

Nov. 26, 1957

W. C. OBEREM
SLOTTING TOOL AND ASSOCIATED PARTS
FOR A BOX BLANK FORMING MACHINE

2,814,344

Filed March 16, 1954

2 Sheets-Sheet 1

Fig. 1.

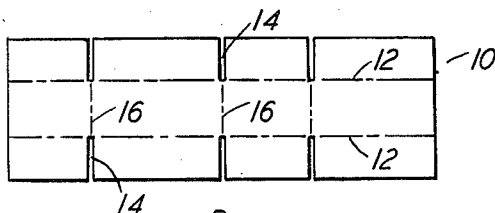


Fig. 2.

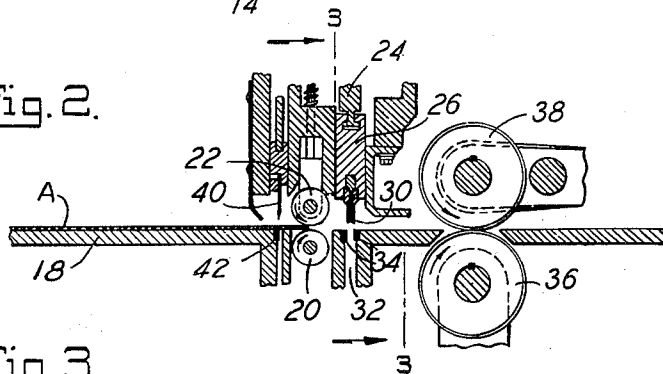


Fig. 3.

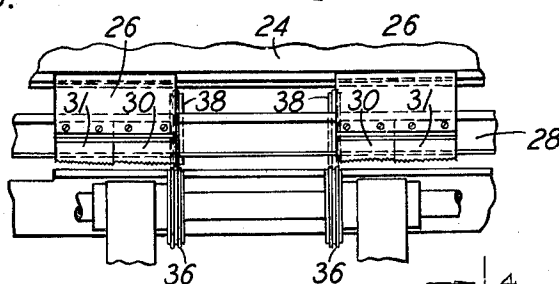
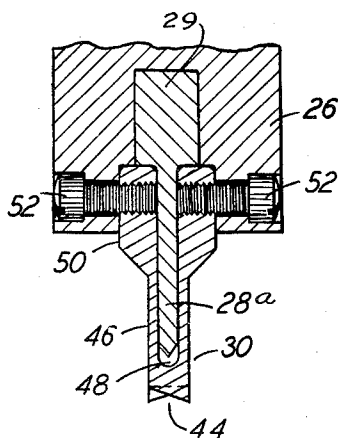
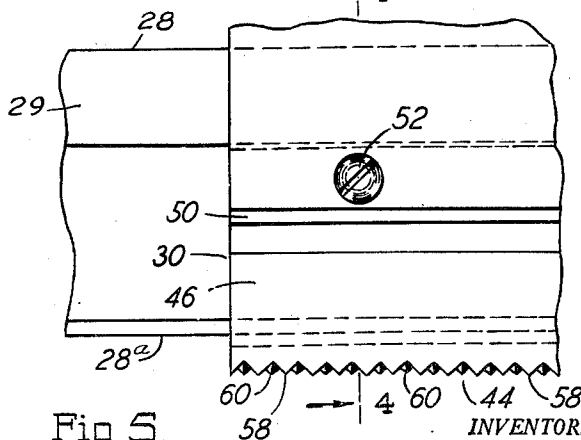


Fig. 4.

Fig. 5.



