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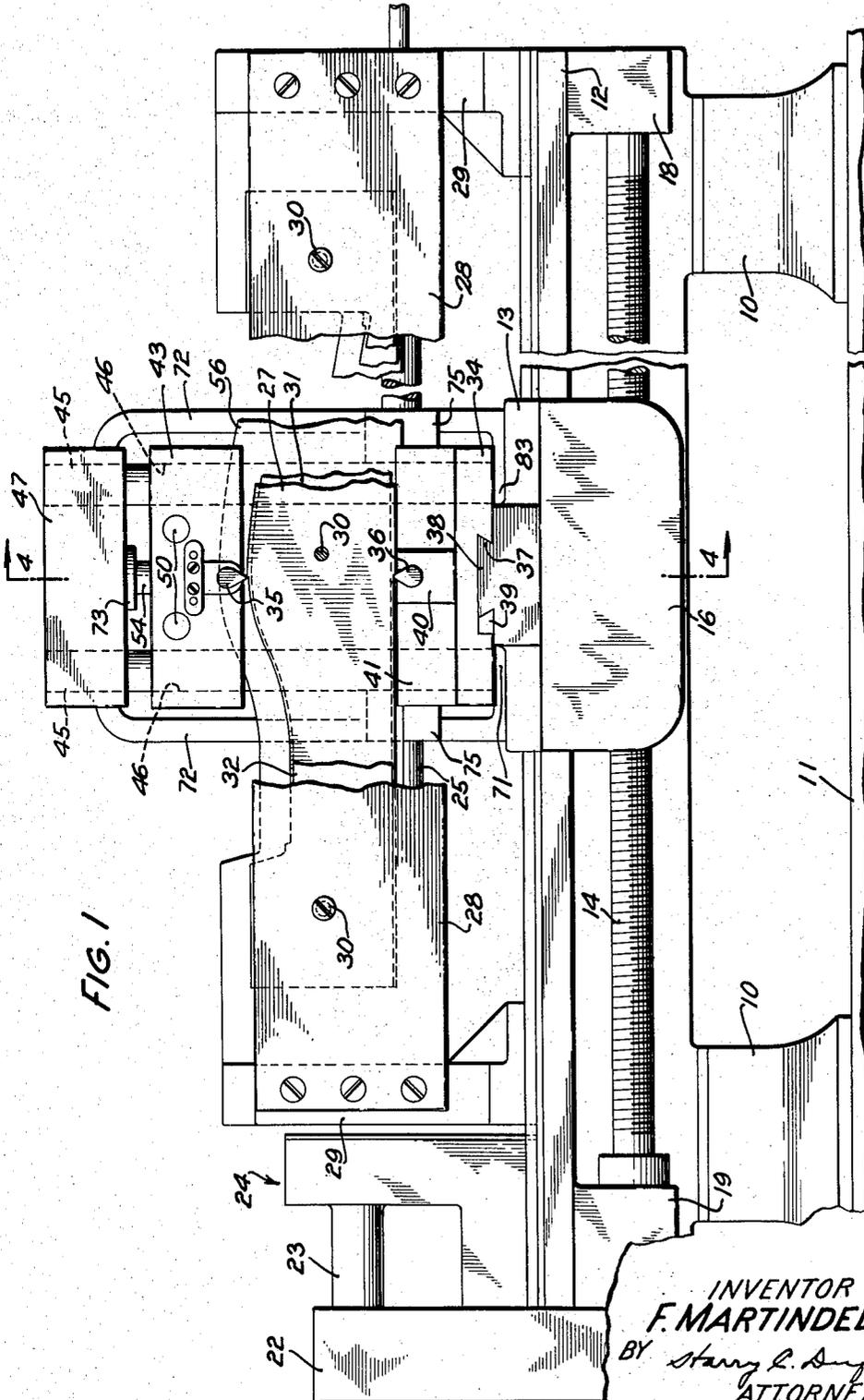
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2,355,811

