July 23, 1940. T. L. HEDGPETH 2,208,843

POWER DRIVEN TOOL

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Fig. 1.

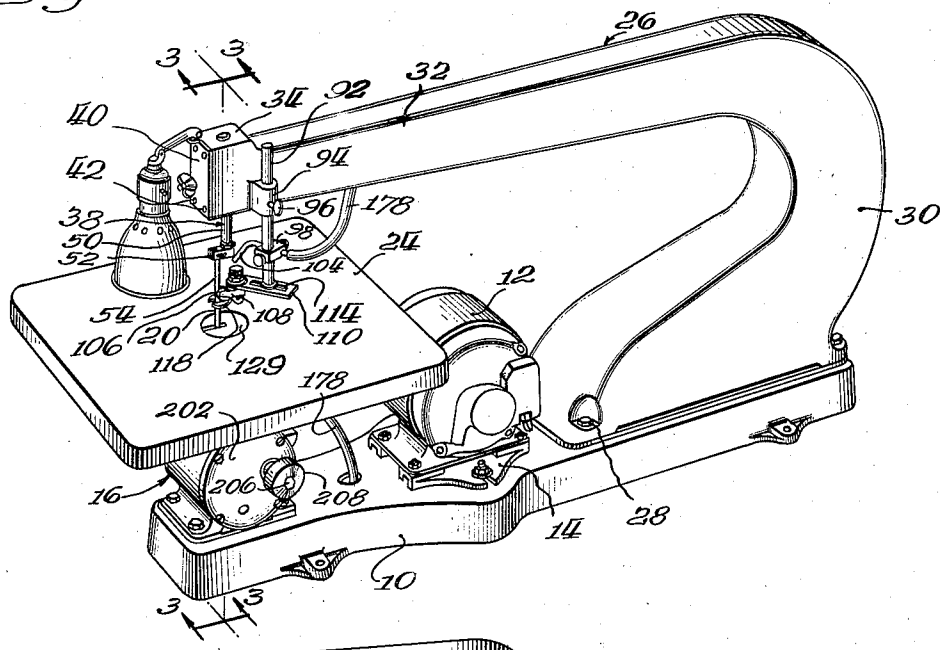
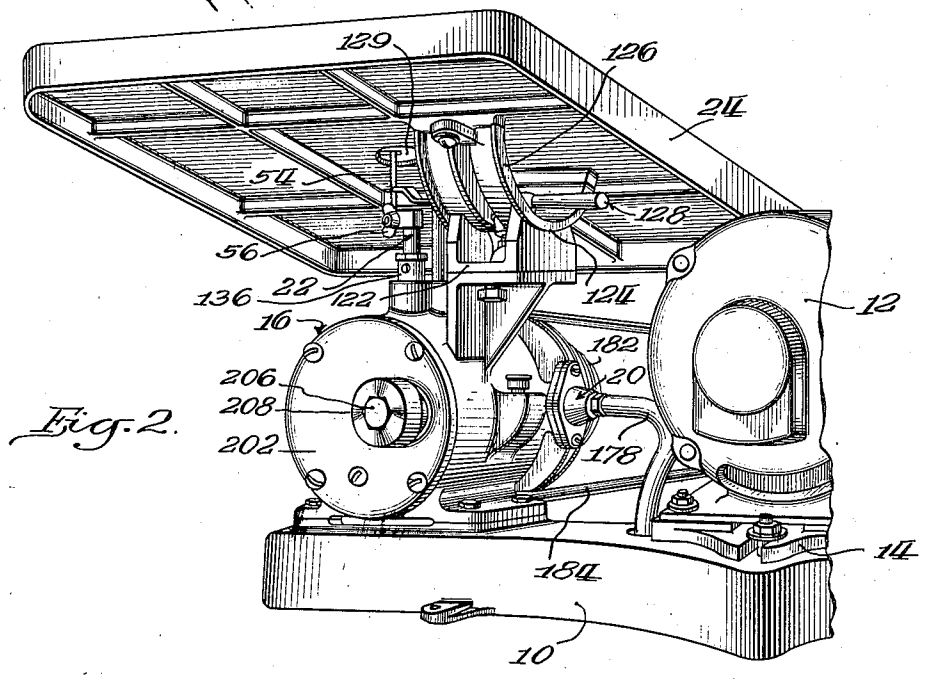


Fig. 2.



