Aug. 8, 1950 R. B. LUCKENBACH 2,517,901

CONTOURING MACHINE

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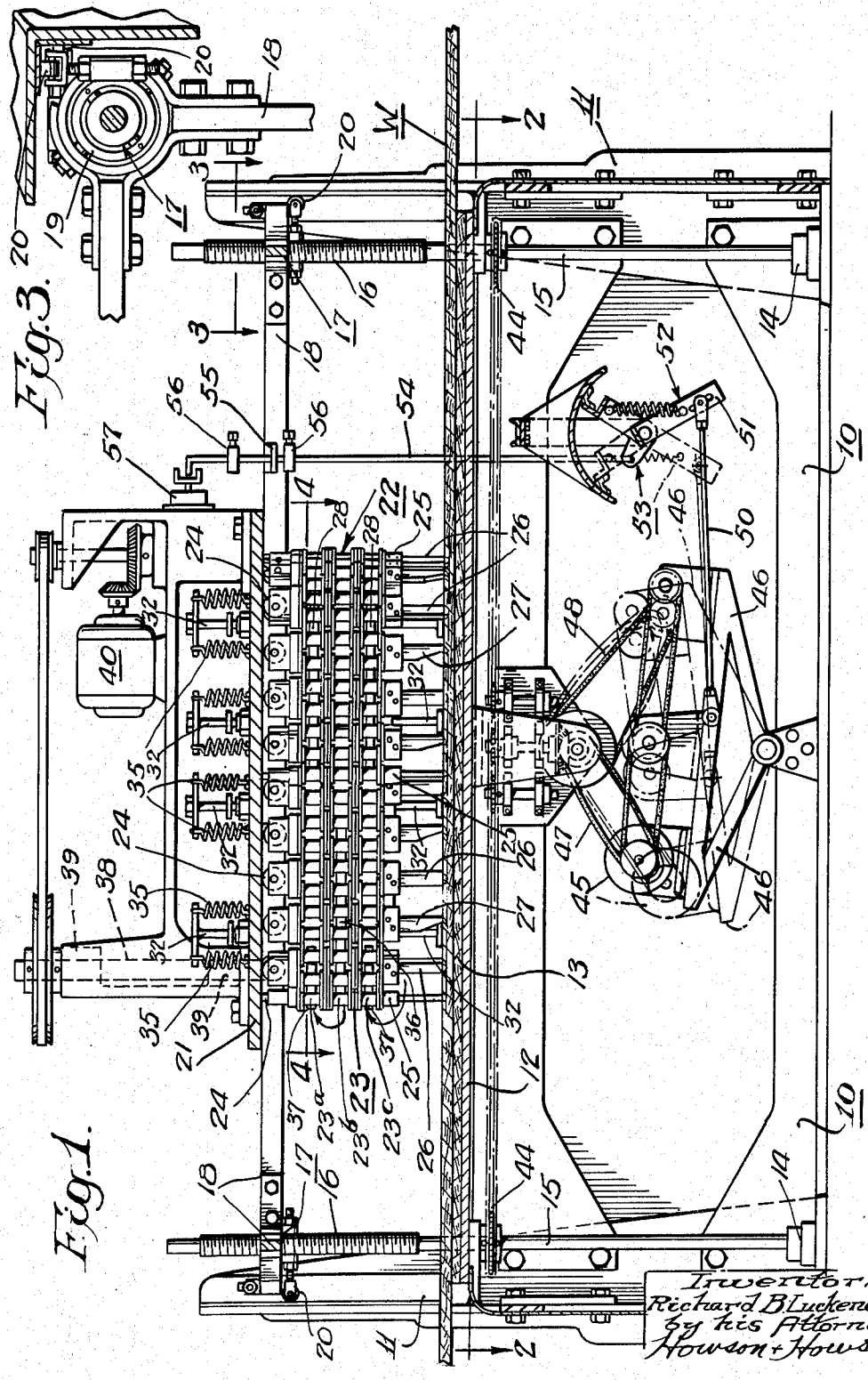


Fig. 1.

Fig. 3.