METHOD OF AND APPARATUS FOR SHAPING ARTICLES

Filed July 23, 1943

4 Sheets—Sheet 1



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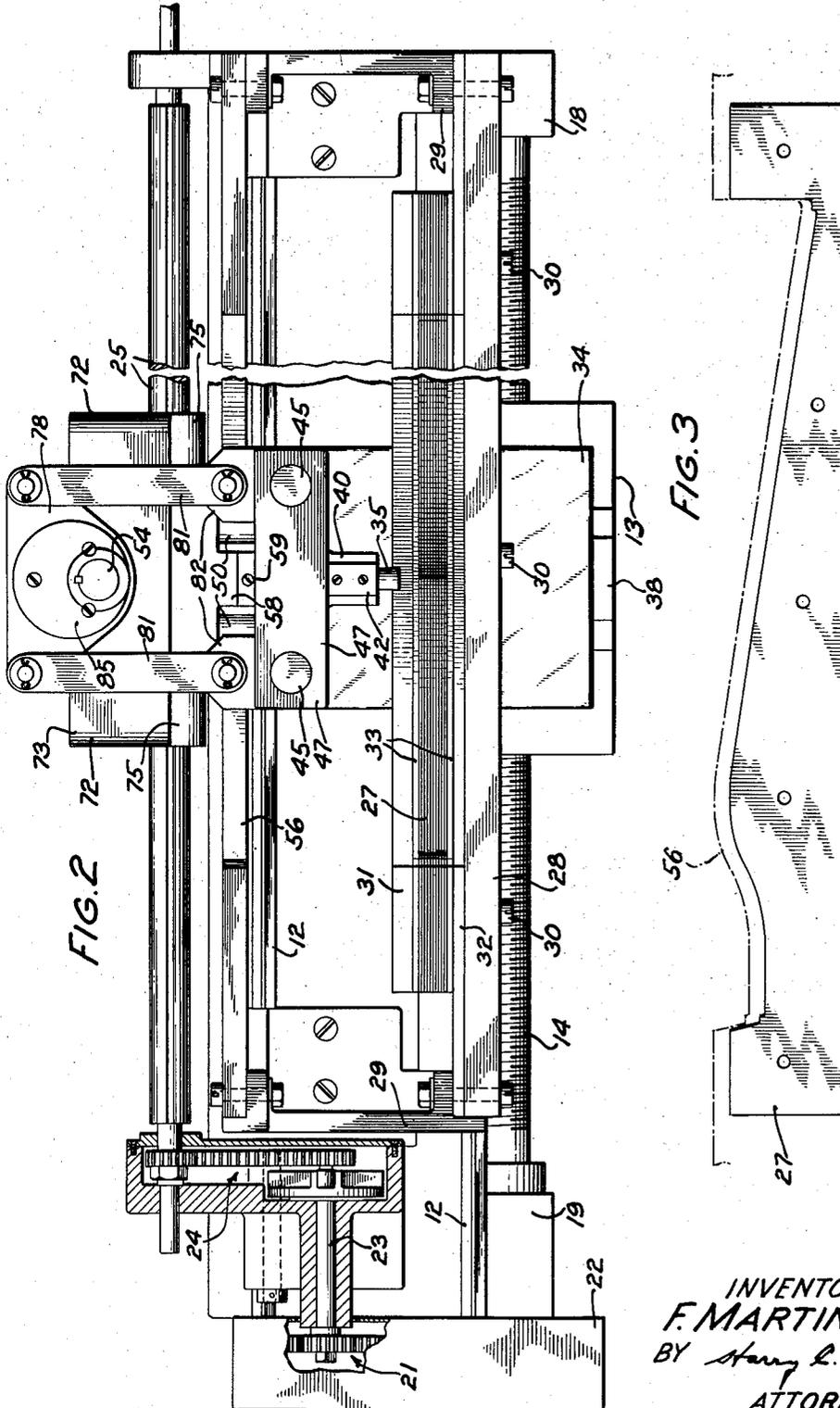
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METHOD OF AND APPARATUS FOR SHAPING ARTICLES

