May 21, 1946. H. S. JAKOBSEN 2,400,826

UNIVERSAL GRINDER HEAD

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Fig. 1.

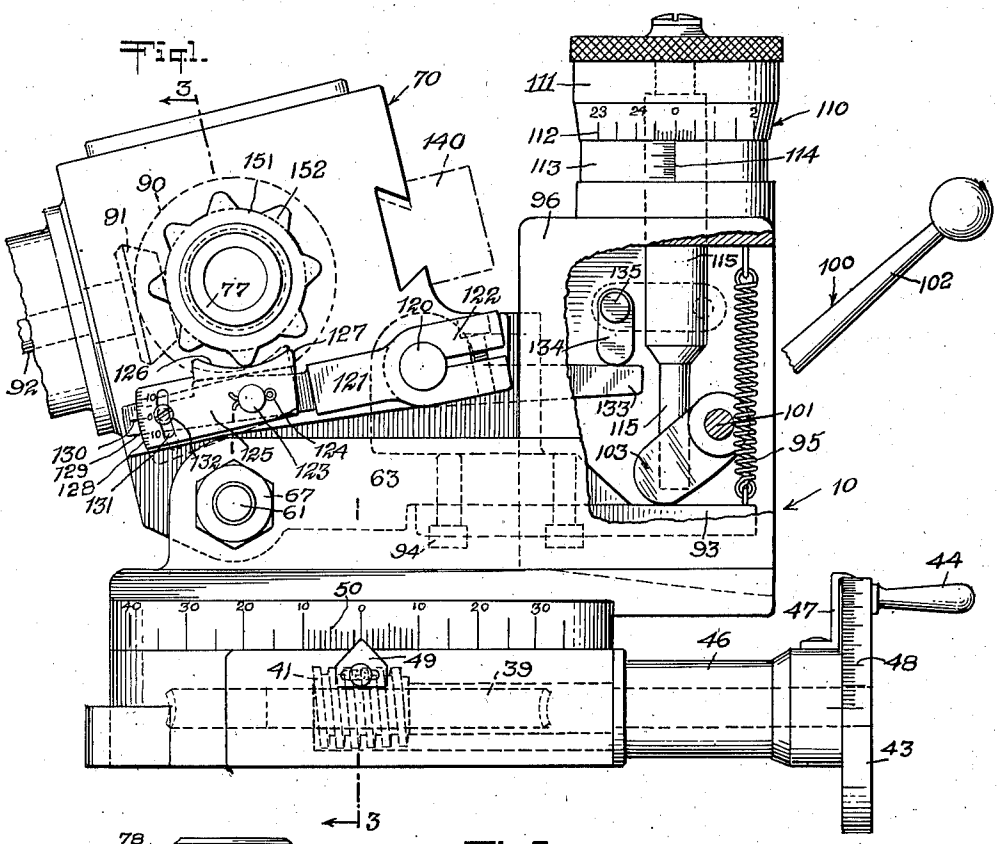
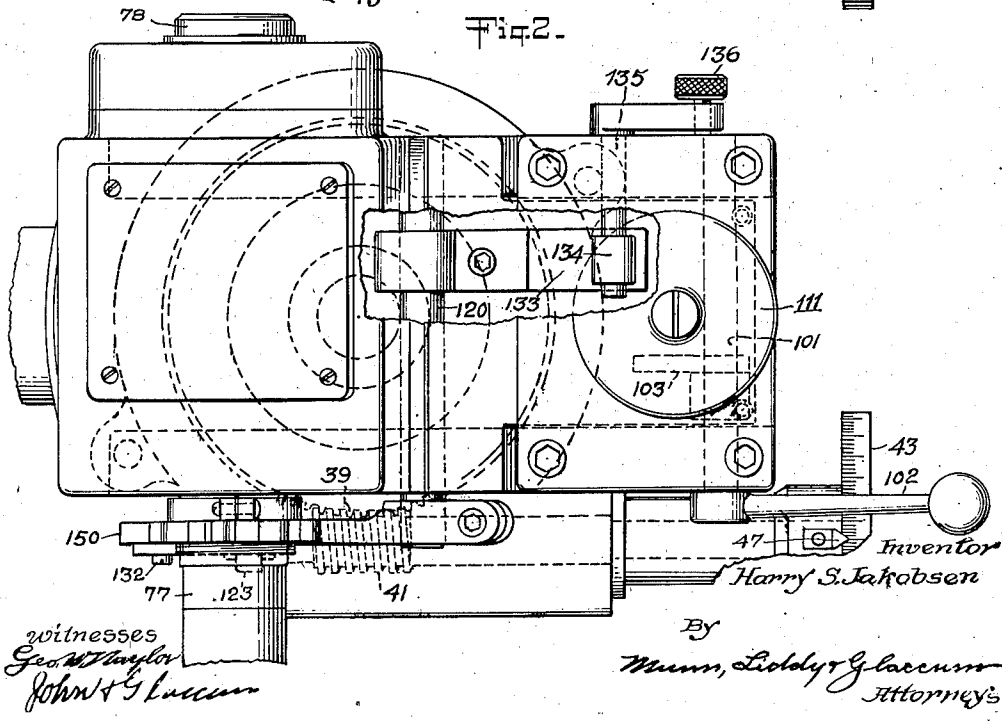


