March 25, 1930. E. HOPE ET AL 1,751,549

MACHINE FOR OPERATING UPON BLANKS OF SHEET MATERIAL

Filed Sept. 4, 1924 2 Sheets-Sheet 1

Fig. 1.

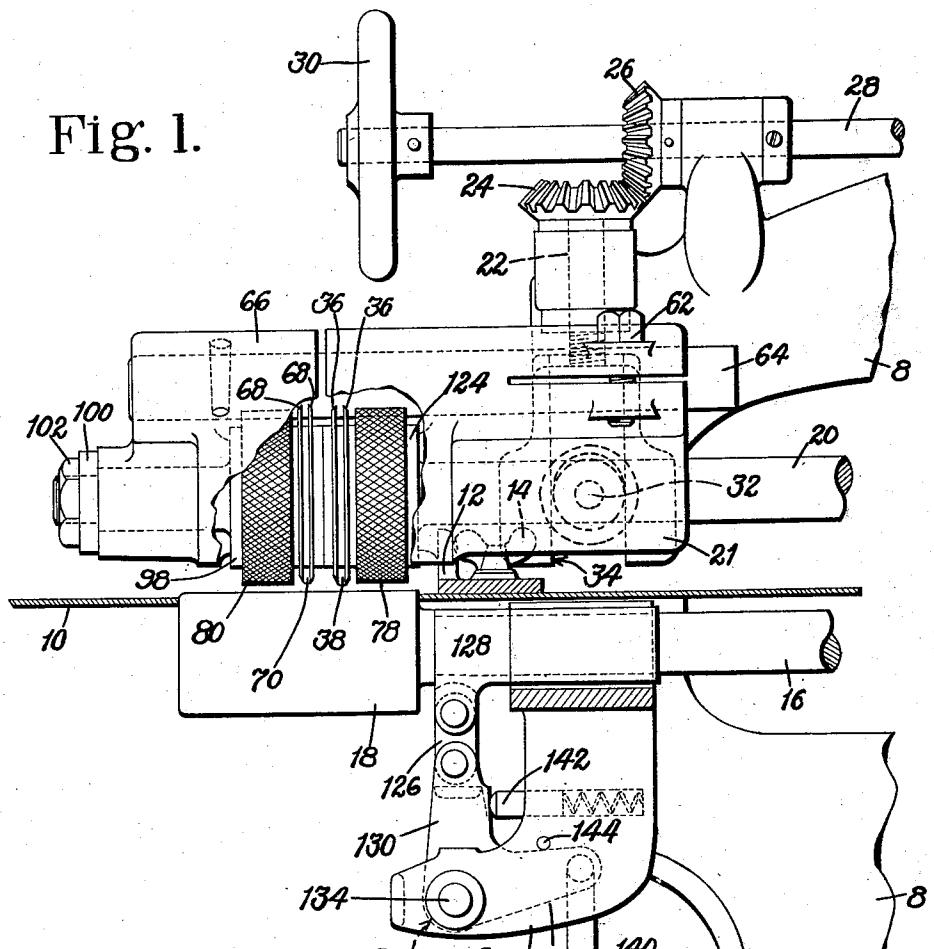
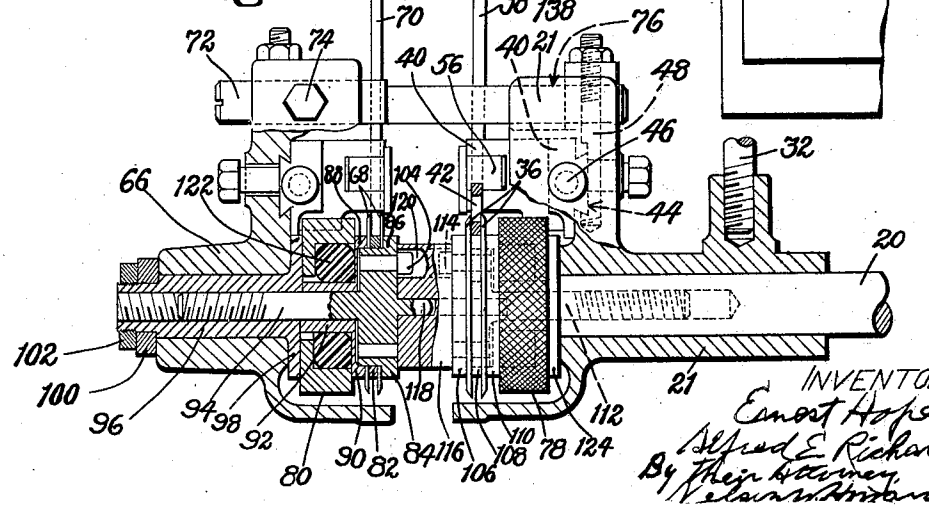


Fig. 2.