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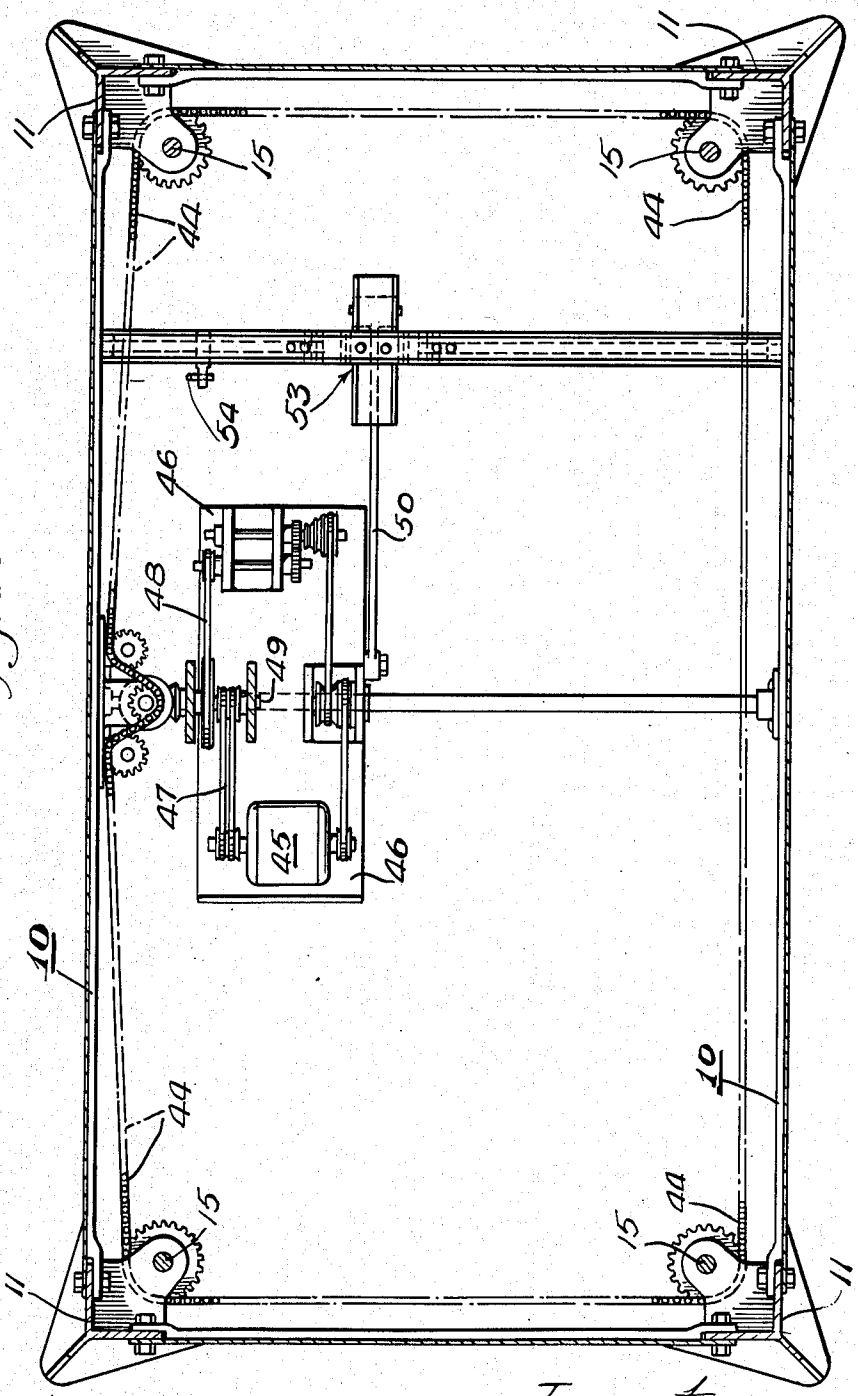


Fig. 2.

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CONTOURING MACHINE

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Fig. 4.