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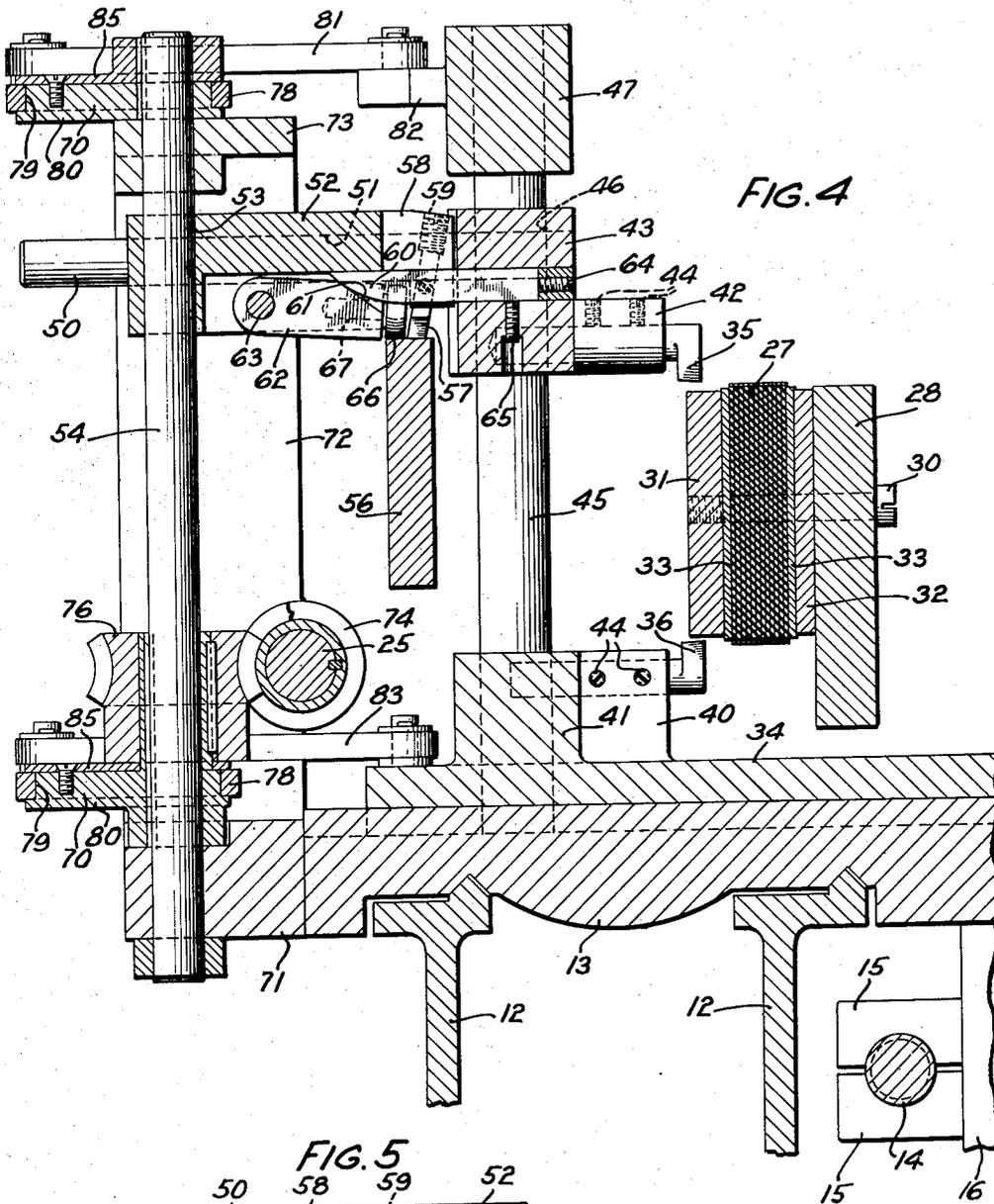