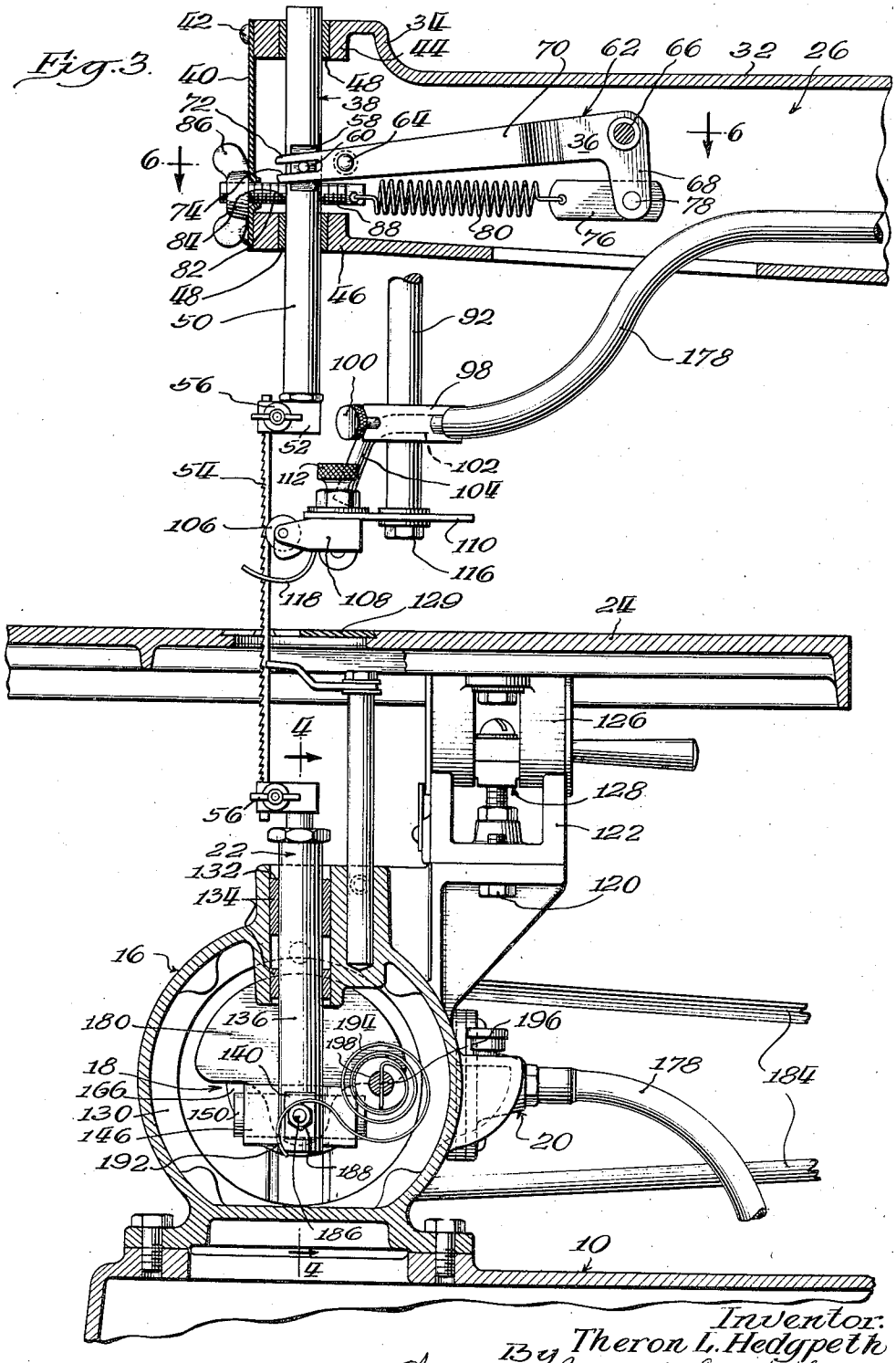
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Fig. 3.