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Filed Sept. 4, 1924 2 Sheets-Sheet 2

Fig. 3.

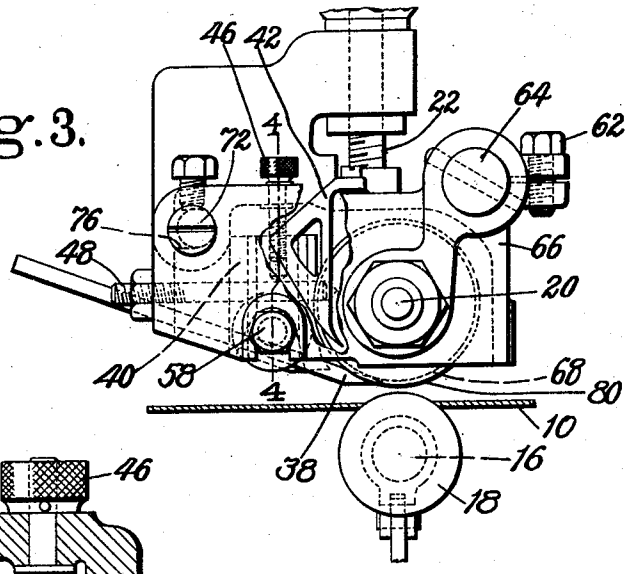


Fig. 4.

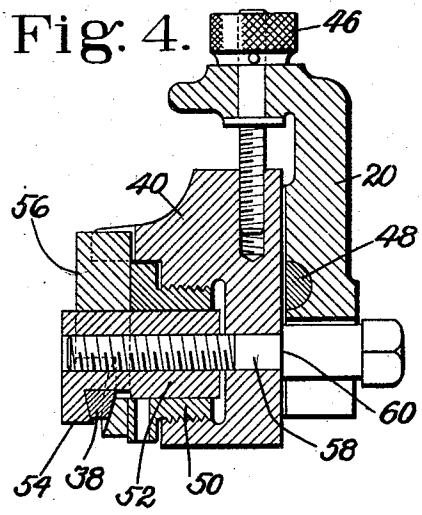


Fig. 5.

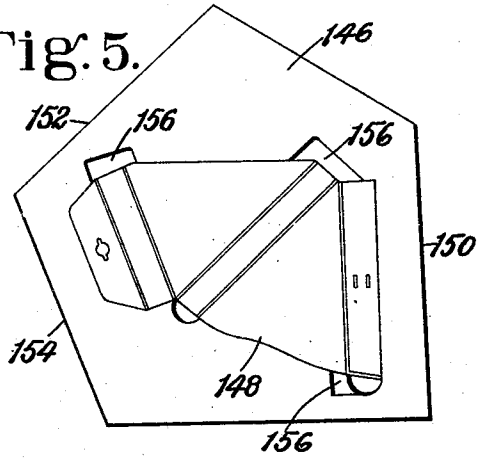


Fig. 6.

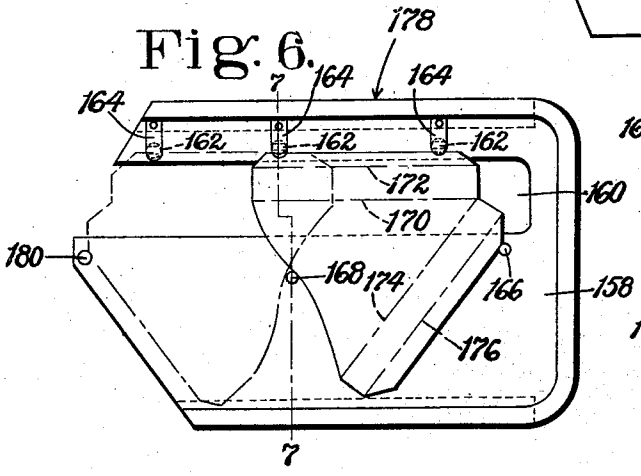
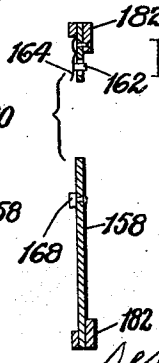


Fig. 7.