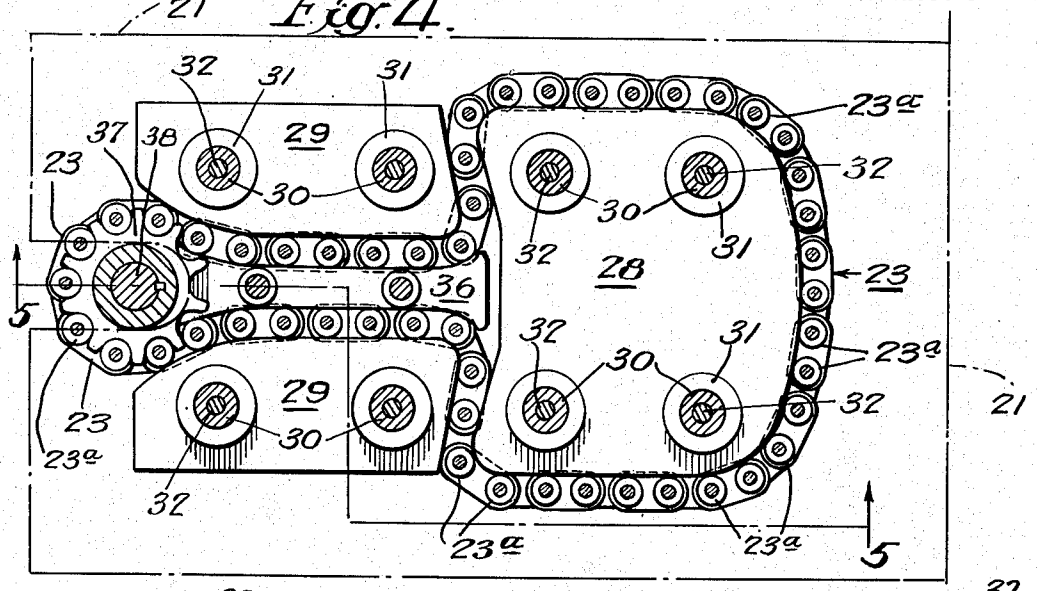


Fig. 5.

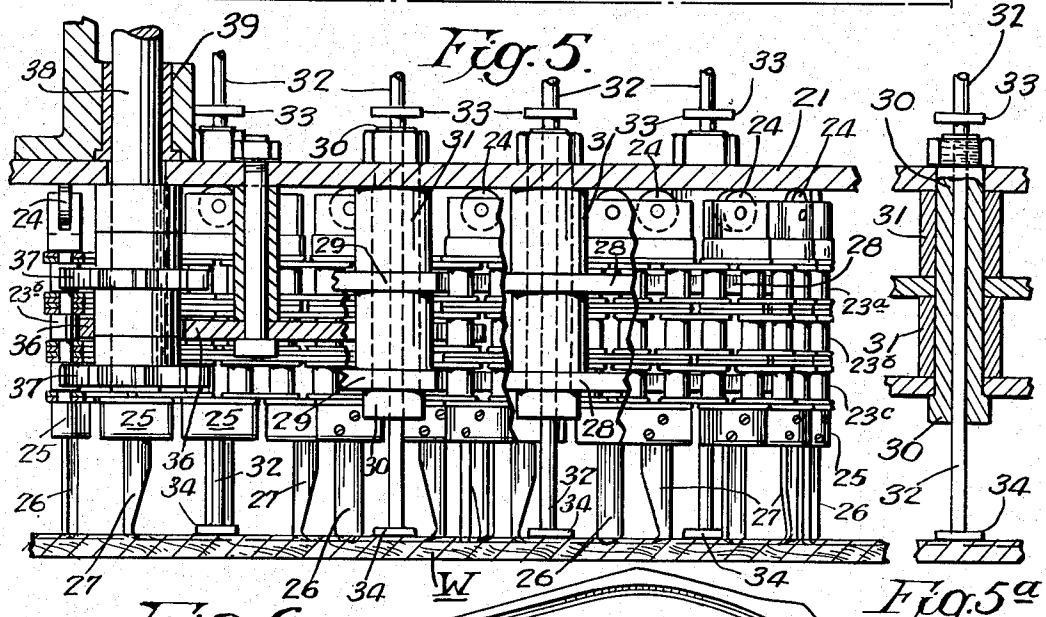
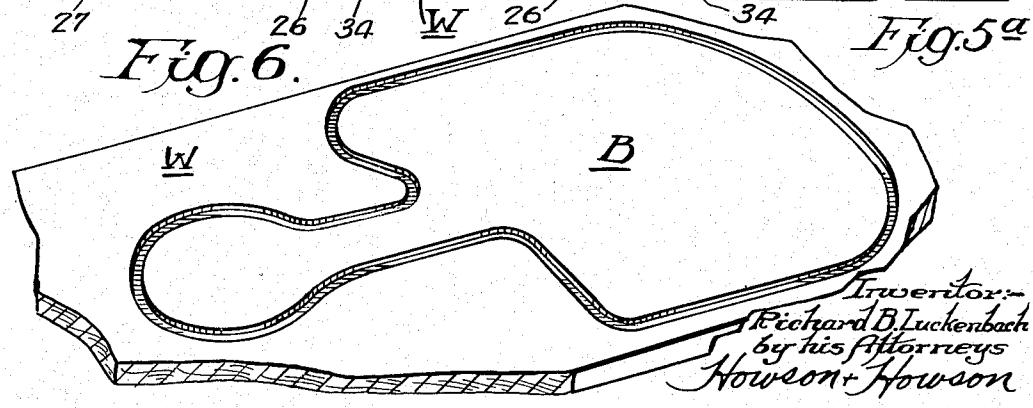


