Nov. 2, 1943. K. SIEG 2,333,592

SLOTTING MACHINE

Filed Sept. 25, 1942 3 Sheets-Sheet 1

Fig. 1.

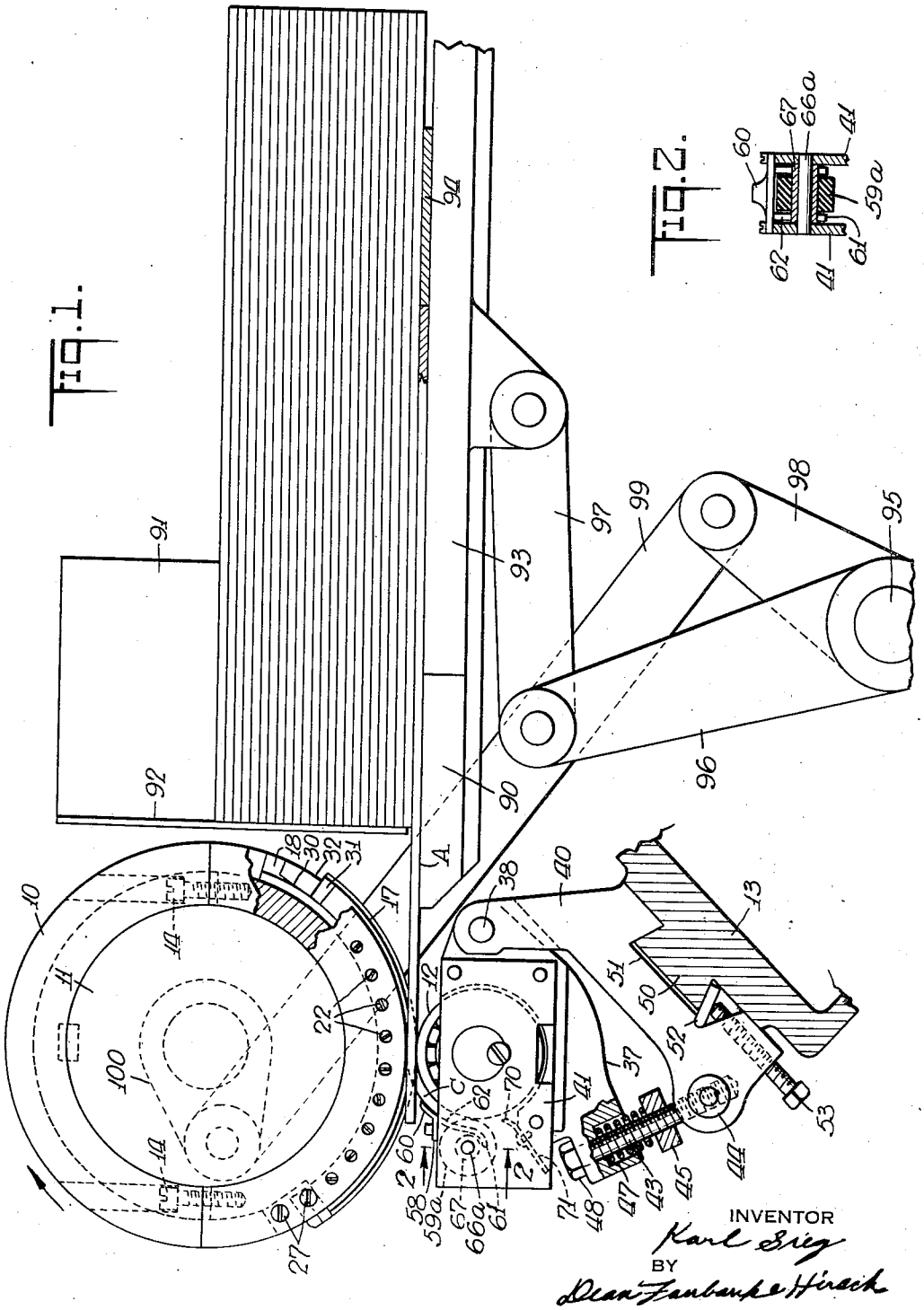


Fig. 2.

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SLOTTING MACHINE

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FIG. 3.