FIG. 4

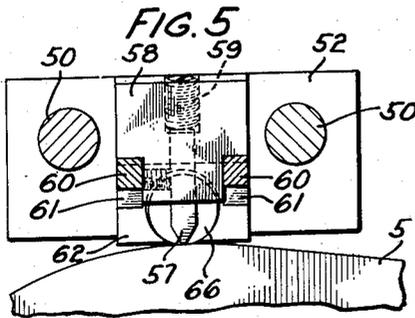


FIG. 5

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METHOD OF AND APPARATUS FOR SHAPING ARTICLES

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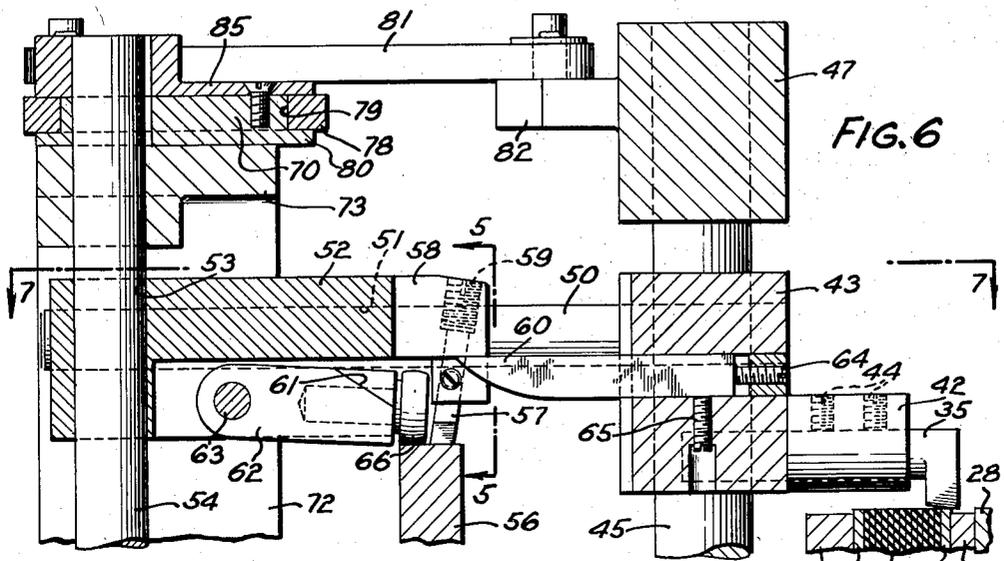