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UNITED STATES PATENT OFFICE

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MACHINE FOR OPERATING UPON BLANKS OF SHEET MATERIAL

Application filed September 4, 1924, Serial No. 735,863, and in Great Britain September 6, 1923.

This invention relates to machines for operating upon blanks of sheet material and is herein illustrated as embodied in a machine for grooving or scoring leather blanks for suit cases or small bags of irregular shape, such as tool bags for bicycles.

In the manufacture of cases and bags such as have been referred to, a blank is cut from a sheet of leather, leather-board or other material of such a shape that when the blank is bent or folded and its abutting edges are secured together, as by stitching, a case or bag of the desired shape is produced. To facilitate the bending or folding of the blanks, they are usually grooved on that face of the blank which, in the finished article, will constitute the inner face.

Machines of the type employed for forming grooves in blanks for suit cases and the like commonly comprise a pair of disk cutters arranged to form the opposite sides or edges of a groove, and a stationary gouging knife located between the disk cutters for forming the bottom of the groove, and the work is fed past the cutters by means of a feed roll which projects through an opening in a supporting table and engages the lower face of the blank immediately beneath the disks, the disks cooperating with the roll in the feeding of the blank. If, however, it is desired to cut a groove which is substantially semi-circular in cross-section, such a groove will be formed by the stationary gouging knife and the disk cutters will not penetrate to any appreciable extent into the blank, but will serve merely to define more or less sharply the opposite edges of the groove. In such a case, the disk cutters will not appreciably assist the lower feed roll in the feeding of the blank.

One object of the present invention is to provide simple and reliable means to facilitate the feeding of the blank under conditions such as just adverted to.

To this end, a feature of the invention consists in the provision, in a machine for grooving a piece of stock, of a driving shaft carrying a grooving tool, a work support fixed relatively to the axis of said shaft and tool, a work-feeding roll mounted upon the shaft and in driving connection therewith, the roll being normally coaxial with the shaft, and compressible means between the roll and the shaft adapted to yield transversely of the shaft with variations in the thickness of the work so that the passage beneath the roll of a relatively thick portion of the work will not interfere with the feed of the work.

As illustrated, a pair of disk cutters are carried by a sleeve which is fixed to the driving shaft and the upper feed roll comprises an annular member which loosely encircles the sleeve, and in order that the feed roll may yield bodily transversely of the shaft, a rubber ring is interposed between the roll and the sleeve, the ring being adapted to yield with variations in the thickness of the stock, while the cutters are unaffected by this yielding movement. As a result, a groove will be formed which, at its bottom, has a thickness of material between it and the opposite face of the work which is unaffected by local variations in the thickness of the work.

The above and other aspects of the invention will be readily understood by those skilled in the art from the following description, reference being had to the accompanying drawings, in which:—

Fig. 1 is a view, partially in side elevation and partially in section, of the front portion of a grooving machine embodying work-feeding devices constructed in accordance with the present invention;

Fig. 2 is a view, partially in plan and partially in section, of the mechanism shown in Fig. 1;

Fig. 3 is a view in front elevation of the parts shown in Fig. 1;

Fig. 4 is a detail sectional view upon an enlarged scale taken along the line 4—4 of Fig. 3;

Fig. 5 is a plan view of a jig used in connection with the grooving machine, a blank being shown mounted in fixed relation to the the jig preparatory to being fed to the grooving machine;

Fig. 6 is a plan view showing a jig of modified construction and illustrating the manner in which a blank is mounted thereon; and

Fig. 7 is a detail sectional view taken on the line 7—7 of Fig. 6.