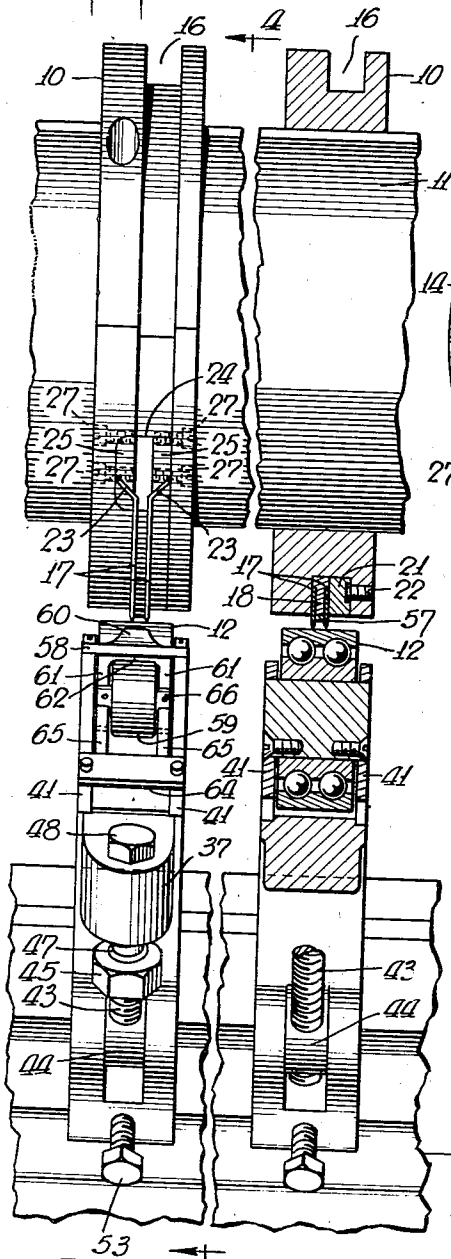


FIG. 4.

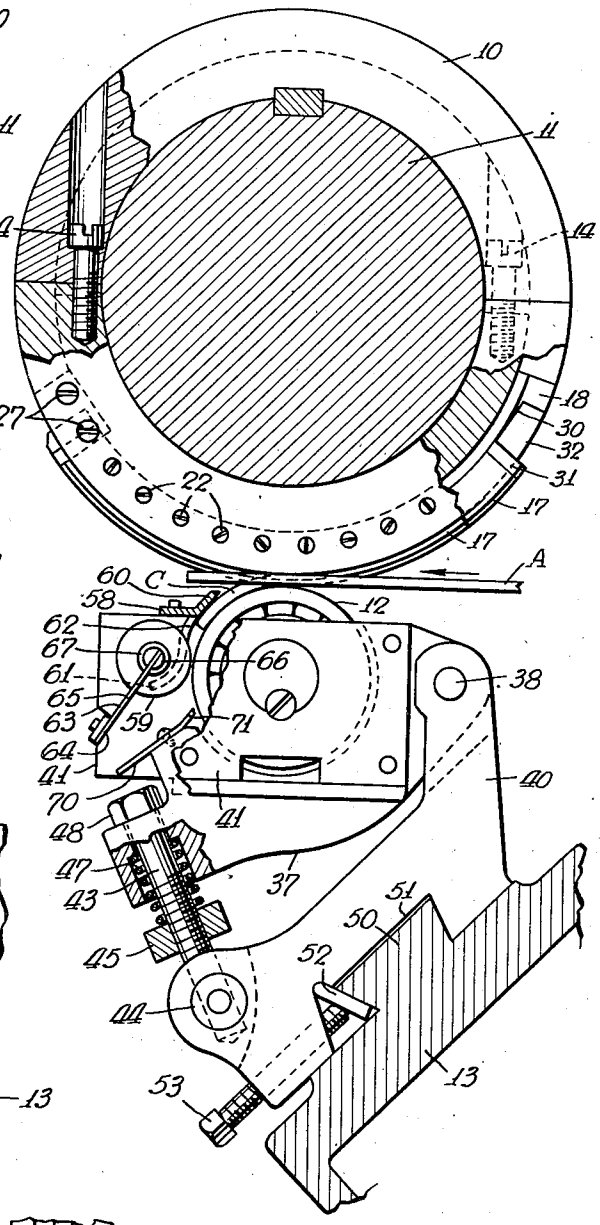


FIG. 13.

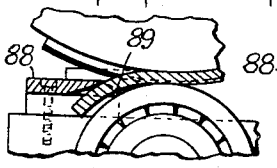


FIG. 14.