Fig. 5a

Fig. 6.



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CONTOURING MACHINE

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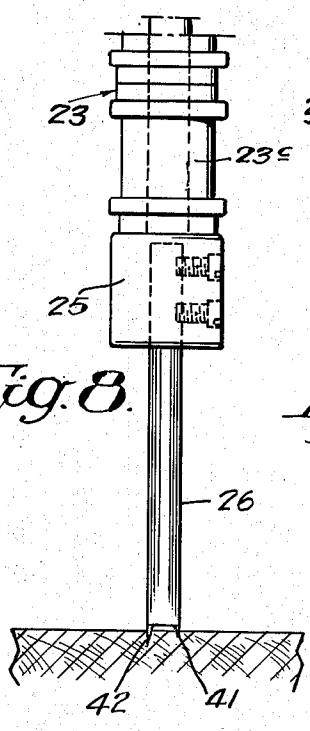


Fig. 8.

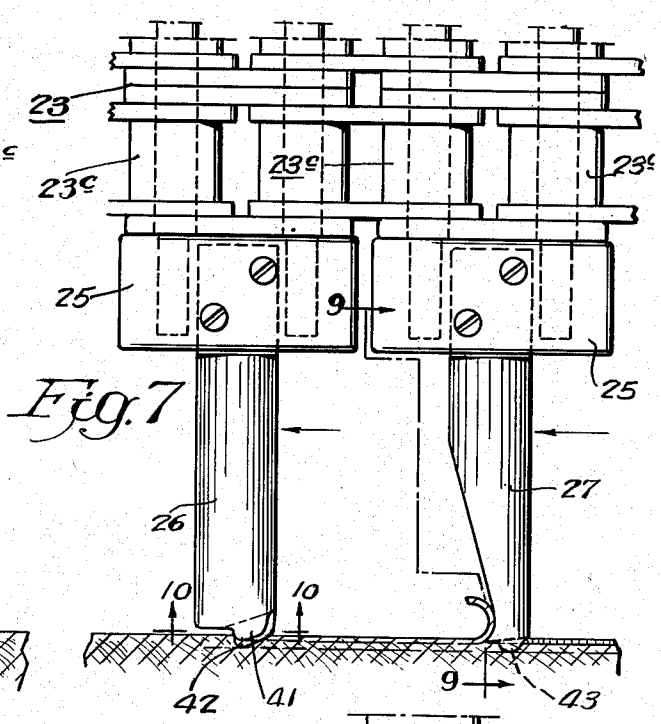


Fig. 7.

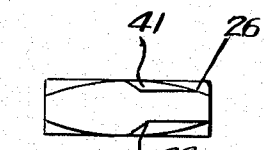


Fig. 10.

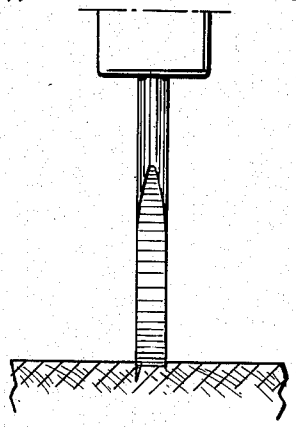


Fig. 9.

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UNITED STATES PATENT OFFICE

2,517,901

CONTOURING MACHINE

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Application January 31, 1945, Serial No. 575,519

16 Claims. (Cl. 144—144)

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This invention relates to contouring machines and more particularly to an apparatus for cutting from sheets or strips of material, such as wood, plastic, or metal, articles of irregular form.

An important object of the invention is the production of a machine which, with but slight changes which may be readily made, may be adapted for cutting various irregular forms from sheet material and which will effect this operation rapidly.