FIG. 6

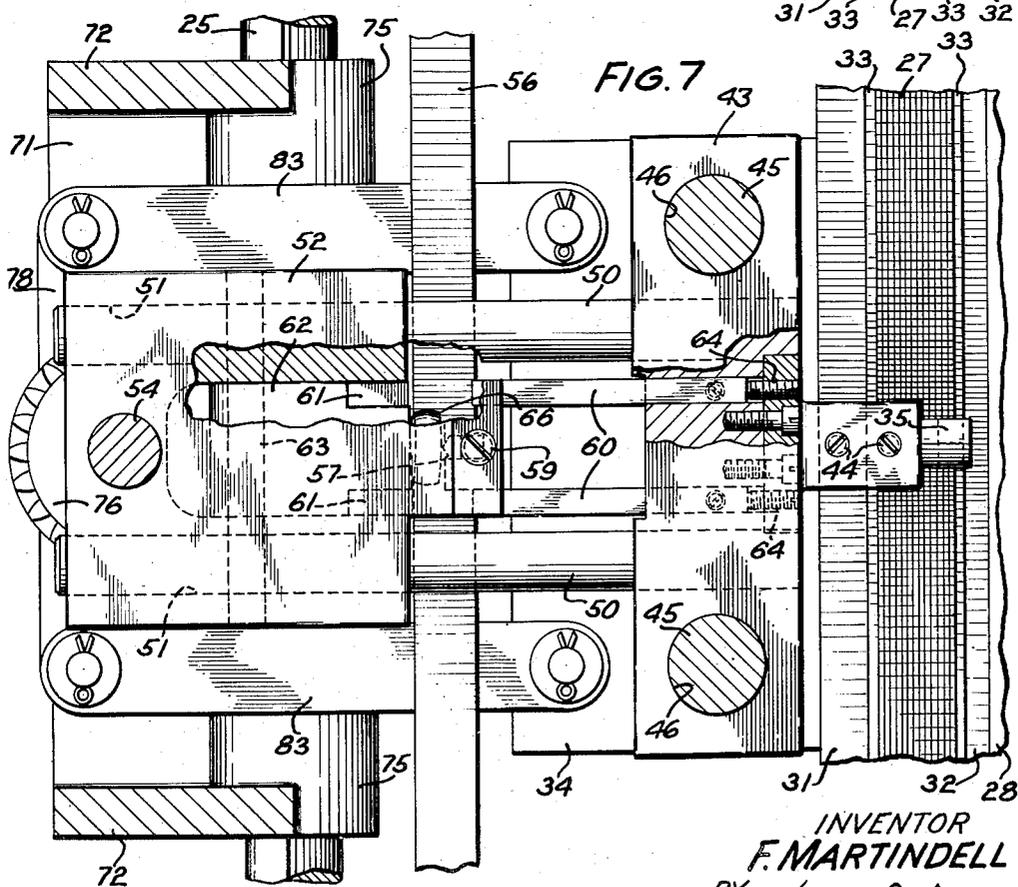


FIG. 7

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# UNITED STATES PATENT OFFICE

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## METHOD OF AND APPARATUS FOR SHAPING ARTICLES

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11 Claims. (Cl. 164—47)

This invention relates to a method of and apparatus for shaping an article, and more particularly to a method of and apparatus for profiling cards.

In certain types of electrical equipment it is sometimes desirable to employ as variable resistance elements cards of a particular contour having a strand of wire wound spirally thereabout. Where a number of such cards are to be employed, it may be necessary that the contours of the cards be exactly alike. However, it is difficult to cut cards of this type to precisely the same dimensions.

Objects of this invention are to provide an efficient and effective method of and apparatus for profiling cards.

In accordance with one embodiment of this invention, a profiling apparatus may be provided in which a stack of cards may be positioned and then cut by a pair of cutting tools which reciprocates transversely of the cards and is intermittently advanced longitudinally of the cards. A knife edged cam follower, associated with one of the cutting tools, engages the surface of a master cam during the cutting operation to control the depth of the cut, but is released from the cam when the cutting tools are advanced longitudinally of the cards.

Other objects and advantages of the present invention will be apparent from the following detailed description taken in conjunction with the drawings, wherein

Fig. 1 is a fragmentary side elevation of a profiling apparatus constructed in accordance with one embodiment of this invention;

Fig. 2 is a plan view of the apparatus shown in Fig. 1;

Fig. 3 is a detail view of a completed card, showing also the relative position of the master cam;

Fig. 4 is an enlarged, vertical sectional view along the line 4—4 of Fig. 1;

Fig. 5 is an enlarged, vertical sectional view along the line 5—5 of Fig. 6;

Fig. 6 is an enlarged sectional view of a portion of the apparatus shown in Fig. 4, showing the cutting tools in advanced position; and

Fig. 7 is a horizontal sectional view along the line 7—7 of Fig. 6.

Referring to the drawings, and particularly to Figs. 1 and 2, a profiling apparatus is there illustrated having a pair of spaced pedestal members 10 mounted on a table 11 and supporting a pair of parallel spaced rails 12 which form ways for the apparatus. A block 13 which serves as a

carriage for the cutting tool assembly, to be described hereinafter, is slidably mounted on the ways, being movable longitudinally along the ways by a rotatable threaded shaft 14 which is engageable by a pair of cooperating internally threaded blocks 15 mounted on a vertically disposed end member 16 of the carriage 13.

The right end of the shaft 14 is rotatably supported in a bearing block 18 mounted on one of the ways 12, while the left end extends through a bearing block 19 mounted near the other end thereof. The intermittent rotation which is required to advance the cutting tools step by step is obtained through a Geneva gear movement 21 which may be enclosed in a housing 22 at the left end of the apparatus, as shown in Figs. 1 and 2, the gear system being connected to the shaft 14. A short shaft 23 connects the gear system 21 to a speed reduction gear system 24, which is driven by a splined power shaft 25 positioned at the rear of the apparatus and extending the length thereof.

A number of cards 27 to be profiled are supported during the profiling operation by a cross plate 28 which is mounted between two upright supporting members 29 positioned near either end of the apparatus and fixed to the beams 12. The cards are clamped to the plate 28 by several bolts 30, which are mounted in the plate 28 and engage a plate 31 positioned against the outer card. It will be apparent that, by tightening the bolts 30, the plate 31 may be clamped against the cards 27 to hold them in position against the cross plate 28. A spacer plate 32 of substantially the same configuration as the clamping plate 31 is positioned between the cards and the cross plate 28. The cards are previously apertured to receive the bolts 31.