The illustrated machine is adapted to cut two parallel grooves at the same time, but may be readily adjusted to cut only a single groove as a blank is fed past the grooving tools. The operating parts of the machine are mounted upon a C-shaped frame the forward portions of which are shown at 8 in Fig. 1 of the drawings. Fixed to the frame is a table 10 upon which the work is supported and across which the work is fed to the grooving tools. An edge gage 12 is secured to the table 10 by means of a thumb screw 14, the arrangement being such as to permit adjustment of the edge gage toward and from the grooving tools, and a suitable scale may be provided to facilitate the positioning of the gage. Beneath the work table 10 suitable bearings are provided for a horizontal shaft 16 upon the front end of which is fixed a smooth-surfaced, lower feed roll 18 which project through an opening in the table. Parallel to the shaft 16, and located directly above it, is a shaft 20 which is journaled in suitable bearings adjustably mounted upon the frame 8, one of these bearings being shown at 21. These bearings are adjustable vertically according to the depths of the grooves which it is desired to cut, or in order to vary the thickness of the material at the bottom of the grooves, and for these purposes each bearing for the shaft 20 has a vertical screw-threaded bore which receives the lower threaded end of a vertical shaft, one of these shafts being shown at 22 in Fig. 1. The vertical shaft 22 has fixed to its upper end a bevel gear 24 which meshes with a bevel gear 26 fast on a horizontal shaft 28. A gear corresponding to the gear 24 is fixed to the vertical shaft supporting the rearmost bearing for the shaft 20, and this gear is connected by means of a suitable bevel gear with the shaft 28. The shaft 28 is journaled in suitable bearings on the frame 8 and is provided at its forward end with a hand wheel 30 by means of which the shaft 28 may be turned to raise or lower the shaft 20. The adjustable bearings for the shaft 20 may be locked in adjusted position by means of bolts passing through vertical slots in the frame, the bolt and slot associated with the front bearing being shown at 32 and 34, respectively, in Fig. 1.

At the left-hand end of the shaft 20 (as viewed in Fig. 1) is fixed a pair of disk cutters 36, 36 spaced apart a distance corresponding to the width of the groove which it is desired to cut, the cutters 36 forming the opposite sides of the groove. The bottom of the groove is cut by a fixed knife 38 the cutting area of which projects between the disk cutters. The knife 38 is fixed in a block 40 (Fig. 2) adjustable vertically on the bearing 21. A stripper 42 is also mounted on the bearing 21 and projects between the disk cutters 36, 36 and above the knife 38 to remove the waste portion cut by the knife. The block 40 is slidably mounted in a vertically dove-tailed guideway 44 formed in the bearing 21 and is capable of being adjusted therein, to raise or lower the knife 38 relatively to the disk cutters 36, by means of a screw 46 rotatably mounted in the bearing 21 and threaded into the block 40. The block 40 is locked in adjusted position by means of a hooked bolt 48 engaging the block 40 and mounted in the bearing 21.

The knife 38 is fixed to the block 40 so that it may be adjusted laterally, i. e. axially of the disk cutters 36, 36, to position it directly between the disk cutters. For this purpose the block 40 has threaded into it a sleeve 50 and the sleeve 50 has slidingly mounted in it a nut 52 having a lip 54 which engages one side of the knife 38. A collar 56 encircles the nut 52 and is formed to engage the other side of the knife. A screw 58 passing through the block 40 is threaded into the nut 52 and is provided with a shoulder 60 which engages the block. The screw 58 clamps the knife 38 between the lip 54 and clamps the collar 56 against the face of the sleeve 50. By slackening the screw 58 and adjusting the sleeve 50 in the block 40, the knife 38 may be adjusted readily to position it properly between the disk cutters.

The bearing 21 has clamped to it by means of a screw 62 one end of a shaft 64 which has pinned to its opposite end a bracket 66 which supports a stripper similar to the stripper 42, a second pair of disk cutters 68, 68 similar to the disk cutters 36, 36, and a grooving knife 70. The bracket 66 may be adjusted about the axis of the shaft 64 accurately to aline the axes of the disk cutters 36, 36 and 68, 68 by means of an eccentric shaft 72 (Figs. 2 and 3) one end of which is fixed in the bracket 66 by a screw 74 and the other end of which enters a slot 76 in the bearing 21.