Fig. 2.



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Fig. 3.

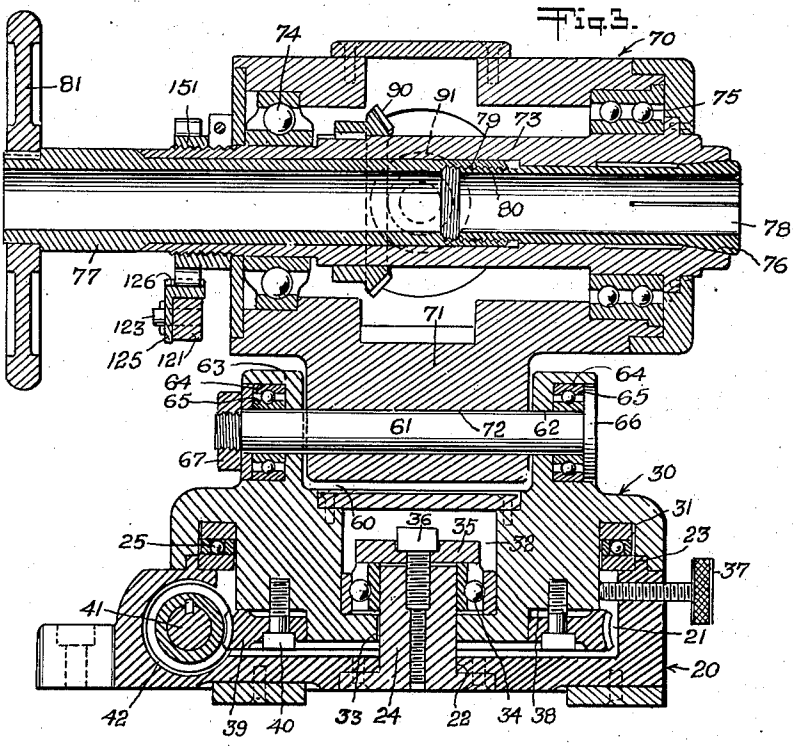
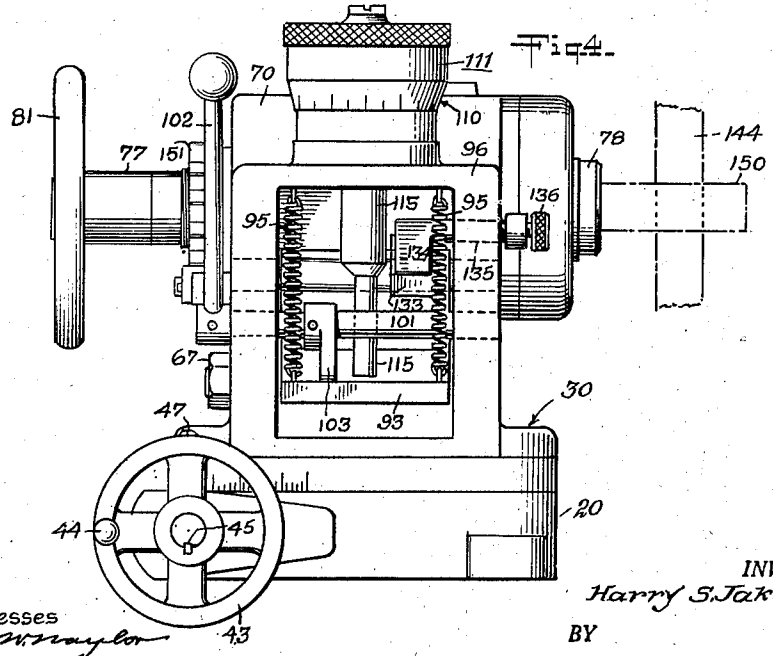


Fig. 4.