Another object is the provision in a machine of this character of an arrangement whereby both the sheet or strip and the piece severed therefrom may be very firmly held during the cutting operation.

Still another object is the provision of a novel and improved means for supporting and guiding an endless cutter bearing chain for effecting irregular contour cutting.

A still further object is the provision of novel and improved cutters for use in connection with such a chain having means to reduce defective guiding and to eliminate to a great extent possible chatter.

These and other objects I attain by the construction shown in the accompanying drawings, wherein for the purpose of illustration I have shown a preferred embodiment of my invention and wherein:

Fig. 1 is a longitudinal sectional view through a contouring machine constructed in accordance with my invention;

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

Fig. 3 is an enlarged section on line 3—3 of Fig. 1;

Fig. 4 is a section on line 4—4 of Fig. 1;

Fig. 5 is a section on line 5—5 of Fig. 4;

Fig. 5a is a vertical section through one of the guide supports;

Fig. 6 is a perspective view of a working strip illustrating a partially cut out contoured piece of the character shown in the arrangement of Fig. 4;

Fig. 7 is an enlarged fragmentary illustration of two adjacent links of the chain;

Fig. 8 is an end elevation of the scoring tool;

Fig. 9 is an end elevation of the routing tool; and

Fig. 10 is a bottom plan view of the scoring tool.

Referring now more particularly to the drawings, the numeral 10 generally designates a base from which, through standards 11, a work support 12 is supported. This work support, for a purpose which will presently appear, is provided with a removable and replaceable cover sheet or strip 13 which may be, if so desired, of the same

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material as that upon which the machine is intended to act. Standards 11 are arranged at each of four corners of the base, and supported in bearings 14 carried by the base and standards, are vertically directed shafts 15 having their upper ends threaded as indicated at 16. Mounted upon the threaded upper end portion 16 of each shaft is a nut 17 supporting one corner of a frame 18. The supporting connection between nut 17 and frame 18 is, due to possible slight misalignments of the shaft or slight deflections of the shaft, in the form of gimbal rings 19 (see Fig. 3). The standards 11 are preferably in the form of angle members, the inner sides of which provide vertical guides against which guide rollers 20 secured to the outer ring of the gimbal joint abut so that the frame 18 may be firmly held against displacement.

Supported by the frame 18 and paralleling the work support 12 is a head plate 21 mounting the cutter assembly 22. This cutter assembly comprises a sprocket chain 23, each link of which preferably comprises a plurality of vertically spaced roller sections 23a, 23b and 23c mounted upon common pivots. The heads or upper ends of the pivots mount rollers 24 engaging the under surface of plate 21 while the lower ends thereof mount tool sockets 25 bearing scoring or routing tools indicated at 26 and 27 respectively. The chain 23 is guided in its movement by interiorly and exteriorly disposed guide members 28 and 29 (see Fig. 4) which are arranged in vertically spaced pairs in position for engagement with the roller sections of the upper and lower ring sections 23a and 23c of the chain, these guides being provided in sufficient number to insure travel of the chain upon a predetermined path. As at present shown, the guide members are in the form of flat sheets supported from the plate 21 through bolts 30, spacers 31 being provided upon the bolt to maintain the guides at their proper levels. In addition to their function as guides, the guide plates furthermore serve as a means for assisting in supporting the remainder of the assembly during elevation of the frame from the work, since, as will be noted, from an inspection of Fig. 4, the leaves of the chain are of slightly greater width than the diameter of the rolls and will accordingly overlie the edges of these guide plates.

The bolts 30 are hollow and have slidably directed therethrough hold-down plungers 32, downward movement of which is limited by a stop 33 engaging the upper end of the associated bolt when the foot 34 of the plunger is disposed slightly below the lower ends of the cutters 26 and 27 (see

Figs. 5 and 5a). These plungers are urged downwardly by springs 35 (Fig. 1) connected between the upper ends of the plungers and the plate 21 and serve to engage the work piece both interiorly and exteriorly of the path traversed by chain 23, coming into engagement with the work piece prior to engagement of the cutters therewith and remaining in contact with the work piece as the cutters recede therefrom until after the cutters are completely withdrawn. In some instances, it may be desirable to provide an additional guide plate or plates 36 as shown in the present illustration, this guide plate aligning with and engaging the central section 23b of the chain 23.