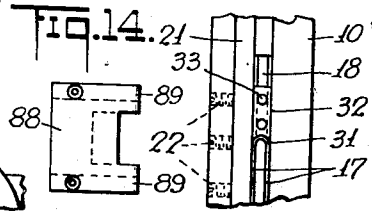


FIG. 5.

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SLOTTING MACHINE

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Fig. 11.

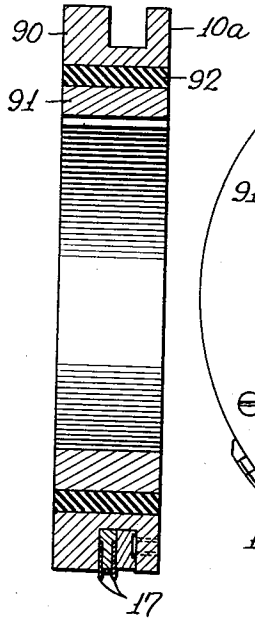


Fig. 12.

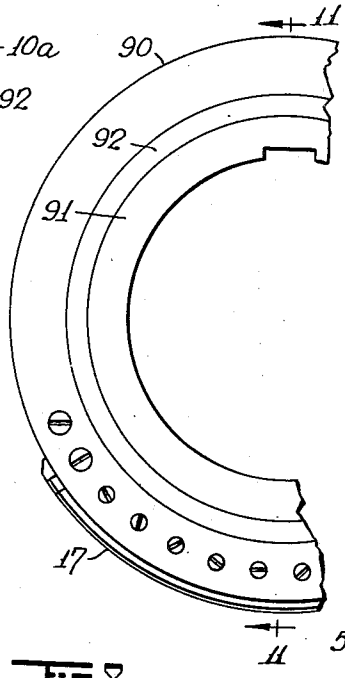


Fig. 6.

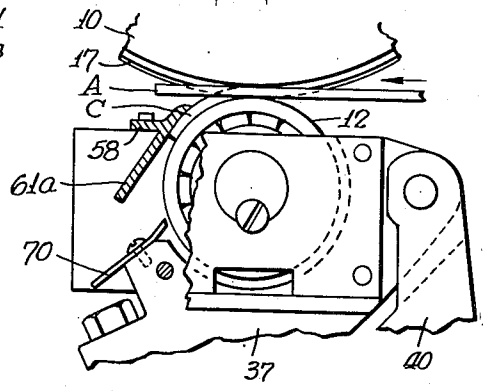


Fig. 7.

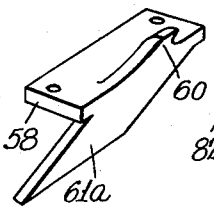


Fig. 10.

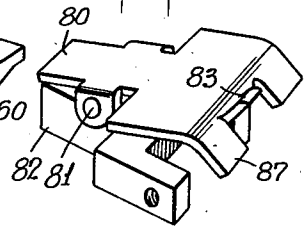


Fig. 8.

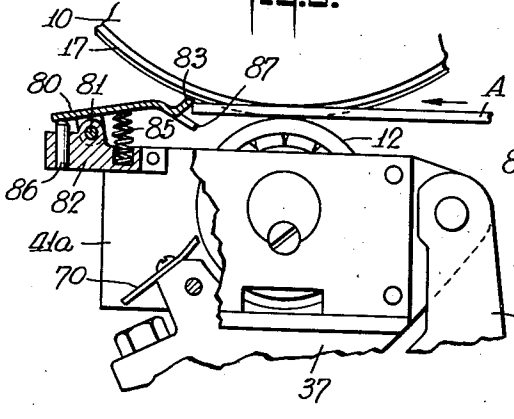


Fig. 9.

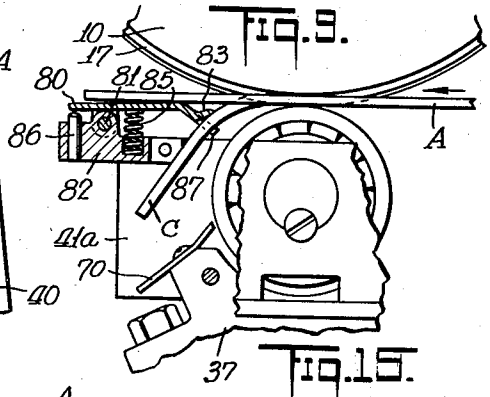


Fig. 15.