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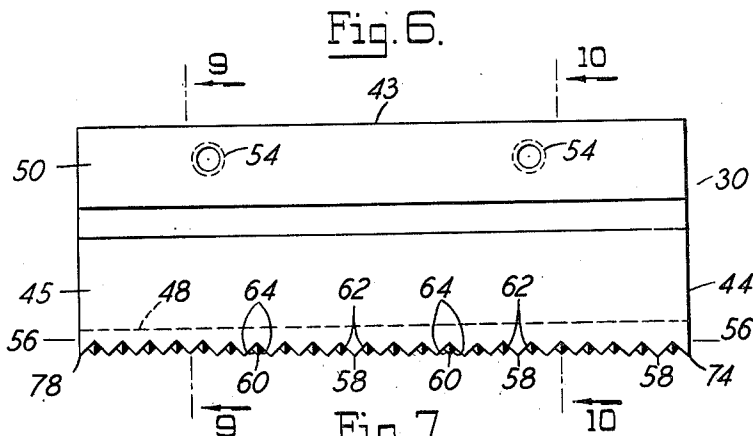
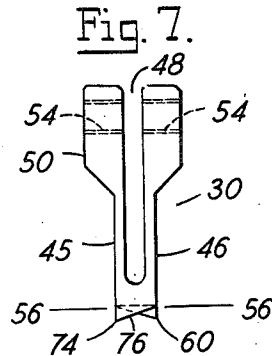
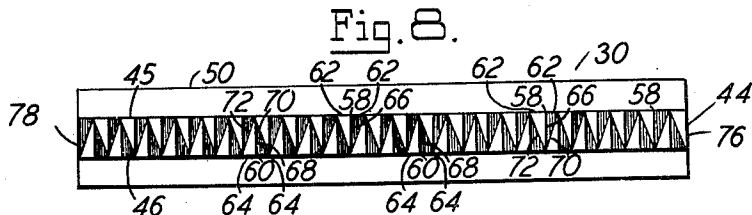
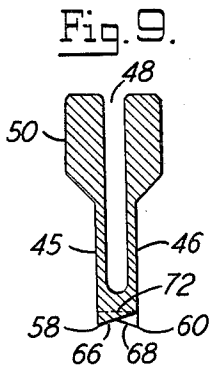
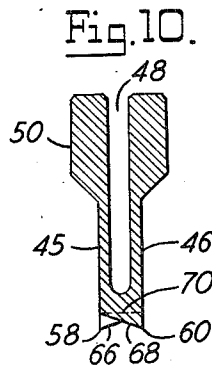
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**SLOTING TOOL AND ASSOCIATED PARTS FOR
A BOX BLANK FORMING MACHINE**

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Application March 16, 1954, Serial No. 416,653

9 Claims. (Cl. 164—58)

The invention relates to slotting tools adapted for use in a box blank forming machine and serving to cut transverse slots in the blank, and the invention further relates to the said tools in combination with certain immediately associated parts.

Prior slotting tools for box blank machines have comprised several parts including two or more separate knives and they have had interior recesses or crevices into which particles of the box blank material may be forced and packed. The accumulation of the material in the crevices of the tool tends to interfere with the cutting action of the knives and further acts to deflect the knives so that they do not properly cooperate with the ledger plates with resultant dulling or bending of the knife edges. The principal object of the invention is to provide a slotting tool for use as above stated which has no interior recesses or crevices and which is preferably formed from one piece of metal with integrally formed teeth arranged in two series along the sides of the tool for cutting a corresponding slot.

A further object of the invention is to provide a slotting tool as above described having an additional end tooth for cutting the end of a slot.

A still further object of the invention is to provide two slotting tools as above described having a novel cooperative relationship with a mounting means and with a scoring bar for forming a transverse score line between two transverse slots cut by two tools.

Other objects of the invention will be apparent from the drawings and from the following description.

In the drawings I have shown in detail a preferred embodiment of the invention, but it will be understood that various changes may be made from the construction shown, and that the drawings are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

Fig. 1 is a plan view of a box blank having slots of the type adapted to be cut by a slotting tool embodying the invention.

Fig. 2 is a fragmentary longitudinal vertical sectional view illustrating a machine for utilizing slotting tools embodying the invention.

Fig. 3 is a fragmentary transverse vertical sectional view taken along the line 3—3 of Fig. 2.

Fig. 4 is an enlarged view similar to a portion of Fig. 2 and showing one slotting tool and the immediately associated parts, this view being taken along the line 4—4 of Fig. 5.

Fig. 5 is an enlarged side view of the parts shown in Fig. 4.