At a suitable point in its travel, the chain is engaged by driving sprocket 37 which may, if so desired and as shown in the present instance, serve as a guide for the chain during a portion of its travel. Sprocket 37 is secured to shaft 38 mounted in bearings 39 supported on the upper surface of plate 21. Likewise, supported from this plate is a drive motor 40 (Fig. 1) for shaft 38.

The guiding means for chain 23 may take a variety of forms, one of which is at present illustrated and, as will be noted, these forms may include relatively sharp arcuate curves, that at present illustrated being the form for a seat for a child's toy. The scoring and routing tools employed must be of such character that they may operate about such curves and to this end, the operative portions of these tools have their side faces arcuately curved in the direction of travel upon arcs having a radius substantially that of, and not greater than that of the smallest radius of the path upon which they are to travel. The scoring tool 26 has at opposite sides thereof, blades 41 and 42 which do not remove material but are adapted to form crease kerfs to define the width and depth of the material to be removed by the routing cutter (see Figs. 7, 8 and 10). Blade 42 forms a kerf of greater depth than the kerf formed by blade 41 which kerf is adapted to receive a keel 43 on the lower face of the routing cutter 27. These cutters are alternated in the chain. In the present illustration, there is direct alternation but in some instances, it may be desirable that these blades be disposed in alternate groups or in groups alternated with a single blade of the other type and it will be understood that it is in this sense that the term "alternated" is employed in the claims.

Means are provided for operation of the shafts 15 to cause the assembly to move toward and away from the work support. In the present instance, the shafts 15 are shown as provided with a chain and sprocket connection 44, the chain being driven from a motor 45 (see Figs. 1 and 2). The motor 45 is mounted upon an oscillatory support 46 and is connected through feed and reverse driving belts 47 and 48 to a pulley shaft 49 disposed centrally of and above the oscillatory support 46. As shown, the drive belts 47 and 48 extend to the shaft 49 from opposite ends of the oscillatory platform with the result that upon oscillation of the platform, one of the belts 47 or 48 will be tightened as the other is loosened. This support is linked at 50 to one member 51 of a snap action toggle 52, the second element of which is connected through a bell crank arm 53 to a vertical rod 54 directed through a bracket 55 carried by one member of frame 18. Through stops 56 secured to this rod and engaging the bracket, the snap action of the toggle may be brought into play at desired points during raising and lowering of frame 18, and accordingly, of the assembly 22. Relative movement of the rod 54 and the frame 18 may likewise be employed to operate switch 57 interrupting operation of the motor 40 as the frame is being elevated to disengage the assembly from the work and restarting the motor when travel of the assembly to the work commences.

In Fig. 1, the apparatus has been illustrated in the course of performing the cutting operation. At this time, the direction of operation of worm shafts 15 is such that the frame 18 and accordingly the assembly 22 is being fed downwardly. The scoring cutters produce the side kerfs, one of which provides a guide for the succeeding routing cutters and since the number of cutters is multiplied, the downward feed may be made at a relatively rapid rate. When the assembly has been fed downwardly to a point where the blank B has been completely severed from the work piece W, the bracket 55 has engaged the lower stop 56 and depressed the same sufficiently to cause a reversal of the position of the toggle mechanism 52, and accordingly a reversal of position of the oscillatory support 46 and the direction of drive of shafts 15. The final action of rod 54 operates switch 57 stopping the assembly. Shafts 15 are preferably operated at a much higher speed during the retraction of the assembly. As the assembly is elevating, the work piece is shifted to a new position and when the assembly reaches a predetermined raised position, the toggle mechanism 52 is again actuated and switch 57 operated to restart the assembly 22. As the assembly lowers, the hold-down elements 34 come into engagement with the work piece and the blank B prior to engagement of the tools therewith so that the work piece is very firmly held.

Since the construction herein illustrated is obviously capable of considerable modification without departing from the spirit of my invention, I do not wish to be understood as limiting myself thereto except as hereinafter claimed.

I claim:

1. In a contouring machine, a work support, a plurality of pairs of elements disposed normal to said work support and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, and means to support and guide said pairs of elements for movement serially through a predetermined endless path comprising fixedly mounted guide means arranged to engage predetermined bearing sections of said pairs of elements.

2. In a contouring machine, a work support, a plurality of pairs of elements disposed normal to said work support and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements for movement serially through a predetermined endless path comprising fixedly mounted guide members arranged to engage predetermined bearing sections of said elements from at least one side of said path, and tools carried by said pairs of elements arranged to engage work on said support.