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Fig. 5.

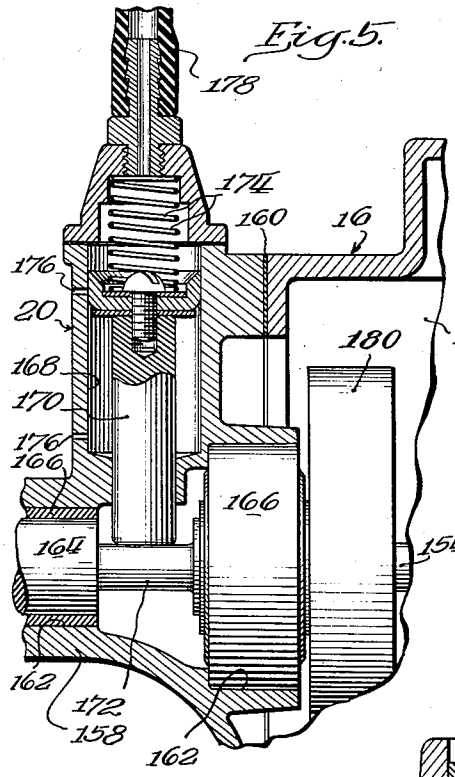


Fig. 6.

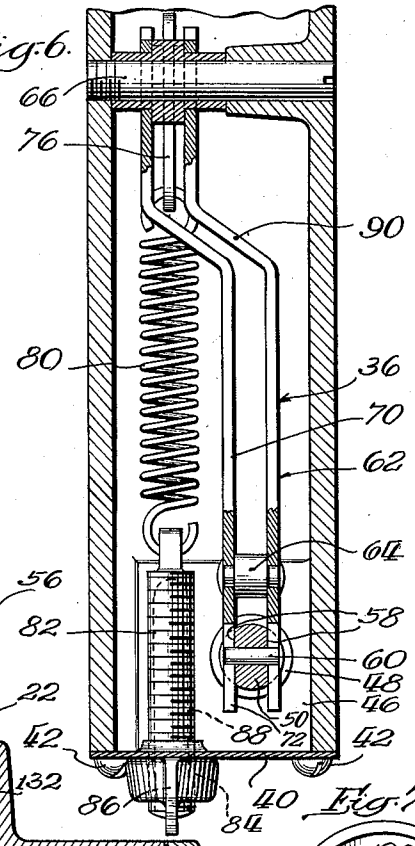


Fig. 4.