Witnesses

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Filed June 27, 1944 3 Sheets-Sheet 3

Fig 5.

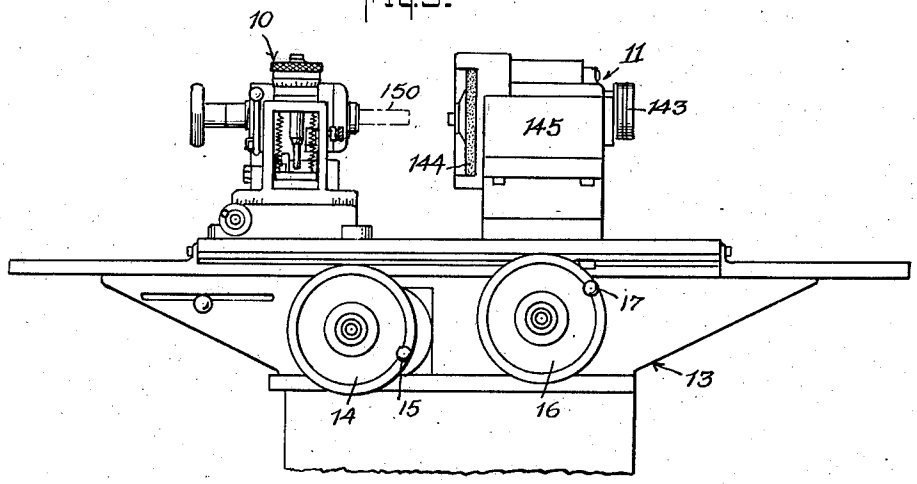
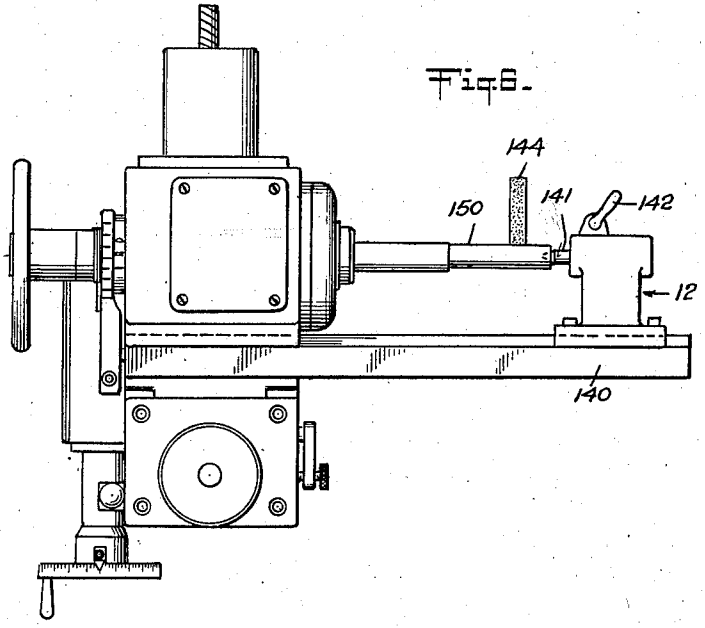


Fig 6.



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UNITED STATES PATENT OFFICE

2,400,826

UNIVERSAL GRINDER HEAD

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Application June 27, 1944, Serial No. 542,350

2 Claims. (Cl. 51—101)

The present invention relates to grinding machines.

The principal object of the invention is to provide a micrometrically adjustable grinding machine.

It is the object of the invention to provide a grinding machine in which the position of the work relative to the grinding wheel may be micrometrically adjusted on an axis perpendicular to the aixs of the grinding wheel as well as on an axis which lies in a plane parallel to the axis of the grinding wheel.

Another object is the provision of a grinding machine in which the work may be micrometrically adjusted on a vertical and on a horizontal axis.

A further object is the provision of a grinding machine in which the depth of bite of the grinding wheel may be adjusted and limited micrometrically.