The knives 38 and 70 may have straight or curved edges according to the shape of the groove desired, and if a straight edged knife is used, the cutting edge will be set in relation to the disk cutters so that the cutters will extend to the bottom of the groove (that is, so that the edge of the knife is level with and just inside the edges of the disk cutters). The disk cutters are thus adapted to form the side faces of the groove, but if the fixed knife is curved to form a groove which is substantially semi-circular in cross-section, the disk cutters will barely cut below the surface of the material and will do no more than define the opposite edges of the groove. Under these latter circumstances, the disk cutters cannot appreciably assist the lower feed roll 18 in feeding the work, and in order to assist the feeding of the stock under these conditions there are provided upper feed rolls 78 and 80 associated with the grooving cutters. It will be under-

stood that if the bracket 66 and the grooving cutters carried thereby are removed, the machine may be used to cut a single groove. When used for cutting two parallel grooves, the bracket 66 may be adjusted toward or from the bearing 21 to vary the distance apart of the grooves which are to be cut, there being provided for this purpose, as will hereinafter be described, distance pieces of varying thickness which determine the spacing of the grooves.

The disk cutters 68, 68 and a spacing ring 82 between them (which may vary in thickness to vary the width of the groove) are mounted on a head 84 and are clamped between a flange 86 on the head 84 and a flange 88 on a collar 90. The collar 90 has a sleeve portion 92 through which passes a stem 94 projecting from the member 84, said stem being threaded within a sleeve 96 journaled in the bracket 66. The sleeve 96 is prevented from moving endwise in its bearing by a flange 98 formed on the sleeve, and a washer 100 and nut 102 on the sleeve. The head 84 has fixed to it a stud 104 which may be engaged by a suitable wrench to screw the member 84 into the sleeve 96.

The disk cutters 36, 36 may be of the same

collar 90 and the flange 98 of the sleeve 96 while the feed roll 78 is similarly supported between the collar 110 and a flange 124 on the shaft 18.

The lower feed roll 18 is unyieldingly supported during the operation of the machine by a toggle comprising a link 126 pivoted at its upper end to a bearing 128 of the shaft 16 and an arm 130 of a bell-crank lever 132 pivoted at 134 to a bracket 136 fixed on the frame of the machine. A second arm 138 of the bell-crank lever 132 is connected by means of a rod 140 with a treadle (not shown), by means of which the toggle may be broken to lower the feed roll 18 below the surface of the table 10 to allow the work to be inserted between the table and the grooving cutters. When the treadle is released, the toggle is straightened to raise the feed roll 18 into cooperative relation with the upper rolls by means of a spring-pressed plunger 142 carried in the bracket 136. Movement of the bell-crank lever 132 under the influence of the plunger 142 is limited by a pin 144 fixed in the bracket 136. To permit the feed roll 18 to be moved up and down, the bearing 128 is slidably mounted in the bracket 136 and the

moved from the machine or moved to a fresh position for cutting another groove in the blank.

A modified form of jig is shown in Figs. 6 and 7. This jig comprises a thin metal plate 158 having an opening 160 through which the lower feed roll 18 may project to engage the under side of the work. The work is positioned in the jig against pins 162 carried on leaf springs 164 fixed to the plate 158, and against pins 166, 168 projecting directly from the plate. The blank shown in Fig. 6 requires to be grooved along lines 170, 172, 174 and 176. The blank is inserted in the position shown in full lines and grooves are cut along the lines 170, 172, the edge 178 of the jig being used to guide the jig by engagement of this edge with the edge gage 12. The blank is then moved into the position shown by dot-and-dash lines and positioned by means of the pin 168 and a pin 180, upon the plate 158, and the grooves are cut along the lines 174 and 176, the same edge 178 being used to guide the jig. The upper feed roll passes over the leaf springs 164 as the jig is fed through the machine. The plate 158 has secured to its under side metal strips 182, 182 which provide bearing surfaces for the jig on the work table 10. It will be understood that blanks varying considerably in size and shape may be rapidly grooved in jigs similar in construction to those above described and adapted to receive the particular blank which it is desired to operate upon.

The novel jigs hereinabove described are not herein claimed but are made the subject-matter of a copending application Serial No. 351,088, filed March 29, 1929, the said copending application being a division of this application.

Having described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:—

1. In a machine of the class described, a driving shaft carrying a grooving tool, a work support fixed relatively to the axis of said shaft and tool, a work-feeding roll mounted upon the shaft in driving connection therewith, said roll being normally coaxial with the shaft, and compressible means between the roll and the shaft arranged to yield transversely of the shaft with variations in the thickness of the work.

