions shown in Figs. 13 and 14.

Referring now to the drawings, the improved tray construction herein referred to is formed from a paper board blank indicated at 20 in Fig. 5, the said blank comprising a bottom-forming portion 21, front and rear side wall-forming portions 22 and 23, opposite end wall-forming portions 24 and 25, and flaps such as 26 extending endwise from the opposite ends of the front and rear side wall flaps 22 and 23. As indicated in Fig. 1, the flaps or tongues 26, 26 are folded to substantially right angles to the respective side walls from which they project and their outer surfaces are adhesively secured to the inner surfaces of the respective end wall portions 24 and 25.

Score lines such as indicated at 27, or other forms of weakened fold lines, are provided for facilitating bending of the wall-forming portions to right angles relative to the bottom portion, and the flaps to right angles relative to the wall portions from which they extend.

In the construction illustrated, the front and rear wall-forming portions 22 and 23 are additionally provided with weakened fold lines indicated at 28, 28. These fold lines extend transversely of the respective wall portions at an angle relative to the fold lines 27 about which the end walls and flaps are foldable. The said angularly disposed fold lines permit triangular portions of the front and rear side walls which are disposed outwardly of the respective fold lines 28, to be folded inwardly into overlapping relation and in face to face contact with portions of the respective front and rear side wall portions inwardly of the respective angularly disposed fold lines. By thus permitting portions of the front and rear walls to be folded upon themselves, the end walls 24 and 25 may, after being secured to the flaps 26, 26, also be folded into flat condition substantially parallel with the bottom portion of the tray. As indicated in Fig. 2, when the end walls are folded to flattened condition, the front and rear side walls 22 and 23 are disposed in their flat co-planar position relative to the bottom wall. When the tray is in the condition illustrated in Fig. 2, large numbers of them may be stacked one upon the other for handling, storage and shipping purposes. When in this condition, a large number of the trays occupy a considerably smaller space than the same number of trays would occupy were they set up in their operative condition as shown in Fig. 1.

When the described construction is employed, 55

the box manufacturer may complete the formation of the trays to the condition illustrated in Fig. 2 and ship them to his customer, for example, a candy manufacturer. The candy manufacturer, when ready to use the trays, merely unpacks them and one by one, as required, either manually or automatically folds the side wall portions 22 and 23 upwardly relative to the bottom portion, to condition the tray for receiving his products. It will be observed that if the side walls of a tray in the condition illustrated in Fig. 2 are folded upwardly, the end walls will automatically unfold due to the link-like connection between the side and end walls effected by the triangular side wall portions outwardly of the angularly disposed fold lines 27.

Apparatus for setting up the tray includes a receptacle designated 30 which receives a stack of the tray blanks 20 (see Figs. 3 and 4). Mechanism well known in the art and not herein illustrated in detail is provided for feeding the blanks one by one from the bottom of the receptacle, such mechanism in this instance being typified by the conveyor belts indicated at 31 and feed rolls 32 which are suitably driven. The blank feeding mechanism delivers the blanks one by one to conveyor belts 33 which are suitably driven by means of rollers 34 and 35 around which such belts pass. A slack take-up device comprising a pair of rollers indicated at 36 serves to maintain the upper reach of the belts 33 taut. Supporting rollers such as indicated at 37 may be provided beneath the entire length of the upper reaches of the belts 33 between the rollers 34 and 35, if desired, to more effectively prevent sagging of the upper reaches of the belts.

An upper belt 38 cooperates with the middle one of the lower belts 33, of which in this instance there are three. The said belt 38 passes around pulleys 39 and 40 by means of which such upper belt is driven in properly synchronized relation with the drive of the belts 33. A take-up device comprising rollers 41 is provided in the upper reach of the belt 38 for facilitating maintenance of the lower reach thereof in suitably taut condition. Guide rollers indicated at 42 may also be provided for acting on the lower reach of the upper belt to hold such lower reach in proper cooperative relation to the underlying lower belt.

The belts 33 and 38 are driven at a high rate of speed and accordingly serve to carry the tray blanks through the mechanism with great rapidity. It has been known in the art to effect folding of flaps by means of guide rods or the like which act against a flap and turn the same more or less rearwardly or inwardly, and this operation has been efficiently performed when the blanks are carried at high speed by the conveyor belts. According to the present invention, flaps are folded not only rearwardly and inwardly by means of guide rods as an incident to the forward movement of the blanks, but also forwardly, i. e., in the same direction as the direction of travel of the blanks, by guide rod means.

The structure herein disclosed for folding the flaps comprises a pair of guide rods 43, 43, respectively on opposite sides of the path of travel of the blanks. Said guide rods 43, 43 are arranged in vertically and horizontally inclined relation to the path of travel of the blanks, the front end portions 44 of the rods being located below the plane of travel of the blanks. The blanks travel in the direction indicated by the

arrow 45 in Figs. 5 and 6, and it will be seen from an inspection of Fig. 5 that the front ends of said guide rods are arranged to engage the under sides of the outer extremities of the flaps 26, 26. As the blanks progress, the flaps 26, 26 ride upwardly on the guide rods 43, 43, the flaps bending on the angular fold lines 28, 28.