A still further object is the provision of a grinding machine which automatically grinds the work in accordance with a pattern.

These and other objects are attained by mechanism of which a preferred embodiment is illustrated in the accompanying drawings, in which—

Figure 1 is a rear end view of the headstock portion of the machine, a part of the casing thereof being broken away;

Fig. 2 is a plan view of the headstock;

Fig. 3 is a vertical section on the line 3—3 of Fig. 1;

Fig. 4 is a side view of the headstock;

Fig. 5 is a side view of the entire machine; and

Fig. 6 is a plan view of the headstock and footstock.

Referring to Figures 5 and 6, the grinding machine herein disclosed and claimed comprises a headstock 10, a grinder head 11 and a footstock or tailstock 12 (the latter may be dispensed with for certain kinds of grinding work) mounted in the usual way on table 13. Table hand wheel 14 carrying knob 15 and wheel feed hand wheel 16 carrying knob 17 perform the usual functions of said wheels.

Referring to Figures 1 to 4 inclusive, the headstock 10 comprises a base 20 affixed to table 13 in the usual manner, a turntable 30 mounted on the base and a pivoted head portion 70 carried by the turntable.

The base has a circular well or recess 21 formed in it, a circular aperture 22 formed in the center of said recess, and a peripheral shoulder 23 formed at the top of the wall of said recess, concentric therewith. A vertically disposed boss 24 is fixed in said aperture, centrally disposed with respect to said shoulder. A roller bearing 25 is carried by said shoulder, said bearing being axially aligned with said boss and designed to carry turntable 30 rotatably with respect to said base.

Turntable 30 has a circular groove 31 formed in its under surface, said groove being adapted to receive said roller bearing 25. Turntable 30 has a centrally disposed recess or well 32 formed in it, and a circular aperture 33 formed in the center of said recess, said aperture being adapted to receive boss 24, said boss projecting, in part, into recess 32. In the ring shaped space formed between said boss and the wall of said recess 32 is a ball bearing 34 adapted to maintain the turntable in axial alignment with said boss, preventing lateral displacement of said turntable. A plate or washer 35 screwed or bolted to the top of boss 24 by means of bolt 36 holds roller bearing 34 in place against vertical displacement, and by the same token prevents vertical displacement of turntable 30. A horizontally disposed clamping screw 37 set into the side wall of base 20 engages the turntable to prevent rotation thereof.

A peripheral shoulder 38 formed in the lower outer edge of turntable 30, concentric with groove 31 and shoulder 23, receives a worm gear 39 which is bolted to said turntable by means of bolts 40. Said gear is concentric with groove 31, shoulders 23 and 38 and roller bearing 25. A long shafted worm 41 positioned to engage said worm gear, is rotatably carried in a horizontal aperture 42 formed in base 20. A handwheel 43 carrying a knob 44 is carried by the worm shaft, being fixed thereto by means of key 45. A sleeve 46 encloses said worm shaft and carries a pointer or indicator 47 which points to the outer periphery of handwheel 43. On said outer periphery is a vernier scale 48. Another pointer or indicator 49 is affixed to base 20, pointing upwards towards a micrometric scale 50 carried by turntable 30.

Turntable 30 has a horizontal, elongated, rectangular depression 60 formed in its upper portion. Transversely disposed bolt shaft 61 is rotatably fixed in apertures 62 formed in the two elongated walls 63 which flank or form said depression. Said apertures 62 open into circular depressions 64 formed in the outer surfaces of said walls, said depressions carrying roller bearings 65, said roller bearings rotatably carrying said bolt shaft. The head 66, and the nut 67 of said bolt shaft, prevent axial displacement not only of the bolt shaft itself, but of the roller bearings 65 as well.

The head or work holding portion 70 has a

lower ridge or tongue 71 through which at one end a horizontal aperture or shaft hole 72 is formed, said aperture being adapted to receive said bolt shaft 61, said head portion being mounted on turntable 30 through the instrumentality of said bolt shaft and said aperture.

The head portion carries the usual draw-in collet chuck attachment consisting of a horizontally disposed hollow spindle 73, rotatably mounted in roller bearings 74 and 75 which are fixed in said head portion, a taper sleeve 76 and a draw bar 77 carried by said spindle, a collet 78 carried by said sleeve, internal screw threads 79 at the inner end of said draw bar engaging external screw threads 80 at the inner end of said collet, and a hand wheel 81 affixed to the outer end of said draw bar.