3. In a contouring machine, a work support, a plurality of pairs of elements disposed normal to said work support and each having a plurality of

vertically spaced bearings sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements for movement serially through a predetermined endless path comprising fixedly mounted guide members arranged to engage predetermined bearing sections of said elements, and drive mechanism operable to actuate said pairs of elements as a group through said path.

4. In a contouring machine, a work support, a plurality of pairs of elements disposed normal to said work support and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements for movement serially through a predetermined endless path comprising fixedly mounted guide members arranged respectively to engage predetermined bearing sections of said elements, tools carried by said pairs of elements arranged to engage work on said support, drive mechanism operable to actuate said pairs of elements as a group through said path, means to bodily relatively shift said pairs of elements and work support to cause said tools to engage and disengage work on the support, and mechanism automatically operable in response to the position of the tools relative to the work for controlling operation of said drive mechanism.

5. In a contouring machine, a work support, a head plate overlying said work support parallel thereto, a plurality of pairs of elements disposed intermediate said plate and support normal thereto and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements for movement serially through a predetermined endless path comprising guide members arranged to engage predetermined bearing sections of said elements from at least one side of the said path, drive mechanism operable to actuate said pairs of elements as a group through said paths, anti-friction means carried by said pairs of elements and engaging said head plate, and tools carried by said pairs of elements and arranged to engage work on said support.

6. In a contouring machine, a work support, a head plate overlying said work support parallel thereto, a plurality of pairs of elements disposed intermediate said plate and support normal thereto and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements from said head plate for movement serially through a predetermined endless path comprising guide members arranged to engage the bearing sections of said elements from opposite sides of the said path, drive mechanism operable to actuate said pairs of elements as a group through said path, anti-friction means carried by said pairs of elements and engaging said head plate, tools carried by said pairs of elements and arranged to work on said support, and means to bodily relatively shift the head plate and work support to cause said tools to engage and disengage work on said support.

7. In a contouring machine, a work support, a head plate overlying said work support parallel thereto, a plurality of pairs of elements disposed intermediate said plate and support normal thereto and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements from said head plate for movement serially through a predetermined endless path comprising guide members arranged to engage the bearing sections of said elements from opposite sides of the said path, drive mechanism operable to actuate said pairs of elements as a group through said path, anti-friction means carried by said pairs of elements and engaging said head plate, tools carried by said pairs of elements and arranged to engage work on said support, means to bodily relatively shift the head plate and work support to cause said tools to engage and disengage work on said support, and spring urged hold-down means carried by said head plate arranged to engage and hold work on the support while engaged by said tools.

8. In a contouring machine, a work support, a head plate overlying said work support parallel thereto, a plurality of pairs of elements disposed intermediate said plate and support normal thereto and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements from said head plate for movement serially through a predetermined endless path comprising guide members arranged to engage the bearing sections of said elements from opposite sides of the said path, drive mechanism operable to actuate said pairs of elements as a group through said path, anti-friction means carried by said pairs of elements and engaging said head plate, tools carried by said pairs of elements and arranged to engage work on said support, means to bodily relatively shift the head plate and work support to cause said tools to engage and disengage work on said support, and mechanism automatically operable in response to the position of said tools relative to work on the support for controlling operation of said last-mentioned means.

9. In a contouring machine, a work support, an assembly comprising a plurality of pairs of elements disposed normal to said work support and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements for movement serially through a predetermined endless path comprising fixedly mounted guide means arranged to engage predetermined bearing sections of said elements, drive mechanism operable to actuate said pairs of elements as a group through said path, tools carried by said pairs of elements and arranged to engage work on said support, a plurality of spaced threaded shafts having their axes normal to the work support connections between said shafts and said assembly, and means to rotationally drive said shafts to

bodily relatively shift the assembly and work support to cause said tools to engage and disengage work or said support.

10. In a coutouring machine, a work support, a head plate overlying said work support parallel thereto, a plurality of pairs of elements disposed intermediate said plate and support normal thereto and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements from said head plate for movement serially through a predetermined endless path comprising guide members arranged to engage predetermined bearing sections of said elements from at least one side of the said path, drive mechanism operable to actuate said pairs of elements as a group through said path, anti-friction means carried by said pairs of elements and engaging said head plate, tools carried by said pairs of elements and arranged to engage work on said support, a plurality of spaced threaded shafts having their axes normal to the head plate, connections between said shafts and said head plate, means to rotationally drive said shafts to bodily relatively shift the head plate and work support to cause said tools to engage and disengage work on said support, and spring urged hold-down means carried by said head plate arranged to engage and hold work on the support while engaged by said tools.

