Dec. 11, 1962 L. E. NICHOLS 3,067,654

BOX BLANK ERECTING MACHINES

Filed Nov. 28, 1960 2 Sheets-Sheet 1

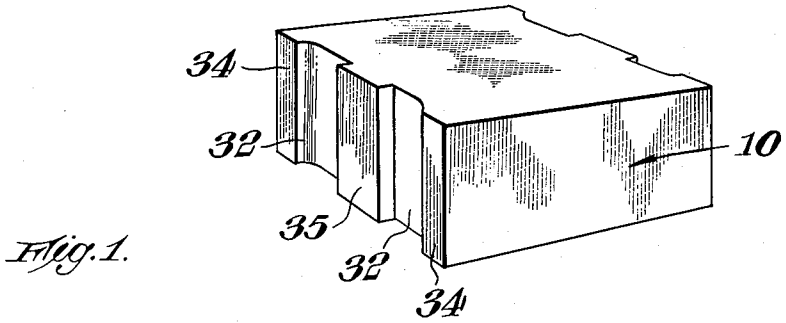
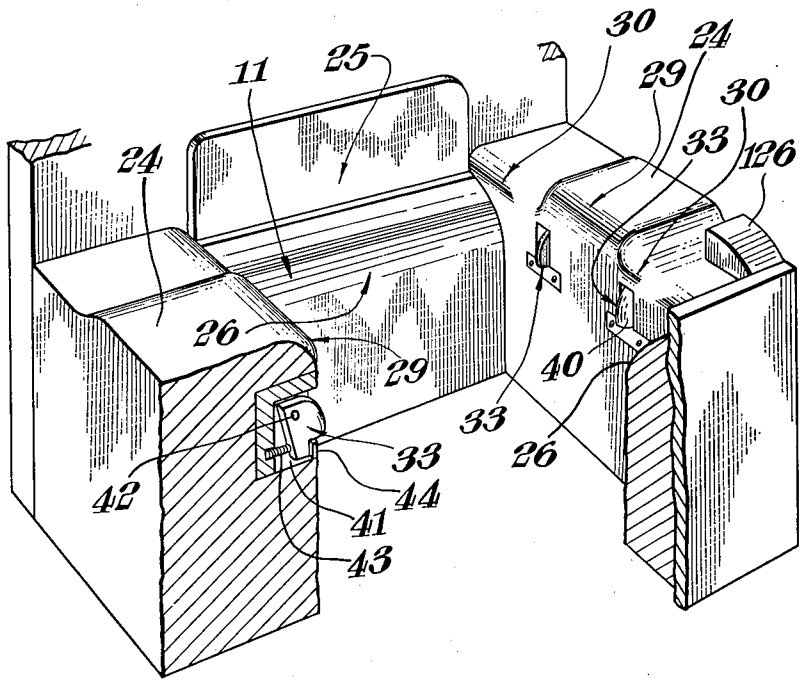


Fig. 1.



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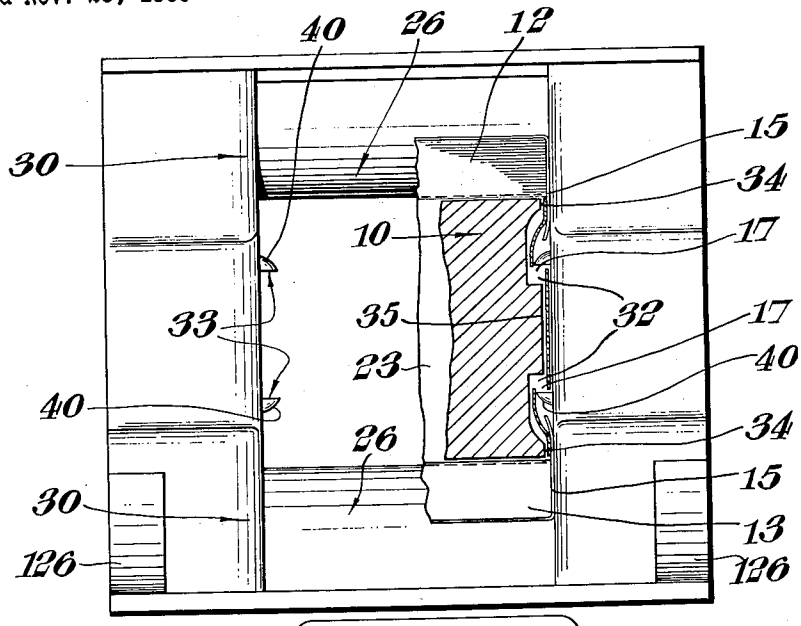


Fig. 2.