The flaps 26 bend on the diagonal fold lines 28 instead of on the adjacent fold lines 27, possibly because of the greater lever-arm length of the flaps from the point of application of the bending force to the diagonal fold lines and possibly because there is a more efficient relationship between the actuating rods and said diagonal fold lines. Also, if it is desired to insure bending of the flaps on said diagonal lines, the latter may be made somewhat weaker than the other fold lines. For example, portions of the fold lines 28 may be slitted partially or wholly through the blank, other portions being conventional creases. In the drawings, the diagonal fold lines 28 are shown as being formed partially of creases and partially of slits which may be cut partially or completely through the blank, the slit portions being indicated by the heavier portions of the fold line.

The upward folding movement of the flaps continues because of the upwardly and inwardly inclined position of the guide rods until the flaps assume an approximately perpendicular position relative to the remainder of the blank. So far as the flaps 26, 26 which extend from the foremost sides of the blank are concerned, their folding may be effected by a simple continuation of the inward inclination of the rods 43, since such a continuation would serve as an obstruction under which the leading flaps 26, 26 would pass by folding rearwardly. However, in respect of the flaps 26 which project from the rearmost portions of the blanks, it will be observed that a different problem arises to effect forward folding of the flaps from their perpendicular position while also continuing the forward travel of the blanks.

In this instance, such forward folding of the rearmost flaps is effected by means of supplementary guide rods designated 45, 45 on opposite sides of the path of travel of the blanks. Said guide rods 45 are disposed in approximately parallel relation to the plane of travel of the blanks and they are arranged in inwardly inclined relation so that they will apply inwardly directed force to the flaps which they engage.

As best shown in Fig. 5, the forward or receiving end portions 46 of the guide rods 45 underlie the delivery end portions 47 of the guide rods 43. Hence it will be apparent that the receiving end portions 46 of the guide rods 45 will be operative to engage the edge portions of the flaps to thereby apply said inwardly directed force thereto. As an incident to such inwardly directed force, the rearmost flaps 26 will be caused to continue their folding movement in a forward direction as an incident to the forward movement of the tray blanks. As indicated in Fig. 5, when both flaps 26 are folded they form, in effect, continuations of each other and the end wall portions 24 and 25 remain in their initially flat, unfolded condition.

Special guide rods or bars such as indicated at 48, 48 are preferably provided for overlying the end wall portions 24 and 25 to maintain the same in said normally flat, unfolded condition during the folding of the flaps 26.

Means for applying glue or other adhesive to

the upper surfaces of the end wall portions 24 and 25 of the blank comprises glue-pots indicated at 49, 49 (Figs. 3 and 4), from which adhesive-transferring rollers 50 pick up a coating of glue, transfer it to glue-applying wheels 51, 51 which are carried by the shaft of the pulleys 40. The glue-applying wheels 51, 51 are located in proper position to roll over the projecting end wall-forming portions 24 and 25 of the blanks and thereby apply a coating of adhesive to such end wall portions.

Short upper conveyor belts 52, 52 overlie the folded flaps of the blanks after the same have passed the gluing rolls 51, 51, and serve to hold said flaps in their folded condition after they pass beyond the delivery ends 53 of the guide rods 45, 45. After leaving the glue-applying rolls, the box blanks are propelled mainly by that portion of the upper belt 38 which is disposed between the pulley 40 and the glue-applying mechanism and an extension or continuation designated 54 of the middle lower belt. The middle lower belt extends around a pulley 55 and is guided adjacent the glue mechanism by a pulley in axial alignment with the pulleys 35 around which the outside belts 33 pass.

For folding over the end-wall-forming portions 24 and 25 of the blanks, there are provided twisted belt arrangements including belts 56, 56, which are caused to twist or turn in the desired manner by properly positioning guide rollers 57, 57 around which the belts pass. Such twisted belts cooperate with underlying belts 58, 58 which are guided by suitably arranged pulleys as indicated. Such twisted belt folding devices are well known in the art and therefore need not be described in greater detail.

When the box blanks pass through the zone of operation of the belts 56 and 58, the end flaps 24 and 25 are turned or folded from laterally extending initial position to inverted position overlying the previously folded flaps. Due to the adhesive applied to the inside surfaces of the end-wall-forming portions, the same will be adhesively secured to the folded flaps and will thus serve to connect the same and to maintain them permanently in proper box or tray-forming relation. Arrangements for drying the adhesive before releasing the work from the belts 56 and 58 may conveniently be provided in accordance with well-known practice. The finished trays in their collapsed or flattened form as shown in Fig. 2 are delivered by the belts 58, 58 to any suitable stacking mechanism or other receiving means.