In practice, it has been found desirable in some cases, when profiling thin cards, to assemble a heavy strip 33 of fibre, or other similar material, at either side of the cards 27 in order to support the edges during the profiling operation and, thus, to prevent bending or breaking of the upper or lower edges of the cards.

The reciprocable cutting assembly, to be described hereinafter, is supported on a platform 34 which is mounted on the longitudinally movable block 13, as shown in Fig. 4, being slidable transversely with respect to the direction of movement of the block 13 to reciprocate a pair of knife-edge cutting tools 35 and 36 relatively to the cards 27. In order to align the platform 34 with the block 13 during transverse reciprocation, the lower portion of the platform 34 is recessed to

form a dovetail slot 37, as shown in Fig. 1, into which extends a dovetail 38, integrally formed with the upper surface of the block 13. A gib 39 is positioned adjacent the dovetail 38 and fixed to the slot 37 to fit the dovetail closely to the slot.

The cutting tools 35 and 36 are positioned respectively above and below the cards so as to profile simultaneously both the upper and lower edges of the cards, the lower tool reciprocating in a fixed plane with respect to the cards while the plane of reciprocation of the upper tool is adjustable so as to cut the desired contours in the upper edges of the cards. The lower cutting tool 36 is mounted, as shown in Fig. 4, on a forwardly projecting portion 40 of a shoulder 41 integrally formed with the upper surface of the slidable platform 34, while the upper cutting tool is mounted on a forwardly projecting portion 42 of a crossbar 43, both tools being held in position by set screws 44. The crossbar 43 is vertically movable on a pair of parallel spaced posts 45, which extend through apertures 46 formed therein and the bases of which are mounted on the platform 34. The upper ends of the posts are fixed to a second crossbar 47. A pair of parallel spaced rods 50, mounted on the crossbar 43, extend rearwardly therefrom and through apertures 51 formed in a crossblock 52 which is positioned at the rear of the apparatus, the rods 50 being slidable therein to permit horizontal reciprocation of the cutting tools with respect to the cards. An aperture 53 is formed in the rear portion of the block 52 to permit a vertically disposed rotatable shaft 54 to extend therethrough, the block 52 being vertically movable with respect thereto.

It will be apparent from the foregoing that the upper cutting tool is vertically movable with respect to the lower cutting tool, the crossbar 43 and block 52 moving vertically as a unit to raise or to lower the plane of reciprocation of the upper cutting tool. Since the posts 45, which extend through the crossbar 43, are supported on the slidable platform 34, on which is mounted the lower cutting tool 36, it will also be apparent that the cutting tools move horizontally as a unit and are, consequently, adapted to cut simultaneously both upper and lower edges of strips positioned therebetween, as hereinbefore described. The plane of reciprocation of the upper tool is controlled by a master cam 56 which extends parallel to the ways 12 and is mounted on the upright members 29. As the cutting tools are moved into engagement with the cards 27, a knife-edge cam follower 57, adjustably mounted on a reduced forward portion 58 of the crossblock 52, engages the upper surface of the master cam 56 and supports the upper cutting tool and associated parts, the crossblock 52 being connected to the cutting tool supporting bar 43 by the rods 50 mounted on the bar 43 and extending through the block 52. Since the entire weight of these several parts is supported on the cam follower 57, which rests on the master cam 56, the plane of reciprocation of the upper cutting tool 35 will depend on the contour of the master cam. The position of the knife-edge cam follower 57 is adjustable with respect to its support by an adjusting screw 59 threaded in the reduced portion 58 of the crossblock 52.