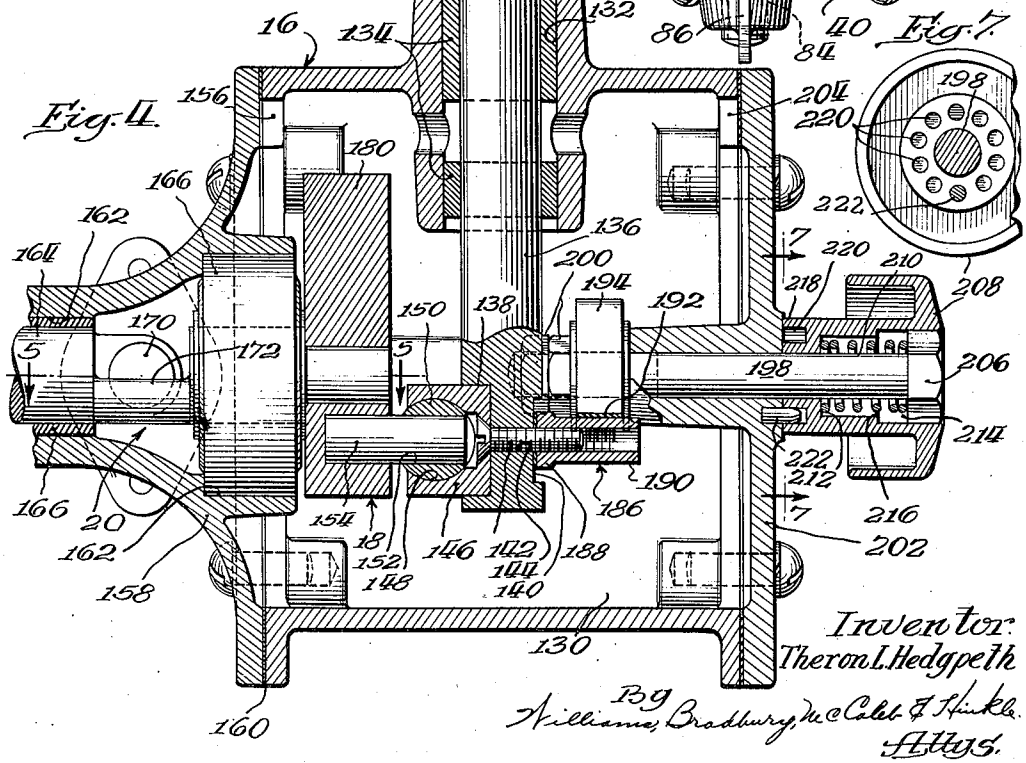


Fig. 7.

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UNITED STATES PATENT OFFICE

2,208,843

POWER DRIVEN TOOL

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Application May 7, 1938, Serial No. 206,616

2 Claims. (Cl. 143—73)

This invention relates to power driven tools and particularly to power driven tools such as scroll saws in which a flexible element, such as the saw, is positively actuated at one end and is subjected to continuous bias at the other end.

Such tools are driven at very high speeds, in fact, at speeds which are almost vibratory in nature and the flexible members are subjected to undue strain and whip, particularly at the times when the direction of movement is being reversed. In accordance with the present invention I subject the flexible member, for example the saw blade, to spring tension at opposite ends so that it is always maintained in a state of tension. I provide simple means whereby the spring tension applied at each end may be varied at will. Ordinary I find that the best operation is attained when the tension applied at opposite ends of the flexible member is approximately the same.

I prefer to provide improved spring means which are subjected to very little change in tension as a result of the displacement to which they are subjected in the normal operation of the tool.

The invention will readily be understood from the following description of a preferred embodiment thereof, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a perspective view of a scroll saw embodying my invention;

Fig. 2 is a fragmentary perspective view of the scroll saw shown in Fig. 1, as viewed from a low point, the overhanging arm and associated parts being omitted for the sake of clarity;

Fig. 3 is a sectional view, taken on the line 3—3 of Fig. 1, showing, on a larger scale, the reciprocating drive mechanism for the scroll saw blade;

Fig. 4 is a sectional view, on a larger scale, the section being taken on the line 4—4 of Fig. 3, showing the drive mechanism for the scroll saw blade;

Fig. 5 is a fragmentary sectional view, taken on the line 5—5 of Fig. 4, showing the pump mechanism;

Fig. 6 is a fragmentary sectional plan view, taken on the line 6—6 of Fig. 3, showing the spring mechanism associated with the upper end of the scroll saw blade, and

Fig. 7 is a fragmentary sectional detail, taken on the line 7—7 of Fig. 4.

Referring to the drawings, the improved saw comprises a base on which is mounted a motor 12 with the aid of an adjustable bracket 14. The base 10 carries a housing 16 within which is located the drive mechanism 18 whereby the saw blade is reciprocated up and down. On the housing 16 is carried the air pump 20, which is best seen in Fig. 5. The lower spindle assembly 22 is mounted in the housing 16 and the work table 24 is mounted on the housing 16 by means which will hereinafter be more fully described.

The saw comprises an overhanging arm 26 which is secured to the base 10 by bolts 28. This arm is preferably hollow and comprises an upright portion 30 and a horizontal overhanging portion 32 which extends above and over the work table 24. The horizontal portion 32 terminates in an enlarged hollow head 34. Within this head and within the adjacent portion of the horizontal portion 32 are located the upper spindle assembly 38 and the spring mechanism 36. The upper spindle assembly 38 is located in alignment with the lower spindle assembly 22. The head 34 is normally closed by a cover plate 40, which is held in position by means of screws 42.