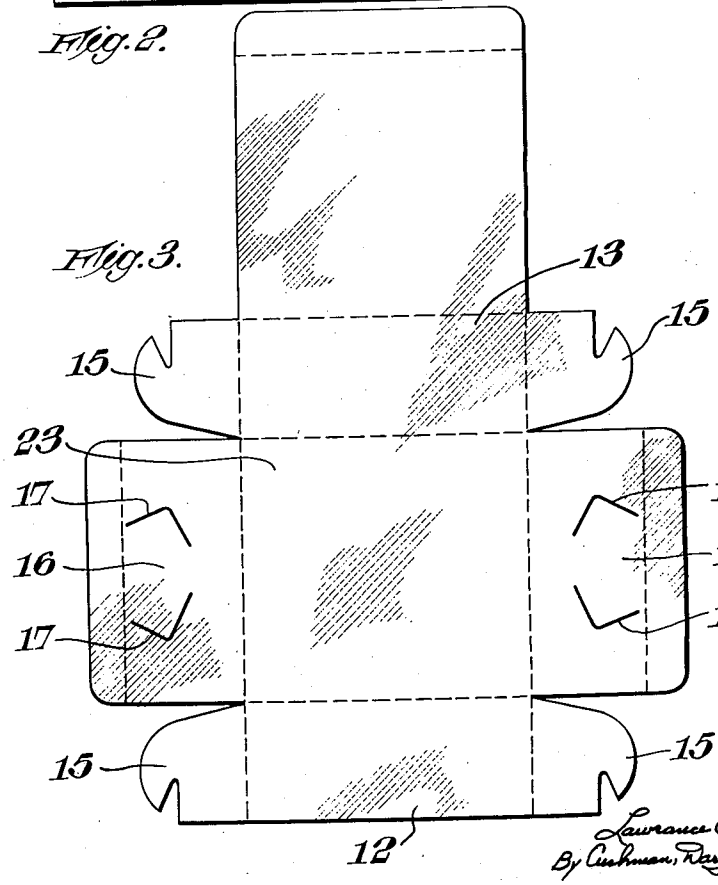


Fig. 3.

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BOX BLANK ERECTING MACHINES

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This invention relates to box-blank erecting machines for making boxes (which may be in the form of trays), and concerns box-blank erecting machines of the die-plunger type for erecting blanks of the kind in which a flap on a side edge of a side forming portion of the blank is insertable into a slit in an adjacent side forming portion of the blank to lock the corner made between said side forming portions when the blank is erected.

By a machine of the "die-plunger type" is to be understood a machine comprising a generally rectangular-sectioned plunger which, in use of the machine, is forced through a corresponding die having walls which erect opposite pairs of side forming portions of a blank to a position upstanding from a base portion of the blank and against backing walls on the plunger. For erecting blanks of the kind described, it is known to provide such machines with means for opening the slit to receive its flap as the blank is erected.

An object of the present invention is to provide a machine of the die-plunger type for erecting blanks of the kind described and having improved slit opening means so that the opeartion of erecting a blank will proceed in a positive and certain manner.

According to the present invention the slit-opening means comprises a recess in the slit-side backing wall of the plunger and a retractable projection on the slit-side erecting wall of the die, the projection being positioned to engage the material of the erected slit side between the slit and the side edge of the slit side adjacent the flap to force the material inwardly into the recess thereby to open the slit.

Preferably, the recess extends completely across the slit-side backing wall of the plunger in the direction of movement of the plunger.

According to a feature of the invention the projection may be resiliently urged to its projected position.