Fig. 6 is a side view of one slotting tool, this being the tool shown at the left in Fig. 3.

Fig. 7 is a right end view of the tool as shown in Fig. 6.

Fig. 8 is a bottom view of the tool as shown in Fig. 6.

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Fig. 9 is a vertical sectional view taken along the line 9—9 of Fig. 6.

Fig. 10 is a vertical sectional view taken along the line 10—10 of Fig. 6.

Referring to the drawings, Fig. 1 shows a box blank 10 adapted to be made by a machine having slotting tools embodying the invention. The box blank 10 may be widely varied but as shown it has longitudinal score lines 12, 12 and has transverse slots 14, 14 extending inwardly from its side edges and terminating at the said score lines 12, 12. As shown, there are three pairs of oppositely disposed slots. The box blank 10 has transverse score lines 16, 16, each of which extends between the two transverse slots 14, 14 of one pair. When the blank 10 has been formed with the said score lines and with the said slots, it may be folded in a conventional manner on the score lines to form a box.

Portions of a box blank making machine adapted to utilize slotting tools embodying the invention are shown in Figs. 2 and 3. The machine may be widely varied so far as concerns the present invention. As illustrated, the machine is similar to that disclosed in the copending application of Alexander V. Hose, Serial No. 306,279 filed August 25, 1952, for Machine for Making Box Blanks and reference is made to the said application for any features of the machine not herein fully disclosed.

The box blank forming machine comprises a horizontal work table 18 for supporting a sheet of paper board or stock A having the required characteristics as to weight, strength and the like. Two transverse horizontal feed rolls 20 and 22 are provided, the lower roll 20 being in an opening in the table 18 and the upper roll 22 being directly above the roll 20. The rolls are rotatable in the directions indicated by suitable driving means, not shown, so as to engage the stock and feed it toward the right. The lower roll 20 is rotatable about a fixed axis and the upper roll 22 is slightly movable under spring pressure in order to press against the stock A and grip it for feeding.

Adjacent the feed rolls and preferably spaced forwardly therefrom is a vertically reciprocable member 24, which carries transversely adjustable supporting blocks 26, 26. Carried by the blocks 26, 26 and fitting within transverse slots therein is a transverse scoring bar 28 which is more clearly shown in Figs. 4 and 5. The scoring bar 28 has a narrow lower portion 28^a and a wide upper portion 29 which is entered in and which fits the said transverse slots in the blocks 26, 26. When the blocks 26, 26 are transversely adjusted they are so adjusted relatively to the scoring bar 28. The said scoring bar is adapted to form the transverse score lines 16, 16 on the blank 10. Carried by each of the blocks 26, 26 and transversely adjustable therewith is at least one slotting tool adapted to cut the slots 14, 14 in the blank 10. As shown there are two similar slotting tools 30 and 31 on each block, but if preferred there may be a single longer slotting tool on each block. One of the slotting tools 30 is more clearly shown in Figs. 5 and 6. Each of the slotting tools has a transverse slot which receives the narrow lower portion 28^a of the scoring bar. The slotting tools 30, 31 upon downward movement enter a slot 32 in the table 18. At the sides of the slot 32 are members 34, 34 which constitute ledger blades for cooperation with the slotting tools 30, 31. The scoring bar and slotting tools will be hereinafter more fully described.

Two transversely spaced pairs of lower and upper scoring rolls 36 and 38 are provided, these scoring rolls being shown as spaced forwardly from the scoring bar and slotting tools. Each lower roll 36 is in an opening in the table 18 and each upper roll 38 is directly above the corresponding lower roll. The scoring rolls are rotatable in the directions indicated by suitable driving means, not

shown, and they are adapted to form the longitudinal score lines 12, 12 on the blank 10. The scoring rolls are so rotated that their peripheral speed is the same as the peripheral speed of the feed rolls 20 and 22. Each lower roll is rotatable about a fixed axis and each upper roll is slightly movable under spring pressure in order to apply sufficient pressure to effect scoring. The scoring rolls of the two pairs are transversely adjustable and they are so adjusted that the score lines 12, 12 formed thereby register with the inner ends of the slots 14, 14 formed by the tools 30, 31. Preferably the scoring rolls are transversely adjustable in unison with the blocks 26, 26 and with the slotting tools 30, 31.