The hollow head 34 comprises upper and lower walls 44 and 46 which carry bearings 48 in which the spindle 50 of the upper spindle assembly 38 reciprocates. The spindle 50 carries at its lower end a chuck 52 which is adapted to receive the upper end of the saw blade 54 which is secured thereto by means of the wing nut 56.

The spindle 50 is cut away on opposite sides to provide flat surfaces 58 (Fig. 6) located at a portion of the spindle 50 which is always within the head 34. A pin 60 extends through the spindle 50 beyond the faces 58. A bell crank lever 62 consisting of two similar members riveted together and maintained in spaced relation, as indicated at 64, is pivotally mounted upon a pin 66 which extends across the horizontal hollow member 32 of the arm 26. The bell crank lever 62 includes a short arm 68 which extends downwardly and a long arm 70 which extends horizontally towards the spindle 50. The two spaced members of the bell crank lever 62 are located on opposite sides of the spindle 50 engaging the opposite faces 58 thereof and holding the spindle 50 against rotation. The extremities 72 of these members are slotted, as indicated at 74, to receive the projecting ends of the pins 60.

The short arm 68 is pivotally connected to a link 76 by a rivet pin 78. The opposite end of the link 76 is connected to one end of coil spring 80, the other end of which is hooked to a threaded bolt 82 which extends past the spindle 50 through an opening 84 in the cover plate 40. The outwardly projecting portion of the bolt 82 is provided with a wing nut 86 so that the tension of

the spring 80 may be adjusted at will. The bolt 82 is held against rotation by suitable means, for example, its underside may be flattened as indicated at 88 (Fig. 6) and the opening 84 may be formed with a corresponding flat side in engagement with the surface 88. It will be seen, with particular reference to Fig. 6, that the long arm 70 of the bell crank lever 62 is offset, as indicated at 90, so as to enable the bolt 82 to be located to one side of the spindle 50.

A vertical rod 92 is adjustably mounted on the overhanging horizontal portion 32 of the arm 26, this rod being slidably and rotatably mounted in an opening in a boss 94 formed on one side of the arm 26. The rod 92 is held in desired adjusted position by means of the thumb screw 96. At its lower end the rod 92 carries a block 98 which is slidably mounted on the rod 92, being positioned thereon in any desired location with the aid of a set screw 100. The block 98 is provided with an internal bore 102 which enters into a projecting nozzle 104 which is adapted to be directed towards the work to blow the sawdust away.

Below the block 98, the rod 92 carries a supporting member 108, upon which is mounted a roller 106 provided with a V groove in which the blade 54 is received and guided. The supporting member 108 is adjustably mounted on a plate 110 by means of a knurled nut 112. The plate 110 is provided with a slot 114 through which extends a bolt 116 whereby the plate is secured to the lower end of the rod 92 in desired position of adjustment. The plate 110 carries downwardly extending curved legs 118 which are adapted to engage the work and prevent it from being elevated by the return stroke of the blade 54.

The work table 24 is mounted upon a table support 122 which is secured to a bracket on the housing 16 by means of bolts 120. The table support 122 is provided with upwardly directed concave arcuate guides 124 and the table 24 is provided with corresponding convex arcuate guides 126 adapted to cooperate therewith. Consequently, the table can be tilted about the common axis of the arcuate guides 124 and 126, into any desired inclination with respect to the saw blade.

The table may be locked in desired position of adjustment by handle and cam means designated generally by the reference numeral 128. The table 24 is provided with an insert 129 which is located in substantial alignment with the spindle 50 and the lower spindle assembly 22, this insert being provided with a kerf through which passes the blade 54. This insert is removable to enable the machine to be used with tools other than a ribbon saw blade, such as a file, saber saw, or sander, for example. It may be noted that when thus employed, the overhanging arm 26 may readily be romoved by removing the bolts 28, thereby providing unlimited work room above the table. When thus used, the tool is rigidly mounted in the lower spindle assembly 22.

Referring more particularly to Figs. 3 and 4, it will be noted that the housing 16 provides a cylindrical crank case chamber 130 which is provided with a vertical boss 132 on its upper side. Bearing members 134 are located within the boss for slidably supporting the lower spindle 136 of the lower spindle asembly 122. The upper end of the spindle 136 is provided with a chuck similar to that carried by the upper spindle 50.