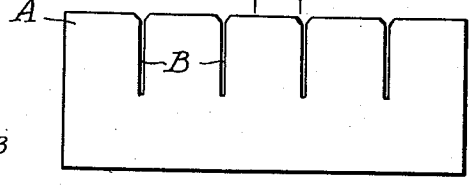
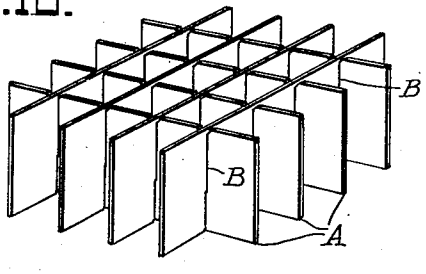


Fig. 16.



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UNITED STATES PATENT OFFICE

2,333,592

SLOTTING MACHINE

Karl Sieg, Philadelphia, Pa., assignor to Samuel M. Langston Co., a corporation of New Jersey

Application September 25, 1942, Serial No. 459,643

15 Claims. (Cl. 164—28)

Certain types of box partitions from paper boards are made from blanks which are slotted and then cross-interlocked to form a series of rectangular compartments. Hitherto the interlocking slots on these partition blanks have been cut by a pair of overlapping rotary slotting heads operating on the shearing principle.

In carrying out my invention I employ score cut cutters instead of shearing cutters, and thereby make a cleaner cut and produce less dust, which in many cases is objectionable. For that purpose, I provide a set of rotary slotting heads, each carrying a pair of spaced scoring blades forming the side cuts of each slot. A set of companion rotary heads afford the necessary cylindrical bearing surfaces for these scoring blades.

To prevent the severed pieces or tabs cut out by the slotting mechanism from jamming in between adjoining scoring blades, a strip of resilient material, such as live rubber, may be inserted between these blades. These rubber strips being compressed by the tabs at the cutting point, will expand right after being released beyond this point, and curl the tabs away from the blades. However, these rubber strips serve to eject the tabs only partly, and are therefore not entirely satisfactory.

As a feature of the present invention, I provide means for effectively and completely ejecting the slot tabs from between adjoining knives during the slotting operation.

As another feature, the blade carrying set of slotting heads is power-driven, while the other companion set is idle or frictionally driven from the power-driven heads.

As a further feature, one set of slotting heads are individually adjustable radially, while the other heads are either revolving or are idling.

Various other objects, features and advantages of the invention will be apparent from the following particular description, and from an inspection of the accompanying drawings, in which

Fig. 1 is a side elevation partly in section of an apparatus embodying the present invention.

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary front elevation partly in section, of a slotting machine embodying the present invention, and shows one form of tab ejector and one form of resilient mounting for one of the sets of slotting heads.

Fig. 4 is a vertical section taken on the line 4—4 of Fig. 3, and showing certain parts broken away.

Fig. 5 is a fragmentary elevation of one side of the slotting head showing the ends of the knives which cut the inner rounded ends of the slots.

Fig. 6 is a fragmentary vertical section of a slotting machine embodying the present invention, and shows another form of tab ejector.

Fig. 7 is a perspective of the tab ejector employed in the slotting machine of Fig. 6.

Figs. 8 and 9 are fragmentary vertical sections of a slotting machine with another form of tab ejector embodying the present invention, and showing different phases of the tab ejecting operation.

Fig. 10 is a perspective of the tab ejector employed in the slotting machine of Figs. 8 and 9.

Fig. 11 is a vertical section through the slotting head, showing another form of resilient mounting for said head.

Fig. 12 is a fragmentary side elevation of the slotting head of Fig. 11.

Fig. 13 is a view similar to a portion of Fig. 8, but showing a further form of tab ejector.

Fig. 14 is a plan view of the ejector shown in Fig. 13.

Fig. 15 shows a blank slotted by the apparatus of the present invention, and

Fig. 16 is a perspective view of a series of partition blanks similar to that shown in Fig. 15 and cross-interlocked into a cellular structure.

The machine illustrated is adapted to score cut a box partition blank A (Fig. 15) with a series of parallel slots B extending from one edge thereof inwardly to a point substantially midway of the width of the blank. The slotted blanks can be cross-interlocked by halving joints to form a lattice unit (Fig. 16) adapted to be inserted in a box to divide it into smaller individual compartments.

The slots B are flared at the edge of the blank to facilitate assembling, and are rounded at their inner ends to afford a clean cut.