Fixedly mounted on hollow spindle 73 is a bevel gear 90 which is in mesh with bevel gear 91 which latter gear is affixed to and rotated by flexible drive shaft 92 which, in turn, is connected with and rotated by an electric motor (not shown). It is by this means that the entire collet attachment is caused to rotate.

Affixed to head portion 70, in a line perpendicular to the axis of shaft hole 72, at the other end of the head portion from shaft hole 72 is an elongated, outwardly projecting substantially horizontally disposed arm or bar 93 being affixed thereto by means of screws or bolts 94. It will be noted that head portion 70 pivots on bolt shaft 61 and that when it does so, bar 93 moves with it as an integral part thereof. A pair of helical tension springs 95 is fastened at one end to bar 93 and at the other end to the top of vertical housing 96, said housing being integral with turntable 30. Said springs act to lift bar 93 and thereby to pivot head portion 70 on bolt shaft 61.

A crank 100 pivoted by means of horizontal pivot or pin 101 to vertical housing 96 engages the upper surface of bar 93 in such manner that raising its handle member 102 causes its actuating arm 103 to force bar 93 downward, thereby causing head portion 70 to pivot in clockwise direction around bolt shaft 61, as seen in Figure 1. It is evident that the action of the crank opposes the action of the springs.

A vertically disposed anvil-less micrometer 110 is fixed in said vertical housing 96. It comprises a thimble or sleeve 111 carrying a vernier scale 112, a barrel or hub 113 carrying a micrometric scale 114, a spindle 15 and the conventional internal micrometer parts (not shown) common to the ordinary micrometer. Spindle 115 engages the upper surface of bar 93 and serves as a stop to the upward movement of said bar.

Affixed to head portion 70 at a distance from shaft hole 72 and axially parallel therewith, is rotatable pivot or pin 120. Rotatably mounted on said pivot is an elongated clamp arm 121 having a split end portion 122 adapted adjustably to clamp said pivot. Affixed to said clamp arm axially parallel with pivot 120 at a distance from said clamping end, is a pin 123. Rotatably mounted on said pin 123 and held thereon by means of cotter pin 124 is a rocking arm 125 having an arcuately concave upper edge or surface 126. The upper end portions or corners are identified by the number 127. Its side edge 128 which is adjacent the non-clamping end of clamp arm 121, is arcuately convex, carrying a graduated scale 129. A longitudinal line 130 on clamp arm 121 serves as the indicator for said scale. An arcuate slot 131 in said rocking arm adjacent to and parallel with its said side edge 128 receives clamping screw 132 which screws into said clamp arm.

A second bar or arm 133 projecting in substantially the opposite direction from clamp arm 121, is clamped to rotatable pivot 120 in the same manner as clamp arm 121. Bar 133 too is adjustably fixed on said pivot. Situated above bar 133 and serving as a stop relative thereto, is a bell crank 134, pivoted by means of pin 135 to vertical housing 96. Affixed to said bell crank, and engaging the outside surface of vertical housing 96 is a clamp screw 136.

An elongated bar 140, axially parallel to the draw-in collet chuck attachment is dovetailed into head portion 70. Affixed to its far end is tail stock or footstock 12, its center piece 141 being in axial alignment with said draw-in collet chuck attachment. The footstock lever is given the identifying number 142. See Figure 6.

The grinder head 11 comprises the usual parts, to wit, a motor and a drive belt (not shown), a pulley mounting said belt 143, a grinding wheel 144, a shaft (not shown) carrying said wheel and said pulley and bearings therefor (also not shown) and a housing 145. In the present embodiment the axis of the grinding wheel is parallel to the plane of the top of the table, as is the axis of the collet attachment.

In operation, the work 150 is inserted into the collet and drawn in in the usual way. The opposite end of the work is held by center 141 of the footstock, where a footstock is used. The work may be turned on a vertical axis by turning handwheel 43. The extent of the turn of the work may be gaged micrometrically with the aid of scales 48 and 59. When the work is positioned on the vertical axis, according to specification, clamp screw 37 is tightened and the work is firmly held in such position for the grinding operation.