For many purposes, a roller contact could be employed instead of the knife-edge cam follower 57, but where, as in the present instance, the greatest accuracy is required, a cam follower having a knife-edge is more satisfactory. How-

ever, the knife-edge, if permitted to rest on the master cam as the cutting assembly is moved longitudinally, would tend to scrape and, consequently, to change the contour of the master cam. Thus, in the present apparatus, a mechanism is provided whereby, during the longitudinal advance of the cutting assembly, the knife-edge cam follower is disengaged from the master cam. As the cutting tools are moved out of engagement with the cards and into retracted position, a pair of cam arms 60, adjustably mounted on the crossbar 43 and extending rearwardly therefrom, engage inclined portions 61 formed adjacent the edges of the forward upper surface of a small lever 62 which is pivotally supported at one end on a pin pivot 63 journaled in the underside of the block 52, which is recessed to receive the lever 62. The cam arms 60 are movable on the crossbar 43 by adjusting screws 64, threaded in the bar 43, and a pair of set screws 65, also threaded in the bar 43, are provided to engage the lower edges of the cam arms and lock the arms in adjusted position. The other end of the lever 62 carries a roller 66 which rests on the upper surface of the master cam 56 and is mounted on a stud shaft 67 fitted in the end of the lever 62. Thus, as the cam arms 60 engage the portions 61 of the lever 62, the crossbar 43, on which the arms 60 are mounted, and the crossblock 52 are slightly elevated, the weight of the upper cutting tool and associated parts then being carried by the roller 66. Since the cam follower 57 is mounted on the block 52, it is also, consequently, raised from the surface of the master cam. The operation of this apparatus is timed so that, during the period in which the cutting tools have been moved out of engagement with the cards 27 and the cam follower 57 has been raised from the master cam, the shaft 14 is rotated to advance the cutting assembly.

The cutting tools are reciprocated into and out of engagement with the cards 27 by a pair of eccentrics 70 which are rotatable by the shaft 54, being positioned thereon, one above the other. The lower end of the shaft 54 is journaled in and supported by a rectangular housing block 71 which is fixed to the rear of the longitudinally slidable block 13. A pair of upright columns 72 are fixed to either end of the block 71 and support a bolster plate 73, which is mounted between their upper ends, the upper portion of the shaft 54 being journaled in the bolster plate 73 and extending therethrough. The shaft 54 is rotated by the power shaft 25 through a worm 74 which is splined to the shaft 25 and positioned between bearings 75 which are mounted on the forward portion of the upright columns 72. The worm 74 engages a worm gear 76 mounted on the shaft 54 and is keyed thereto. Thus, as the power shaft 25 rotates, the shaft 54 also rotates.

A pair of bearing plates 78 are associated with the eccentrics 70, each plate having a circular aperture 79 formed therein of such a size as to receive one of the eccentrics. The plates 78 are supported in position on their respective eccentrics by a flanged portion 80 integrally formed at the periphery of each eccentric. A retaining plate 85 is mounted on the upper side of each eccentric and extends sufficiently beyond the periphery thereof to retain the associated plate 78 in position. The bearing plates 78 are thus partially interposed between the retaining plates 85 and the flanged portions 80.

The upper bearing plate is connected to the crossbar 47 by a pair of link arms 81, which are

pivotaly mounted on this plate and pivotaly attached to the lugs 82, fixed to the rear of the crossbar 47. The bearing plate which is associated with the lower eccentric is similarly connected to the rear of the slidable platform 34 by a pair of connecting link arms 83 which are pivotaly attached to the platform and to the plate. Consequently, as the eccentrics are rotated by the shaft 54, which is keyed thereto, the link arms 81 and 83 are reciprocated backwards and forwards by the bearing plates 78 and the cutting tools 35 and 36 are thereby reciprocated transversely with respect to the cards 27.

What is claimed is:

1. In a profiling apparatus, means for holding an article to be profiled, means for cutting said article, means for reciprocating said cutting means transversely with respect to said article, means for intermittently advancing said cutting means longitudinally with respect to said article, a support for said cutting means, and means for controlling the plane of reciprocation of said cutting means in accordance with a predetermined pattern, said control means acting directly on said support.

2. In a profiling apparatus, means for holding an article to be profiled, means for cutting said article, means for reciprocating said cutting means transversely with respect to said article, means for intermittently advancing said cutting means longitudinally with respect to said article, means for controlling the plane of reciprocation of said cutting means, and means connected directly to said cutting means for engaging said control means during the cutting operation.