According to a further feature of the present invention the projection may be so shaped on its side facing the approaching flap as to provide a camming face which guides the flap edge on into the opened slit.

The action of the slit-opening means according to the invention is to deform the erected slit side by inclining inwardly from the side edge of the slit side at the corner, the material of the slit side between that side edge and the slit. To this end the slit-side backing wall of the plunger supports the material of the slit side adjacent its side edge at the corner and also to the side of the slit remote from the corner.

A machine according to the present invention for erecting a blank of the kind described will now be described merely by way of example with reference to the accompanying drawings whereof:

FIG. 1 is a perspective diagrammatic view of the die and plunger of the machine with part of the die broken away to show details of construction,

FIG. 2 is a plan view corersponding to FIG. 1, but with a blank being erected in the machine, part of the blank having been broken away, and

FIG. 3 shows the blank in the flat.

Referring to the drawings, the machine is of the "die-plunger type" and comprises a generally rectangular sectioned plunger **10**, which in use of the machine is forced into a corresponding die **11** to fold opposite pairs of side

forming portions of a blank into a position upstanding from the base portion of the blank and against the backing walls of the plunger.

The machine is designed for erecting blanks of the kind shown in FIG. 3 and comprising a first pair of opposite side forming portions **12** and **13**, each having a pair of flaps **15** one at each of its side edges, and a second pair of opposite side forming portions **16** each having a pair of slits **17** one adjacent each of its side edges for receiving the adjacent flaps **15**.

To erect the blank, the flaps **15** are passed round the outside of the slit sides **16** and are entered one into each of the slits **17** in well known manner. The flaps are able to pass freely into the slits. That is to say there is no interference for locking the flaps in the slits once they have been entered into the slits.

The side forming portion **13** has an extension which forms a lid. If this extension is omitted the blank is erectable to form an open topped tray.

To erect the blank in the machine the blank is laid on the upper surfaces **24** of the die with the base forming portion **23** of the blank squarely over the die opening. An upstanding wall **25** and stops **126** are provided for properly positioning the blank in this way.

The plunger **10** is then moved downwardly so that its advancing face engages the base portion **23** of the blank the plunger then being forced through the die to erect the blank and discharge it through the bottom of the die.

As the blank is forced through the die by the plunger the slit sides **16** are first erected by the slit-side erecting walls **29** of the die. Immediately following this, the flaps **15** are bent up by the die wall portions **30** on each side of the walls **29**. The flapped sides **12** and **13** are then erected by the flapped-side erecting walls **26** of the die, the flaps **15** passing round the outside of the slit sides **16** and each entering its adjacent slit **17**.

As so far described, the machine is generally of known construction and operates in well known manner.

The present invention is concerned with the means for opening the slits **17** to allow the introduction of the flaps **15**.

According to the invention, the slit opening means comprises for each slit **17**, a recess **32** in the appropriate slit-side backing wall of the plunger **10**, and a retractable projection **33** on the appropriate slit-side erecting wall of the die.

Thus each slit-side erecting wall **29** has a pair of the projections **33**, and the opposing slit-side backing wall of the plunger has a pair of the recesses **32**.

The recesses **32** extend completely across the slit-side backing walls of the plunger in the direction of movement of the plunger.

When the slit sides **16** are erected, each side is supported by the plunger wall adjacent each of its side edges by the side edge portions **34** of the wall, and the material of the side between the slits is supported by the centre portion **35** of the wall between the two recesses. This is shown in FIG. 2.

The projections **33** engage the slit side one between each slit and the adjacent side edge of the slit side also as shown in FIG. 2, and the material of the side between the slits and the adjacent side edges of the side is forced inwardly by the projections into the recesses **32** to open the slits as shown in FIG. 2.

The action of the projections in combination with the plunger wall, is thus to incline the material of the slit-side between the slits and the side edges of the slit-side inwardly from the side edges towards the slits.

The flaps **15** are advanced between the erected slit sides of the slit-side erecting walls **29** of the die by the upfolding action of the walls **26**, and pass edge-on between the projections **33** and the erected slit sides into the opened slits.