Preferably a vertically reciprocable transverse cut-off knife 40 is provided, this being shown as spaced rearwardly from the feed rolls 20, 22. The cut-off knife is adapted to enter a transverse slot in the table 18, the slot being provided with a member 42 which serves as a ledger blade for cooperation with the knife 40.

In setting the machine for forming a blank having selected dimensions, the blocks 26, 26 and the slotting tools 30, 31 are transversely adjusted to provide the desired spacing between the inner ends of the slots 14, 14. The scoring rolls 32, 34 are similarly adjusted so that the score lines 12, 12 will register with the inner ends of the said slots. Other adjustments that need not be described are made in accordance with the required longitudinal dimensions of the blank.

In operation the feed rolls and the scoring rolls are rotated as described and a sheet of stock A is engaged with the feed rolls as shown in Fig. 2. As the sheet is fed forwardly, it is subsequently engaged by the scoring rolls. When the sheet has been advanced to a position for the forming of one pair of slots 14, 14 and the corresponding score line 16, the rotation of the feed rolls and of the scoring rolls is momentarily interrupted and the member 24 is moved downwardly to cause the slotting tools to form the slots 14, 14 of one pair and to cause the scoring bar to form the corresponding transverse score line 16. This procedure is repeated for each pair of slots and for each corresponding score line. As the sheet advances, the scoring rolls form the longitudinal score lines 12, 12. After advance of the sheet to the proper extent the rotation of the feed rolls and of the scoring rolls is again interrupted and the cut-off knife 40 is moved downwardly to transversely cut the sheet and to thus complete the forming of the blank 10.

The present invention relates more particularly to the slotting tools 30, 31 and to their cooperative relationship with other parts, more particularly the blocks 26, 26 and the scoring bar 28. The scoring bar and the parts immediately associated therewith are shown in detail in Figs. 4 to 10.

Each tool 30 or 31 is preferably a single piece of metal having cutting teeth at the bottom as hereinafter more specifically described. Each tool has a horizontal top face 43 and a transverse vertical end face 44. The width of each tool at the lower portion thereof is equal to the width of the slots 14, 14, the said lower portion having opposite vertical side faces 45 and 46. The combined length of the two tools 30 and 31 is at least equal to the maximum slot length within the capacity of the machine. In describing the slotting tools and the associated parts, such terms as "horizontal" and "vertical" are used for convenience. It will be understood, however, that such terms are not to be construed as limiting the scope of the invention.

Each one-piece tool 30 or 31 has a central longitudinal slot 48 therein open at the top face 43 and adapted for receiving and fitting the lower portion of the transverse scoring bar 28. The bottom of the slot 48 in each tool is above the cutting teeth thereon and the bottom of the scoring bar is therefore spaced upwardly from the said cutting teeth of the several tools, the spacing being so related to the vertical reciprocation that the scoring bar

engages and scores the stock to form a score line 16 immediately after the tools have engaged the blank to form the corresponding slots 14, 14. The cutting teeth on the tools 30, 31 are symmetrically disposed with respect to the slot 48 and the scoring bar 28, so that the sides of the slots 14, 14 are symmetrically disposed with respect to the corresponding score line 16.

Preferably the upper portion 50 of each tool 30 or 31 is wider than the lower portion thereof and the portions of the tool at opposite sides of the slot therein fit the before-mentioned transverse slot in the corresponding block 26. The tool is held in place in the block by oppositely disposed screws 52, 52 entering threaded holes 54, 54. The said wide upper portion 29 of the scoring bar 28 fits the slots in the blocks 26, 26 above the said wider upper portions 50, 50 of the tools. The tools hold the upper portion of the scoring bar in the said slots. The said blocks 26, 26 together with the corresponding slotting tools 30, 31 are freely adjustable longitudinally relatively to the scoring bar. The screws 52, 52 tend to draw the opposite sides of the upper tool portion 50 away from each other and away from the scoring bar 28, thus avoiding any tendency of the tool to engage and bind the bar. The scoring bar extends between the tools in all positions of adjustment thereof.