3. In a profiling apparatus, means for holding an article to be profiled, means for cutting said article, means for reciprocating said cutting means transversely with respect to said article, means for intermittently advancing said cutting means longitudinally with respect to said article, means for controlling the plane of reciprocation of said cutting means, means associated with said cutting means for engaging said control means, and means associated with said cutting means for disengaging said engaging means from said control means when said cutting means is advanced longitudinally with respect to the article.

4. In a profiling apparatus, means for holding an article to be profiled, means for cutting said article, means for reciprocating said cutting means transversely with respect to said article, means for intermittently advancing said cutting means longitudinally with respect to said article, a master cam for controlling the plane of reciprocation of said cutting means, and a cam follower carried by said cutting means for engaging the surface of said master cam during the cutting operation.

5. In a profiling apparatus, means for holding an article to be profiled, means for cutting said article, means for reciprocating said cutting means transversely with respect to said article, means for intermittently advancing said cutting means longitudinally with respect to said article, a master cam for controlling the plane of reciprocation of said cutting means, a cam follower associated with said cutting means for engaging the surface of said master cam during the cutting operation, and means for disengaging said follower from said cam when said cutting means is advanced longitudinally.

6. A profiling apparatus comprising means for holding an article to be profiled, means for cut-

ting said article, means for reciprocating said cutting means transversely with respect to said article, means for intermittently advancing said cutting means longitudinally with respect to said article, a master cam for controlling the plane of reciprocation of said cutting means, a cam follower associated with said cutting means for engaging the surface of said master cam during the cutting operation, and means actuated in response to said cutting means moving away from said article for disengaging said follower from said cam.

7. In a profiling apparatus, means for holding an article to be profiled, means for cutting said article, means for reciprocating said cutting means transversely with respect to said article, means for intermittently advancing said cutting means longitudinally with respect to said article, a master cam for controlling the plane of reciprocation of said cutting means, a cam follower associated with said cutting means for engaging the surface of said master cam during the cutting operation, rotatable means engageable with said cam, and means for causing said rotatable means to disengage said follower from said cam at predetermined intervals.

8. In a profiling apparatus, means for holding an article to be profiled, means for cutting said article, a support for said cutting means, means for reciprocating said cutting means transversely with respect to said article, means for intermittently advancing said cutting means with respect to said article, a master cam for controlling the plane of reciprocation of said cutting means, a cam follower associated with said cutting means, a roller rotatably mounted on said cutting means support and engageable with said cam, and means for engaging said roller with said master cam to raise said cam follower from said cam during the advancing of said cutting means.

9. In a profiling apparatus, means for holding an article to be profiled, means for cutting said article, a support for said cutting means, means for reciprocating said cutting means transversely with respect to said article, means for intermittently advancing said cutting means with respect to said article, a master cam for controlling the plane of reciprocation of said cutting means, a cam follower associated with said cutting means, a roller rotatably mounted on said cutting means support and engageable with said cam, and means for engaging said roller with said master cam, said means being actuated in response to said cutting means moving away from said article.

10. In a profiling apparatus, means for supporting an article to be profiled, means for cutting said article, means for supporting said cutting means, means for reciprocating said cutting means transversely with respect to said article, means for intermittently advancing said cutting means longitudinally with respect to said article, a roller, a support for said roller pivotaly mounted on the support for said cutting means, a master cam for controlling the plane of reciprocation of the cutting means, a cam follower associated with said cutting means for engaging the surface of said cam, and means associated with said cutting means for engaging the roller with said cam to raise the cam follower from said cam at predetermined intervals.

11. An apparatus for profiling an article comprising a support for an article to be profiled, means for cutting said article, a support for said cutting means, means for reciprocating said cut-

ting means with respect to said article, means for intermittently advancing said cutting means longitudinally with respect to said article, a roller, a support for said roller pivotally mounted on said cutting means support, a master cam for controlling the plane of reciprocation of said cutting means, a cam follower associated with said cutting means and mounted on said cut-

ting means support, and a cam arm mounted on said cutting means support and engageable with said roller support in response to said cutting means moving away from said article to engage said roller with said master cam and to raise said cam follower from said master cam at predetermined intervals.

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