Each projection 33 is rounded off as at 40 (see FIGS. 1 and 2) on its side facing the adjacent corner of the die to provide a camming face on the projection which guides the advancing flap edge on towards and into the opened slit, the advancing edge of the flap sliding down the inclined material of the slit side.

Each projection 33 is constituted by the curved part of the P-shaped lever which is housed in a recess 41, in the die wall. Each lever is pivoted as at 42, and a coiled compression spring 43 engages between the stem of the lever and the back of the recess.

The spring urges the stem against a stop 44 closing the lower part of the lever recess, and in this position the curved part of the lever projects into the die aperture as clearly shown in FIGS. 1 and 2.

When a blank is forced into the die by the plunger, the lower edges of the slit sides of the blank at the fold lines between the base portion and the slit sides come up against the top surfaces of the curved parts of the P-shaped levers i.e. the projections 33, and these surfaces constitute camming faces which cooperate with the aforesaid lower edges whereby the projections are pushed back into the recesses 41 against the action of the springs 43 to allow the lower edges of the slit sides to pass over the projections. The springs then urge the projections outwardly to deform the slit sides and open the slits as described above.

The projections 33, in their projected position, lie in the recesses 32 in the plunger, and do not therefore interfere with the withdrawal of the plunger from the die after the erected blank has been discharged through the bottom of the die.

The die is preferably fixed to a frame of the machine, and the plunger mounted on the frame for movement into and out of the die. The plunger may be manually operated, or alternatively motor means such as a pneumatic cylinder may be provided for moving the plunger.

Instead of the projections being formed the P-shaped levers, each may be formed by a roller carried on a slide mounted in a bore in the die wall, a spring being provided behind the slide to project the roller. The rollers are set with their axis transverse to the direction of movement of the plunger.

The machine described may be modified to enable it to erect the blanks in which the flaps are an interference fit in the slits. In this case, the flaps are only partially freely enterable in the slits after which they have to be forced inwardly to enter them fully in the slits. To perform this operation the machine may be provided with means generally as described and claimed in our application Serial No. 831,199, now abandoned.

I claim:

1. In a box blank erecting machine of the die-plunger type having a generally rectangular-sectioned plunger and a die to receive the plunger, the die having walls to erect opposite pairs of the side forming portions of a box blank

forced into the die aperture by the plunger to a position upstanding from a base portion of the blank and against backing walls on the plunger, and means operable automatically through movement of the plunger during erection of the blank to open a slit in one side forming portion of the blank and to guide into such opened slit a flap on an adjacent side forming portion of the blank thereby to lock the corner between the sides formed by said side forming portions, the provision of such means comprising a slit-opening element mounted in the slit-side erecting wall of the die for movement between a position projecting into the die aperture to deflect the material of the erected slit-side between the slit and the side edge of the slit-side adjacent the flap and a position retracted therefrom, resilient means continuously urging the element to said projecting position, means on the die positively limiting the extent of movement of said element into the die aperture to define said projecting position, and a recess formed to extend along the slit-side backing wall of the plunger in the direction of movement thereof to accommodate the projecting element and the material of the erected slit-side deflected thereby, the element having a camming surface to cooperate with the lower edge of the slit-side thereby to force the element against said resilient means into said retracted position to allow the lower edge of the slit-side to pass the element, and the element being arranged to guide the flap, subsequent to said passage of said lower edge of the slit-side, edge-on between the element in projecting position and the deflected material of the erected slit-side accommodated in the plunger recess and thence into the slit opened by the projecting element.

2. A machine according to claim 1 wherein the element has a further camming surface to guide the flap as aforesaid between the projecting element and the deflected material of the erected slit-side and thence into the opened slit.

3. A machine according to claim 2 wherein the recess is spaced inwardly from the edge of the slit-side backing wall of the plunger which corresponds with the slit-side edge adjacent the flap, and said further camming surface and the recess form, in cross-section transverse of the plunger, a converging throat-like gap in which the deflected material of the slit-side is inclined inwardly from adjacent the slit-side edge towards the slit and which assists in guiding the advancing flap edge to slide down such inclined deflected material.

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