In the following more detailed description, reference will be made particularly to the tool 30 shown at the left in Fig. 3, it being understood that the tools 31, 31 are similar to the tools 30, 30. The cutting teeth at the bottom of the tool 30 project downwardly from a substantially horizontal plane 56—56, and they include a series of uniformly spaced teeth 58, 58 along one edge thereof and a series of similar uniformly spaced teeth 60 along the opposite edge thereof, the teeth of each series being in alternately interplaced relationship to those of the other series. The teeth of the two series are pyramids having oppositely disposed triangular bases located in the said plane 56—56, the triangular bases of the two series of teeth having longitudinal and transverse boundary lines and the said bases preferably being contiguous. Each of the teeth 58 of the first series has a vertical face that is a continuation of the corresponding vertical side face 45 of the body and the said vertical face of the tooth has opposite downwardly facing cutting edges 62, 62 which are oppositely inclined at angles of about 45° to form the point of the tooth, the angle between the two cutting edges being about 90°. Each of the teeth 60 of the second series has a vertical face that is a continuation of the corresponding vertical side face 46 of the body and the said vertical face of the tooth has opposite downwardly facing cutting edges 64, 64 similar to the cutting edges 62, 62. Each of the teeth 58 of the first series has a bottom edge 66 which is at the juncture of two faces thereof and transversely inclined and which extends from the point of the said tooth 58 to the juncture between two teeth 60, 60 of the second series. Each of the teeth 60 of the second series has a bottom edge 68 which is at the juncture between two faces thereof and transversely inclined oppositely and which extends from the point of the said tooth 60 to the juncture between two teeth 58, 58 of the first series.

From the drawings and from the foregoing description it will be apparent that the triangular pyramids that constitute the teeth 58, 58 and the teeth 60, 60 are oppositely disposed and are contiguous with diagonal lines 70, 70 and 72, 72 at their junctures. The said lines constitute the transverse boundary lines of the triangular bases of the teeth.

At one end of the slotting tool 30, as for instance at the right end as shown in Fig. 6, the transverse end face 44 intersects the point of what would otherwise be a tooth 58. At the said end thereof there is therefore a half-tooth or additional tooth 74 having a transversely inclined downwardly facing cutting edge 76, this cutting edge being inclined similarly to the bottom edges 66, 66

of the teeth 58, 58. The opposite end of the tool may have a similar half-tooth or additional tooth 78, but this last said additional tooth is not used. When there are two tools 30 and 31 on each block 26, the additional teeth 74, 74 on the outer tools 31 have no special function.

The before-mentioned plane 56—56 has been described as being substantially horizontal. Preferably, however, it is slightly inclined as shown with respect to the horizontal top face 43, its lower end being at the said additional tooth 74.

The several slotting tools 30, 30 and 31, 31 are similarly formed, but they are reversely mounted in the machine so that the additional tooth 74 of each tool 30 is toward the center of the blank so as to cut the inner end of the corresponding slot 14. Each tool 31 is similarly positioned and the lower end of the inclined plane 56—56 of each of the several tools is therefore toward the center of the blank.

When the slotting tools 30, 31 are moved downwardly as previously described for cutting a slot 14, the teeth 58, 58 with their cutting edges 62, 62 cooperate with one ledger blade 34 to cut the slots 14, 14 at one side thereof and the teeth 60, 60 with their cutting edges 64, 64 cooperate with the other ledger blade 34 to cut the slots 14, 14 at the opposite edge thereof. At the same time the additional teeth 74, 74 on the tools 30, 30 cut the inner ends of the said slots. Thus all of the said teeth on the several tools cooperate to remove from the stock A strips of material having the size and shape of the slots. Immediately after the cutting of the slots the scoring bar 28 forms the corresponding transverse score line 16.