In some instances it is desirable to modify the shape of the blank from which the carton is made, at least partly for purposes of securing economy in the amount of material required. In such instances, the blank may be shaped as shown at the right hand end of Fig. 15, where the blank in its entirety is designated 20^a. In this form, the flaps 26^a, located at the front edge of the blank, are somewhat longer than the corresponding dimension of the end-wall-forming parts 24^a and 25^a of the blank, and the flaps 26^b at the rear edge are somewhat shorter than said end wall portions.

When the carton is formed in this manner, the folding mechanism is arranged to engage the outer marginal end portions of the front edge flaps 26^a beyond the ends of the end-wall-forming portions 24^a and 25^a. As shown in Fig. 15, folding or guide bars designated 60 are arranged to initially effect the upward folding movement of the flaps 26^a. The guide members 60 serve

mainly to raise the flaps 26^a above the plane of the end-wall-forming portions 24^a and 25^a, so that guide members 61 having their receiving end 62 turned upwardly may engage the upper surfaces of the end-wall-receiving portions without first engaging the flaps 26^a. The members 61 serve to bend the end-wall-forming portions 24^a and 25^a downwardly as indicated in Fig. 16. Guide members 63 having receiving ends 64 bent downwardly are then operative to engage the rearward flaps 26^b and to effect upward and inward folding movement of the flaps as an incident to the travel of the blanks. It is, of course, understood that the blanks are propelled and supported by any suitable means, for example, such as above explained and illustrated in Figs. 3 and 4. The guide rods 63 are disposed, excepting their receiving end portion 64, in substantially parallel relation to the plane of travel of the blanks, but they are disposed angularly inwardly thereof so that they are operative to not only receive the upturned leading flap portions 26^a from the guide rods 60 and to fold the same inwardly and downwardly, but also to effect inward and downward folding of the rearward flaps 26^b substantially in the same manner as explained above in connection with Figs. 3 to 6 inclusive. The further operations on the blank after the flaps are folded may be the same as those described in connection with the set-up of the blank form shown in Fig. 5.

Various guide rods herein referred to may be mounted for adjustment as to height and angle by any suitable means. In this instance the guide rods are shown as being provided with laterally extending legs which are designed to fit through apertured brackets having set screws or like means for engaging the legs to hold them in selected position. Such mounting arrangements are well known to those skilled in the art, wherefore detailed illustration and explanation thereof are not considered necessary herein.

The described method of folding, especially the rearwardly located flaps, as an incident to the forward movement of the blanks, is of itself quite simple. It is also quite durable, being free from complexities and is such that the folding operation may be effected with great speed. Also, it will be observed that there is no separately operating mechanism which requires difficult timing with other mechanism. From these considerations it will be seen that the arrangement provided is commercially practicable and highly advantageous. As a practical matter, in the prior practice trays of the kind herein described have been formed by folding the rearwardly disposed flap portions by hand and feeding the blanks in that condition to a machine which operated to fold only the forwardly disposed flaps and the end walls. Such hand work necessarily consumes considerable time and adds materially to the cost of production. Such disadvantages of the prior practical manner of setting up trays of the kind described have been wholly overcome by the method and apparatus described.

Changes in the described construction may be made without departing from the spirit of the invention, the scope of which should be determined by reference to the following claims, the same being construed as broadly as possible consistent with the state of the art.

I claim:

1. Apparatus for setting up trays of the class described, comprising means for propelling a blank in an edgewise direction, stationary guide

means for engaging a portion of said blank to effect folding of such portion rearwardly of the blank as an incident to the travel thereof, stationary guide means for engaging another portion of the blank and operative as an incident to the travel thereof to effect folding of such portion upwardly and inwardly in the direction of travel of the blank and downwardly into overlying relation to a portion thereof.

2. Apparatus for folding a flap which extends sidewise from the rearward portion of a box blank which is being propelled in an edgewise direction, comprising a normally stationary guide rod adapted to engage and fold said flap upwardly to an approximately perpendicularly disposed position relative to the normal plane of travel of the blank, another normally stationary guide rod having a receiving end portion adapted to engage said perpendicularly disposed flap and to fold the same inwardly and downwardly to overlie a portion of the blank, and means for adjustably mounting said guide rods.

3. Apparatus for forming a tray from a blank having a bottom portion, pairs of end and side

wall portions, and flaps extending from the ends of one pair of said wall portions, comprising means for propelling the blank in an edgewise direction with the flaps projecting sidewise therefrom, upwardly and inwardly inclined guide rod means for engaging the under sides of said flaps for folding same upwardly to an approximately vertically disposed position relative to the plane of travel of the blank, inwardly inclined guide rod means disposed substantially parallel with the plane of travel of the blank for engaging the flaps when in said approximately perpendicular position, said last mentioned guide rods serving to fold the flaps inwardly and downwardly, means for applying adhesive to the upper surfaces of the pair of wall portions which extend lengthwise of the direction of travel of the blank, and means for effecting folding of said last mentioned wall portions upwardly, inwardly and downwardly to effect contacting of the adhesive-coated surfaces thereof with the uppermost surfaces of the folded flaps.

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