11. In a contouring machine, a work support, an assembly comprising a plurality of pairs of elements disposed normal to said work support and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements for movement serially through a predetermined endless path comprising guide members arranged to engage predetermined bearing sections of said elements from at least one side of said path, drive mechanism operable to actuate said pairs of elements as a group through said path including means connecting all of said pairs of elements, tools carried by said pairs of elements and arranged to engage work on said support, a plurality of spaced threaded shafts having their axes normal to the support, a connection between each of said shafts and said assembly comprising a gimbal joint mounting, and means to rotationally drive said shafts to bodily relatively shift the assembly and work support to cause said tools to engage and disengage work on said support.

12. In a contouring machine, a work support, a head plate overlying said work support parallel thereto, a plurality of pairs of elements disposed intermediate said plate and support normal thereto and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements from said head plate for movement serially through a predetermined endless path comprising guide members arranged to engage predetermined bearing sections of said elements from the inner and outer side of said path, drive mechanism operable to actuate said pairs of elements as a group through said path, anti-

friction means carried by said pairs of elements and engaging said head plate, tools carried by said pairs of elements and arranged to engage work on said support, a plurality of spaced threaded shafts having their axes normal to the head plate, a connection between each of said shafts and said head plate comprising a gimbal joint mounting, means to rotationally drive said shafts to bodily relatively shift the head plate and work support to cause said tools to engage and disengage work on said support, and hold-down means carried by said head plate arranged to engage and hold down work on the support while engaged by said tools.

13. In a contouring machine, a work support, an assembly comprising a plurality of pairs of elements disposed normal to said work support and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements from said head plate for movement serially through a predetermined endless path comprising guide members arranged to engage predetermined bearing sections of said elements from at least one side of said path, means to bodily relatively shift the assembly and work support, and intercooperating means associated respectively with said assembly and work support operable to guide the assembly and support normal to one another during relative bodily shifting thereof.

14. In a contouring machine, a work support, a head plate overlying said work support parallel thereto, a plurality of pairs of elements disposed intermediate said plate and support normal thereto and each having a plurality of vertically spaced bearing sections thereon, means intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements from said head plate for movement serially through a predetermined endless path comprising guide members arranged to engage predetermined bearing sections of said elements, drive mechanism operable to actuate said pairs of elements as a group through said path, means to bodily relatively shift the head plate and work support, and intercooperating means associated respectively with said head plate and work support operable to guide the head plate and support normal to one another during relative bodily shifting thereof.

15. In a contouring machine, a work support, an assembly comprising a plurality of pairs of elements disposed normal to said work support and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements for movement serially through a predetermined endless path comprising guide members arranged to engage predetermined bearing sections of said elements, drive mechanism operable to actuate said pairs of elements as a group through said path, tools carried by said pairs of elements and arranged to engage work on said support, a plurality of spaced threaded shafts having their axes normal to the work support, a connection between each of said shafts and said

assembly comprising a gimbal joint mounting, means to rotationally drive said shafts to bodily relatively shift the assembly and work support to cause said tools to engage and disengage work on said support, and intercooperating members associated with said assembly and support operable to guide the assembly and support normal to one another during relative bodily shifting thereof.

16. In a contouring machine, a work support, an assembly comprising a plurality of pairs of elements disposed normal to said work support and each having a plurality of vertically spaced bearing sections thereon, members intermediate each of said bearing sections connecting the elements of each pair and pivotally connecting said pairs of elements to form therewith an endless chain, means to support and guide said pairs of elements for movement serially through a predetermined endless path comprising guide members arranged to engage predetermined bearing sections of said elements, drive mechanism operable to actuate said pairs of elements as a group through said path, tools carried by said pairs of elements and arranged to engage work on said support, a plurality of spaced threaded shafts having their axes normal to the work support, a connection between each of said shafts and said assembly comprising a gimbal joint mounting, means to rotationally drive said shafts to bodily relatively shift the assembly and work support, guide means fixedly mounted about the work support normal thereto and cooperatively engaging bearing surfaces on

said assembly to guide the same and said support normal to one another during relative bodily shifting thereof.

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