The unslotted blanks are stacked and successively fed by a feed mechanism of any suitable construction through a slotting machine to cut the slots B. In Fig. 1 there is illustrated a sheet supporting and feeding means very similar to that shown in my prior Patent 2,181,211, issued November 28, 1939. In this construction the stack of sheets rest on a support 90 having side walls 91 and all of the sheets except the bottom one are held against lateral movement toward the slotter by a stop 92. A slide 93 is movable along the support and has a knocker 94 for engaging the bottom sheet and feeding it to the slotter. The slotter and the feeder are interconnected by any suitable mechanism for operation in timed relationship; there being one complete revolution of the slotter for each back and forth movement of the feeder. As shown, there is provided an oscillating shaft 95 with an arm 96 and link 97 connecting it to the feeder, and an arm 98, link 99 and crank arm 100 connecting it to the slotter. The power may be applied to the slotter so that the latter is rotated at a uniform speed and the parts are so adjusted and proportioned that as each sheet is fed, its speed at the instant it enters the slotter, will be the same as the peripheral

speed of the slotter, and its advance edge will contact such a point at the periphery of the slotter, that the slot B will be cut into the edge of the sheet A to the required distance. The said adjustment may be effected by rotary adjustment of the slotter head on its shaft or by lateral adjustment of the stop 92, or by adjusting the position of the knocker 94 along the slide 93.

In the specific form shown in Figs. 3, 4 and 5, the slotting mechanism includes an upper set of rotary scoring blade heads 10, each splined to a power-driven shaft 11 for individual adjustments therealong, and respectively cooperating with a lower set of rotary scoring heads 12 resiliently and adjustably supported on a bar 13 in a manner to be described.

Each of the scoring blade heads 10 is shown of split construction, with the two halves secured together, as for instance by studs 14, to permit these heads to be loosened, shifted axially into desired adjusted position along the shaft 11 according to the desired relative position of the slots B on the blank, and then reclamped on said shaft by the tightening of the studs 14.

A pair of arcuate scoring blades 17 separated by a spacer 18, are held in a circumferential recess 16 of the head 10 by means of a clamp plate 21 in said recess, and a series of set screws 22 bearing on said plate.

To flare the outer ends of the slots B at the edge of the blank, the two forward ends of the blades 17 have flaring sections 23 as shown in Fig. 3. To hold these flaring blade sections 23 rigidly in position, the head 10 has a substantially rectangular recess 24 constituting an enlarged continuation of the peripheral recess 16. In the sides of this enlarged recess 24 are end blocks 25 formed with slots to receive the flaring blade sections 23, and locked to the head by means of studs 27.

To cut the rounded inner ends of the slots B, the arcuate blade spacer 18 is formed at its rear end with a recess 30 into which is inserted a curved blade 31 connecting the rear ends of the two blades 17. A block 32 in the spacer recess 30 has a concave end conforming with the outer curvature of the blade insert 31, and bearing thereagainst to hold said insert in position. This block 32 is secured to the blade spacer 18 by any suitable means, as for instance, rivets 33 as shown in Fig. 5.

The lower head 12 cooperating with the two scoring blades 17 has a continuous cylindrical preferably hardened periphery serving as a bearing surface for the scoring blades 17. This scoring head 12 is supported on a lever 37 pivotally mounted at 38 on a bracket 40 adjustably secured to the bar 13. Affixed to the lever 37 is a pair of spaced parallel plates 41 flanking the ends of the scoring head 12, and serving as a ball bearing journal support for said head. To yieldably press the head 12 against the scoring blades 17, the lever 37 is formed at its free end with a hole loosely receiving a screw 43, one end of which extends between the fork prongs at one end of the bracket 40, and is threaded in a swivel nut 44 journaled in said prongs. An adjusting nut 45 threaded on the screw 43 serves as a bearing for one end of a coil spring 47 encircling said screw, the other end bearing against the free end of the lever 37. The screw head 48 serves to limit the extent of clockwise movement of the lever 37 under the action of the spring 47.

To mount the lower heads 12 for individual adjustments along the bar 13, said bar is provided with a tenon 50 of dovetail shape extending into dovetail recesses 51 in the underside of the brackets 40. On one side of each bracket recess 51 is a clamp 52 bearing against one side of the tenon 50 through the action of a clamping screw 53 threaded in the bracket 40.