The depth of cut may be limited micrometrically by proceeding as follows: crank handle 102 is raised causing crank 100 to lower head portion 70 around bolt shaft 61 against the action of springs 95. Micrometer 110 is adjusted in the usual way to a pre-determined setting. Crank handle 102 is now lowered, releasing head portion 70 and subjecting it to the influence of springs 95.

The springs will tend to pivot head portion 70 around bolt shaft 61 and in the direction of the grinding wheel. The pressure of the work against the grinding wheel will be a function of the strength of the upward pull of the springs. As the work is ground down, the head portion, in response to the action of the springs, will move in upward direction around bolt shaft 61. Its movement in said direction will cease when bar 93 contacts spindle 115 of the micrometer. This will automatically complete the grinding operation.

Should it be desired to grind down the work in accordance with a pattern, the pattern, in the present case a gear pattern 151, is affixed to the hollow spindle 73 immediately above rocking arm 125, as is shown in Figures 1 and 3. The concave upper surface 126 or the upper corners 127 are adjusted to engage the teeth 152 of said gear pattern to a depth which may be predetermined, and which may be measured by means of scale 129. The clamping screw 132 is now tightened and the rocking arm set in the determined position with respect to clamp arm 121. When the spindle is made to rotate, the pattern will rotate with it. As each tooth 152 strikes the rocking arm, it will cause said rocking arm, and hence said clamp arm and with it the entire head por-

tion 70 to move in a downward direction against bell crank 134 which serves as fulcrum. As the pattern continues to rotate, the rocking arm will disengage the tooth in question, and tend to move in upward direction into the space between said tooth and the tooth immediately in back of it. This upward movement would be caused by the upward pull of springs 95 as above described. The entire head portion would thus engage in reciprocal movement. This would cause the work 150 to engage and disengage the grinding wheel according as the head portion moves upwards or downwards. This would conform the grinding operation and hence the work, to the pattern. When the interdental space is too deep for the corners 127 to contact the root of the teeth and the bottom of said interdental space, said corners 127 merely enter such space as far as they or either of them can go. In such case, the work will conform to the peripheral outlines of the pattern only. To prevent upward movement of the head portion beyond a predetermined point and to serve as fulcrum as aforesaid, the bell crank 134 is set to engage bar 133 and clamp screw 136 is tightened to hold the crank in such position.

The embodiment herein described is intended merely to illustrate the present invention and not to limit it. Modifications may be incorporated into the device without departing from its principles. For example, bar 93 might be made integral with head portion 70 instead of being a separate part affixed thereto by means of screws or bolts. Instead of flexible shaft 92 driving the collet attachment, a different driving means might be utilized. Instead of a collet chuck, a different type of chuck might be used.

I claim:

1. A grinding machine comprising a headstock and a grinder head, said headstock comprising a fixed base, a turntable mounted on said base, rotatable with respect thereto on a vertical axis, micrometric means adapted to adjust the position of said turntable relative to said base, work-holding means pivoted to said turntable on a horizontal pivot, said work-holding means comprising a draw-in collet chuck attachment geared to a flexible motor-driven shaft, a pattern mounted on said attachment, an adjustable rocker arm adjustably clamped to a horizontal pivot rotatably fixed to said work-holding means, a second, oppositely disposed arm adjustably clamped to said horizontal pivot, a bell crank adjustably fixed to said turntable and engaging and serving as a fulcrum for said second arm, and tensioning means adapted to bring said rocker arm into yieldable engagement with said pattern.

2. A grinding machine comprising a headstock and a grinder head, said headstock comprising a fixed base, a turntable mounted on said base, rotatable with respect thereto on a vertical axis, micrometric means adapted to adjust the position of said turntable relative to said base, work-holding means pivoted to said turntable on a horizontal pivot, said work-holding means comprising a draw-in collet chuck attachment geared to a flexible motor-driven shaft, a pattern mounted on said attachment, an adjustable rocker arm adjustably clamped to a horizontal pivot rotatably fixed to said work-holding means, a second, oppositely disposed arm adjustably clamped to said horizontal pivot, a bell crank adjustably fixed to said turntable and engaging and serving as a fulcrum for said second arm, and tensioning means adapted to bring said rocker arm into yieldable engagement with said pattern, a foot stock whose center piece is in axial alignment with said draw-in collet chuck attachment and means affixed to said work-holding means, adapted to support said foot stock in fixed relationship to said work holding means.

HARRY S. JAKOBSEN.