2. In a machine of the class described, a driving shaft mounted in fixed bearings, a sleeve fixed to said shaft, a grooving tool carried by the sleeve, a work-feeding roll encircling the sleeve and adapted for limited bodily movement transversely of the shaft, and a compressible ring interposed between the sleeve and the roll and arranged to support the roll.

3. In a machine of the class described, in combinaton, a driving shaft mounted in fixed bearings, an operating tool carried by said shaft, a non-yielding lower feed roll, and an upper feed roll carried by said shaft and in driving connection therewith for co-operating with the lower roll to feed the work past the operating tool, the upper feed roll being capable of yielding bodily transversely of the shaft with variations in the thickness of the work.

4. In a machine of the class described, a pair of disk cutters for forming the opposite sides of a groove, a cutter for forming the bottom of the groove, a shaft supporting the disk cutters, a work support fixed relatively to the axis of the shaft, and a rotary work-feeding member encircling the snaft and having, transversely of the shaft and relatively thereto, a bodily movement of accommodation in accordance with variations in the thickness of the work.

5. In a machine of the class described, a pair of disk cutters for forming the sides of a groove, a cutter for forming the bottom of the groove, a work support, a shaft supporting the disk cutters, a rotary work-feeding member encircling the shaft and adapted for limited movement transversely thereof, and a compressible ring encircling the shaft and normally supporting said member substantially coaxially of the shaft.

6. In a machine of the class described, a pair of disk cutters mounted side-by-side and arranged to define the sides of a groove in a piece of work, a fixed cutter for forming the bottom of the groove, and means for relatively adjusting the fixed cutter axially with respect to the disk cutters.

7. In a machine of the class described, two groups of grooving elements, each group including a pair of side-by-side disk cutters for defining the sides of a groove and a cutter for forming the bottom of the groove, two brackets one for supporting each pair of disk cutters, and means carried by one of said brackets and engageable with the other bracket for relatively moving said brackets to adjust said disk cutters into axial alinement.

8. In a machine of the class described, a plurality of pairs of side-by-side disk cutters for defining the sides of grooves, a bracket for supporting each of said pairs of cutters, a shaft having a bearing in one of said brackets and provided with an eccentric portion having a bearing in the other of said brackets, said shaft being rotatably adjustable axially to aline the bearings of said disk cutters.

9. In a machine of the class described, a fixed cutter for forming the bottom of a groove in a piece of stock, a pair of disk cutters arranged one at either side of the fixed cutter for defining the opposite sides of said groove, and means for adjusting the disk

cutters and the fixed cutter relatively axially of the disk cutters.

10. In a machine of the class described, a pair of side-by-side disk cutters for defining the opposite sides of a groove in a piece of stock, a non-rotary cutter acting between the disk cutters to form the bottom of the groove, co-operating members between which the non-rotary cutter is clamped, a cutter block, a clamping screw carried by the cutter block and threaded into one of said clamping members, and a sleeve threaded into the cutter block and bearing against the other of said clamping members, said screw and said sleeve being turnable to adjust the fixed cutter axially relatively to the disk cutters.

11. In a machine of the class described, a pair of side-by-side disk cutters for defining the opposite sides of a groove in a piece of stock, a non-rotary cutter acting between them to form the bottom of the groove, a cutter block, a screw mounted to turn freely in the cutter block and extending in a direction parallel to the axis of the disk cutters, a nut threaded on the screw, a collar encircling the nut, co-operating means on the nut and collar for clamping the fixed cutter, and a sleeve threaded into the cutter block and bearing against the collar for adjusting the fixed knife laterally with respect to the disk cutters.

12. In a machine of the class described, a pair of side-by-side disk cutters for forming the opposite sides of a groove in a piece of stock, a cutter for forming the bottom of the groove, work supporting and feeding means including members engaging opposite faces of the work, the member engaging the face of the work which is not to be grooved being movable toward and from the other member into operative and inoperative positions, and means for locking said movable member in operative position.

13. In a machine of the class described, a grooving means, a work support, a feed roll above the work support, a feed roll below the work support movable to and from position to co-operate with the upper feed roll to feed the work past the grooving means, a toggle adapted to be straightened to support the lower feed roll unyieldingly in co-operative relation with the upper roll, means for breaking the toggle, and means compressed by one of the toggle members when the toggle is broken for straightening the toggle.

In testimony whereof we have signed our names to this specification.

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