The blanks are fed in between the two sets of heads 10 and 12 in timed relationship, one blank to each revolution of the upper heads 10. Since the lower heads 12 are idle and frictionally driven by the upper heads 10, they can have any suitable diameter. The yieldable mounting of the lower heads 12 permits these to respond to any unevenness in the contour of the scoring knives 17, and any springing action to which the upper driven shaft 11 may be subjected.

Because of the individual bracket mountings of the lower heads 12, and the fact that no overlapping shearing members are employed, these lower heads can be individually adjusted along the bar 13 while the upper heads 10 are revolving or standing idle. This operation can be effected without injuring the blades 17 by merely pressing down on the lever 37 supporting the lower head 12 while the loosened bracket 40 is moved in the desired position along the bar 13.

As the blank A is slotted as indicated, the severed piece of tab C may jam in between the scoring knives 17, and thereby prevent subsequent efficient slotting operation. To prevent these tabs C from jamming between the blades 17, a strip of resilient material such as live rubber 57 is cemented between these knives. This strip of live rubber 57 is compressed by the tab C at the cutting point, but will expand after the tab moves beyond the cutting field, and thereby curl the tab downwardly away from the blades 17. However, the extent of this curling action is not sufficient to completely eject the tab C. To assure the complete ejection of the tab C, there is provided in addition, an ejector serving to guide the tab C away from the scoring blades 17 as the blank A is advanced between the two sets of slotting heads. In the form shown in Figs. 3 and 4, the ejector has a base 58 secured to the lever plate 41, and includes a finger 60 below the plane of the advancing blank, and upstanding from said base in the path of forward movement of the forward curled end of the tab C. The ejector also includes a pair of fingers 61 on opposite sides of the finger 60, extending downwardly from the base 58. A cross-piece 62 between the upper ends of the fingers 61 below the finger 60 defines with said finger 60 a continuous guide surface for deflecting the tab C away from the scoring blades 17. A roller 59 desirably of metal, and peripherally knurled, is shown in Figs. 3 and 4 as yieldably mounted on a spring plate 63 in close proximity to the lower slotting head or mandrel 12. This spring 63 is shown U-shape, with its base 64 secured to the frame levers 41 and its side spring arms 65 flanking the ends of the roller 59. To support the roller 59 on the spring 63, there is provided a roller pin 66 with its ends slotted to receive the free ends of the spring arms 65, and secured thereto by riveting or other suitable means. A bushing 67 on the roller pin 66 serves as a support for the roller 59. In the construction shown in Figs. 1 and 2, a roller 59*a* of soft rubber is used in place of the metal roller 59, and its pin 66*a* is mounted directly in the side walls 41 instead of on spring arms.

As the blank is advanced between the slotting heads 10 and 12 and slotted, the forward end of

each tab C is curled slightly downwardly away from the score blades 17 by the action of rubber strip 57. As the blank continues its advancing movement, the forward curved end of the tab strikes the finger 60, and is deflected downwardly away from the blades 17 and into the nip between the two rollers 12 and 59, where it is gripped and pulled out of the cut slot and from between the scoring blades 17. The two depending fingers 61 serve to prevent the ejected tab from working in between the end faces of the roller 59 and the adjacent frame parts.

A scrap guide plate 70 is fixed to the lever 37 between the plates 41 and below the ejecting roller 59, and is inclined obliquely downwardly away from the roller 12 with the upper lip section 71 of said plate curved slightly upwardly and disposed closely adjacent the periphery of said roller 12. This guide plate 70 serves to scrape off any ejected tabs that might adhere to the surface of the roller 12 after passing beyond the ejector roller 59, and guide it away from said roller 12.

In Figs. 6 and 7 is shown another form of tab ejecting means which is similar to that shown in Figs. 3 and 4, except that the ejector roller 59 is eliminated. Although the use of the ejector roller 59 is desirable, the simpler arrangement shown in Figs. 6 and 7 has been found satisfactory. In this construction the ejector may have a depending plate portion 61a extending at an angle to the plane of the path of movement of the blanks.