Inasmuch as the teeth 58, 58 and 60, 60 are pointed, the portions of each of them engage the sheet successively, thus avoiding a sudden or abrupt cutting resistance such as is encountered when the slotting tool has oppositely disposed straight knives as shown in the said Hose application. Furthermore, the teeth at the right as shown in Fig. 6 first engage the sheet and the other teeth successively engage the sheet. This additionally reduces the impact of the tool with the sheet.

Inasmuch as each tooth is a triangular pyramid it is very strong and has no narrow or delicate cutting edge that can be readily bent or dulled. This is in contrast with the three separate knives shown in the said Hose application, which knives have thin edges that can be readily bent or broken. With a construction of the type shown in the said application, particles of the box blank material may accumulate within the spaces between the knives with the result that the knives are deflected away from each other. As the knives are so deflected, their edges may engage the tops of the ledger plates with serious damage to the knives. The present one-piece tool avoids all of the above-mentioned difficulties.

It will be apparent that a slotting tool embodying the invention can be simply and inexpensively made particularly as concerns the cutting teeth thereof. The inclined faces of all of the teeth conform to two longitudinal series of transverse grooves having inverted V-shapes, the grooves of each series being parallel with each other and the grooves of each series being at an angle to those of the other series. In forming the teeth, it is merely necessary to cut one series of V-shaped grooves having their upper edges at the said diagonal lines 70, 70 and to cut another series of V-shaped grooves having their upper edges at the diagonal lines 72, 72. The two series of diagonal V-shaped slots intersect to form the teeth 58, 58 and 60, 60.

The invention claimed is:

1. A slotting tool for use in a box blank forming machine, which tool comprises a body provided with parallel vertical side faces and having two similar longitudinal series of downwardly projecting contiguous pyramidal cutting teeth all of which teeth have triangular bases with longitudinal and transverse boundary lines

and all of which teeth other than those at the ends of the body are identical in size and shape, the said cutting teeth of the two series having their said triangular bases all in the same approximately horizontal plane with said bases of each series oppositely disposed relatively to said bases of the other series and each of the teeth of one series having a vertical face which is a continuation of one of the said vertical side faces and has oppositely inclined downwardly facing cutting edges and each of the teeth of the other series having a vertical face which is a continuation of the other of said vertical side faces and has oppositely inclined downwardly facing cutting edges.

2. A slotting tool as set forth in claim 1, wherein the body has a horizontal top face and wherein the triangular bases of the said cutting teeth are in a plane longitudinally inclined at a small angle with respect to the said horizontal top face.

3. A slotting tool as set forth in claim 1, wherein the teeth of the two series are alternately interplaced and have their triangular bases contiguous throughout their transverse boundary lines so that the adjacent inclined faces of each two immediately adjacent teeth are contiguous at one of said transverse boundary lines.

4. A slotting tool as set forth in claim 3, wherein the inclined faces of all of the teeth conform to two longitudinal series of transverse grooves having inverted V-shapes, the grooves of each series being parallel with each other and the grooves of each series being at an angle to those of the other series.

5. A slotting tool as set forth in claim 3, wherein each tooth of each series has a bottom edge which is at the juncture of two inclined faces thereof and which extends transversely and upwardly from the said point of the tooth to the juncture between two teeth of the other series.

6. A slotting tool as set forth in claim 5, wherein the said bottom edge of each tooth is in a vertical plane perpendicular to the side faces of the body.

7. A slotting tool as set forth in claim 5, wherein the body is provided with a transverse vertical face at one end thereof, and wherein there is an additional tooth at the said end of the body, the said additional tooth having a size and shape equivalent to the size and shape of one-half of a tooth of one of the said series and having its point spaced in conformity with the spacing of the points of the teeth of the last said series and the said additional tooth having an end face which is a continuation of the said end face of the body and which has a downwardly facing cutting edge extending transversely and upwardly from the said point of the tooth.

8. A slotting tool as set forth in claim 1, wherein the body is provided with a longitudinal slot open at the top and having its bottom above the plane of the triangular bases of the said cutting teeth.

9. A slotting tool as set forth in claim 8, wherein the body has a transversely narrow lower portion upon which the said teeth are provided and has a transversely wide upper portion.

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