The spindle 136 is provided on one side with a horizontal rectangular slot 138. Opposite this slot it is provided with a flat surface 140. A horizontal guide block 146 is rigidly seated within the slot 138 and is held therein by means of a bolt 142 which extends through the block 146 and is threadedly received in a bore 144 which extends through the spindle 136 from the slot 138 to the flat face 140. The bolt 142 is securely locked in position by means of an internally threaded sleeve 186 which is provided with a hexagonal portion 188 near its inner end and a cylindrical portion 190 projecting outwardly therefrom.

The guide block 146 is provided with a longitudinal bore 148 of cylindrical section, which bore is open to the outer side of the block 146, that is, to the left side as viewed in Fig. 4. A cylindrical block 150 is located within the block 146 so as to reciprocate freely therein in a horizontal direction. A crank pin 154 extends freely into a horizontal bore 152 in the block 150. The manner in which the crank pin 154 is actuated will be hereinafter described. It will, however, be noted that when this crank pin is rotated it effects the reciprocation of the spindle 136 in the upward and downward direction. At the same time the block 154 reciprocates horizontally in the bore 148 in the block 146. It is to be noted that the block 150, being held against movement about the axis of the spindle 136 by engagement with the crank pin 154, effectively prevents rotation of the spindle 136.

The left-hand side of the housing 16, as viewed in Fig. 4, is closed by means of a cover 158, a gasket 160 being interposed between the flange of the cover and the adjacent flange of the housing. The cover 158 has a transverse bore 162 through which extends a drive shaft 164, the shaft being supported by suitable bearings 166. The cover 158 comprises a cylinder 168 at right angles to the bore 162.

A piston stem 170 extends downwardly through an opening in the lower end of the cylinder 168 and contacts a cam 172 formed on the drive shaft 164 so as to effect reciprocation of the piston stem. The piston, which is provided with a suitable sealing cup at its upper end, is biased downwardly by a spring 174. The cylinder 168 is provided with air passages 176. The outlet of the pump is connected by a flexible hose 178 to a nipple on the block 98 which connects to the internal bore 102 and, consequently, to the projecting nozzle 104. The flexible conduit 178 may preferably extend into the base 10 and through the overhanging arm 26 to a position adjacent the block 98.

The crank pin 154 is rigidly mounted in a balanced crank 180 which, as best seen in Figs. 3 and 4, consists mainly of a counterweight portion located on the side of the shaft 164 which is opposite the position of the pin 154. The crank member 180 is rigidly mounted on the inner end of the shaft 164. The outer end of the shaft 164 carries a variable speed pulley 182 which is driven by means of a V belt 184 from a corresponding variable speed pulley (not shown) on the motor 12.

The cylindrical portion 190 of the sleeve 186 serves as an abutment for the hook-curved end 192 of a flat spirally wound spring 194. The inner end of the spring 194 is mounted in a transverse slot 196 of a shaft 198 upon which it is held by means of nuts 200. The shaft 198 is rotatably mounted in a boss carried by the cover 202 which closes the end of the housing 204 opposite the cover 158. The shaft 198 is provided at its outer

end with a hexagonal head 206 which is received in a hexagonal opening 214 in a handle 208.

The handle 208, which is slidably mounted on the shaft 198, is recesed to accommodate a spring 216. This spring, which is accommodated around the shaft 198, abuts against the inner side of the head 206 and against the shoulder 212 of the handle 208 so as to force the handle inwardly towards the cover 202. The innermost end 218 of the handle 208, which normally bears against the cover 202, is provided with a circumferential series of openings 220, as best seen in Figs. 4 and 7. The cover 202 has rigidly mounted therein an outwardly projecting pin 22 which is adapted to enter any of the openings 220 which may be presented to it. It will be readily understood that if the handle 208 is pulled outwardly it may be rotated in either direction so as to adjust the tension which the spring 194 applies to the sleeve 186. When the tension is thus regulated, the handle 208 is allowed to move inwardly under the action of the spring 216 and the pin 222 enters the adjacent opening 220 so that the tension of the spring is maintained in the desired condition.