In Figs. 8, 9 and 10 is shown another form of tab ejector comprising a lever 80 pivoted to a block 82 fixed between lever plates 41a. The lever 80 is formed at one end with a finger 83 which is narrower than the width of the slot in the blank, and which normally projects above the upper surface of the advancing blank as shown in Fig. 8. This finger 83 is inclined upwardly and forwardly away from its opposite end and towards the forward end of the advancing blank, so that the tab as it strikes this finger is deflected downwardly, and at the same time pushes the lever 80 clockwise about its pivot support 81. This downward pushing action of the tab will move the finger 83 underneath the advancing blank as shown in Fig. 9, and thereby prevent said finger from hooking said blank when the inner base end of the slot comes along. A spring 85 seated in a recess of the pivot block 82 bears against the underside of the lever 80 and tends to maintain said lever in angular position as shown in Fig. 8. A stop pin 86 in the pivot block 82 limits the extent of angular movement of the lever 80 resulting from the action of the spring 85.

A pair of downwardly inclined fingers 87 on opposite sides of the upstanding finger 83 prevents sidewise deflection of the tab while being ejected from the slot, as shown in Fig. 9.

With the construction of Figs. 8 to 10, the use of the rubber strip 57 to cause preliminary curling of the tab is not necessary, since the finger 83 will engage the forward end of the tab while said tab is in the plane of the advancing blank.

A further simplified form is shown in Figs. 13 and 14. Here a plate 88 is mounted in a horizontal plane with its upper surface in approximately the plane of the under surface of the blank. The edge of the plate has a recess separating two finger portions 89 which have their upper surfaces beveled as shown in solid lines in Fig. 13, while the portion at the rear of the notch has its under surface beveled as shown in dotted lines in both figures. The blank is guided across the upper surface, and it is only necessary that the tab be deflected downwardly to catch the bevel in the rear of the notch.

In the construction of Figs. 3 to 10, the lower head 12 is shown spring mounted, and the upper head 10 supported on a fixed shaft 11 against yieldable transverse movement with respect to said shaft. In the form shown in Figs. 13 and 14, the upper head 10a is resiliently mounted, and for that purpose comprises a pair of cylindrical concentric sections 90 and 91 cemented together by an intervening ring 92 of suitable resilient material such as live rubber. This rubber ring 92 compensates for any irregularity in the contours of the scoring blades 17. With this construction, the resilient mounting for the lower head 12 can be eliminated.

As many changes can be made in the above apparatus, and many apparently widely different embodiments of this invention can be made without departing from the scope of the claims, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative, and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A machine for slotting advancing paper board blanks, including a drive shaft, a set of rotary slotting heads connected to said shaft for rotation in unison, each of said heads carrying score cutting blades disposed side by side for score cutting the sides of each slot, and a second set of idle rotary slotting heads coacting with said first mentioned heads respectively and rotatable independently of each other, the heads of said second set presenting smooth cylindrical bearing surfaces for the cutting edges of said blades, and being mounted to permit their independent axial adjustment transversely with respect to the heads of said first set while said latter heads are rotating or are idle.

2. A machine for cutting slots in an advancing paper board blank, including a series of pairs of coacting rotary slotting heads, one of said heads of each pair having arcuate score cutting blades disposed side by side for cutting the sides of the slots, the other heads of each pair presenting a bearing surface for said blades, and means for mounting said last mentioned heads whereby each of them is independently resiliently and yieldably pressed against the other head of the same pair in a direction transverse to the axes of said heads.

3. A machine for cutting slots in an advancing paper board blank, including a bar, a series of brackets mounted on said bar and adjustable therealong, levers pivotally supported on said brackets respectively, a set of rotary score slotting heads mounted on said levers respectively, a second set of rotary score slotting heads coacting with the heads of said first set respectively, and spring means acting on each of said levers for resiliently urging the heads of said first set against the heads respectively of said second set in a direction transverse to the axes of said heads.

4. A partition slotter having a plurality of pairs of coacting rotary slotting heads between which the blank is advanced, one head of each pair being power-driven and having scoring cutters and the other head of each pair being freely

rotatable and having a surface for contacting said cutters, and means for deflecting the tab in the cut slot between said cutters and from the plane of the advancing blank and guiding it away from said plane to completely eject said tab from said slot and away from said heads.

5. A machine for cutting slots in an advancing paper board blank, including a pair of coacting rotary slotting heads, one of said heads having adjoining sharp edges for cutting the sides and end of the slot, means for partially ejecting the slot tab from between said edges, and a finger adapted to engage and curl the forward section of the slot tab away from the plane of the advancing blank and away from between said edges..