The weighted crank 190 is arranged to provide a substantial balance for the moving system comprising the spindle 136, the blade 54 and the spindle 50. This balance is necessarily somewhat approximate, because the load experienced by this system in moving downwardly varies widely, depending upon whether or not the blade 54 is cutting.

In the ordinary operation of a tool of this kind, the spindle 22 is pulled down forcibly by the crank pin 154 and when the crank pin 154 passes through its lowest position, the downward load on the spindle is released and the spindle is free to move relative to the crank pin 154 within the limits of the lost motion necessary between these elements for working fit. This relative freedom and the initiation of the return movement of the tool, due to the tension of the spring 80 and also to the drive by the crank pin, result in whipping and irregular movements of the blade 54.

In my present structure such defects are completely avoided because the blade 54 is maintained under tension at all times. Further, the springs 80 and 194 counter-balance each other to a considerable extent and the major operating force is that applied by the crank pin 154 which is, in fact, responsible for practically all movements, both up and down, of the blade 54.

In practice, I prefer that the upward force exerted on the blade by the spring 80 should be approximately equal to the downward force applied to the blade by the spring 194. However, it is not necessary to measure these forces since the machine is adapted for very perfect adjustment in the following manner. The wing nut 86 is tightened in order to apply a reasonable degree of tension to the spring 80. If no tension is applied to the spring 194 and the motor 12 is started, the machine will work with a pronounced noise due to whipping and irregular movements of the blade and also due to lost motion between the pin 154 and the spindle 136. If, now, the spring 194 is tensioned by suitable displacement of the handle 208, the noise will lessen and lessen progressively and can be substantially eliminated. If too much tension is applied to the spring 194, the operation again becomes noisy and this occurrence indicates that the handle 208 should be backed up again to reduce the tension of the spring 194 to a degree which is approximately equal to that exerted on the spindle 50 by the spring 80.

It is to be noted that both these springs are adapted to apply a very uniform tension upon the two spindles with which they are associated. That is, the tension of a spring like the spring 80, increases with extension. This effect can be minimized by using a very long spring. I am able to use quite a short spring 80 while obtaining very uniform tension on the spindle 50 by my new feature of employing a bell crank lever 62 of very considerable leverage. The coil type of spring 194 provides the effect of a relatively long spring while occupying a relatively small space.

Although the invention has been disclosed in connection with the specific details of a preferred embodiment thereof, it must be understood that such details are not intended to be limitative of the invention except insofar as set forth in the accompanying claims.

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

1. In a scroll saw, the combination comprising, a base, an overhanging arm mounted on the base having a substantially horizontal hollow portion at its overhanging end and a cover closing said hollow portion, a member extending vertically through the hollow portion near said end and mounted to reciprocate therein, a bell crank within the hollow portion pivotally mounted rearwardly of said member, said bell crank having a long substantially horizontal arm extending forwardly of the pivotal mounting and a relatively short substantially vertical arm, a link pivotally attached to the cutward end of said vertical arm, means to connect said long arm to said member, a horizontally positioned spring secured to said link, and manually operable means outside of said hollow portion to adjust the bias of said spring, the last said means comprising a threaded member secured at one end to said spring and projecting through an opening in said cover, and the portion of said threaded member projecting through said cover having a complementary threaded manually adjustable member threaded thereto.

2. In a scroll saw blade reciprocating unit, in combination, a housing and a cover to close said housing, a reciprocable member extending into the housing, a spiral spring having a hooked outer end engaging said reciprocable member to bias said member downwardly, a control shaft extending into said housing and engaging the inward end of said spring, control means outside of said housing adapted by manual manipulation to rotate said control shaft, and means to secure said control shaft in any manually set position, said control shaft journaled through said cover and extending beyond the outer face thereof, said control means secured to the outer end of said control shaft and said cover carrying the means to secure the control shaft in any manually set position, whereby the control shaft, the spiral spring, the control means, and the means to secure the control shaft are all removable from the saw blade reciprocating unit as a single unit with said cover.

THERON L. HEDGPETH.