6. A partition slotter having a plurality of pairs of coacting rotary slotting heads, one head of each pair being power-driven and having sharp score cutting edges for cutting the sides of the slot, a strip of resilient material disposed between and inwardly of said edges for curling the slot tab away from the plane of the advancing blank and away from between said edges as said tab leaves the field of action of said edges, the other head of each pair being freely rotatable and presenting a surface against which said edges operate, and guide means adapted to engage the curled section of the advancing slot tab and deflect it away from said plane to effect complete ejection of said tab from said blank and from between said edges.

7. A machine for cutting slots in an advancing paper board blank, including a pair of superposed coacting rotary slotting heads between which the blank is adapted to be advanced, the upper head having adjoining cutting knives for cutting the sides of the slot, a strip of resilient material disposed between said knives to curl the advancing slot tab downwardly away from the plane of the advancing blank and away from said knives as said tab leaves the cutting field of said knives, and a finger disposed below said plane and adapted to engage the curled section of the tab to deflect it downwardly away from said plane and away from said knives, whereby complete ejection of said tab from said slot and from between said knives is effected.

8. A machine for cutting slots in an advancing paper board blank, including a pair of superposed coacting rotary slotting heads between which the blank is adapted to be advanced, one of said heads having slot cutting score blades while the other head has a smooth cylindrical bearing surface for said blades, and means for completely ejecting the slot tab from said slot and out from between said blades and including a roller near said last mentioned head, and means for deflecting the advancing tab away from the plane of the advancing blank and into the nip between said roller and said last mentioned head, whereby said tab is gripped by said nip and pulled away from said plane.

9. A machine for cutting slots in the edge of an advancing paper board blank, including a pair of superposed coacting rotary slotting heads between which the blank is adapted to be advanced, one of said heads having slot cutting score blades, and means for completely ejecting the slot tab from said slot and out from between said blades, and including a roller juxtaposed to the other of said pair of heads, and means for deflecting the advancing tab away from the plane of the advancing blank and into the nip between said juxtaposed roller and head whereby said tabs are gripped and pulled away from said plane upon rotation of said roller.

10. A machine for cutting slots in an advancing paper board blank, including a rotary slotting head having a pair of scoring blades and a curved end blade, and deflecting means in the path of travel of the forward end of the advancing slot tab adapted to engage said forward tab end and deflect it away from the plane of the advancing blank.

11. A machine for cutting slots in an advancing paper board blank, including a pair of coacting rotary slotting heads between which the blank is adapted to be advanced, and a lever having a finger disposed in the path of travel of the forward end of the advancing slot tab and adapted to engage said forward tab end and deflect it away from the plane of the advancing blank, said lever being pivotally moved by said advancing deflecting tab to move said finger away from said plane whereby said finger is prevented from hooking into the base end of said slot.

12. A machine for cutting slots in an advancing paper board blank, including a pair of coacting rotary slotting heads between which the blank is adapted to be advanced, and a spring-pressed lever having a finger normally disposed in the path of travel of the forward end of the advancing slot tab and having a width less than the width of the slot to permit entry of said finger into said slot, said finger being adapted to engage said forward tab end and deflect it downwardly away from the plane of the advancing blank, said lever being pivotally moved by the advancing sheet against the action of the spring to move said finger away from said plane, whereby said finger is prevented from hooking into the base end of said slot, said lever also having guide means below and flanking said finger.

13. A machine for cutting slots in each of a series of separately and successively advancing paper board blanks including a shaft, a rotary slotting head on said shaft, and having blades for cutting the sides and ends of said slots, a second shaft, a rotary mandrel thereon and coacting with said blades to effect the cutting action and resilient connections between said mandrel head and said second mentioned shaft and permitting said mandrel head to resiliently yield in a direction transverse to its shaft.

14. A machine for cutting slots in paper board blanks which are successively and separately advanced through the field of operation of said machine, including a rotary head carrying scoring blades, positive drive means to continuously rotate said head to operate upon a separately advanced blank during each revolution of said rotary head and an idle rotary head presenting a bearing surface yieldingly pressed against the cutting edges of said blades.

15. A machine for cutting slots in paper board blanks which are separately and successively advanced through the field of operation of the machine, including a set of power driven rotary slotting heads, each having cutting blades for cutting the sides and ends of said slots, positive drive means to continuously rotate said heads to operate upon a separately advanced blank during each revolution of said rotary head, a set of rotary mandrel heads coacting with said blades and transversely adjustable independent of each other and relative to said first mentioned heads, while the latter are either rotating or standing idle.

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