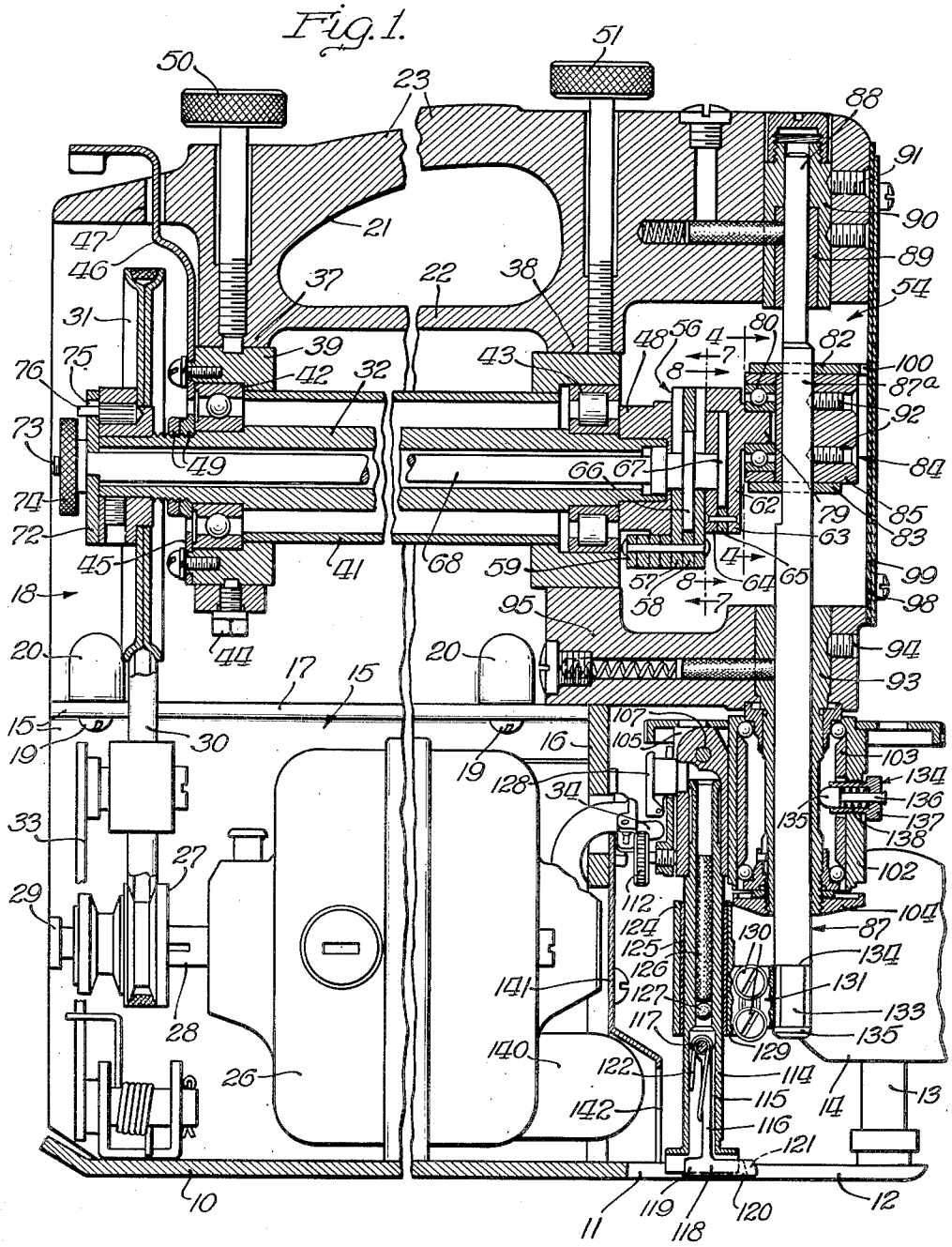
Dec. 15, 1953 W. P. GALLAGHER 2,662,413

CUTTING MACHINE DRIVE MEANS

Filed Sept. 21, 1949 2 Sheets-Sheet 1

Fig. 1.



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CUTTING MACHINE DRIVE MEANS

Filed Sept. 21, 1949 2 Sheets-Sheet 2

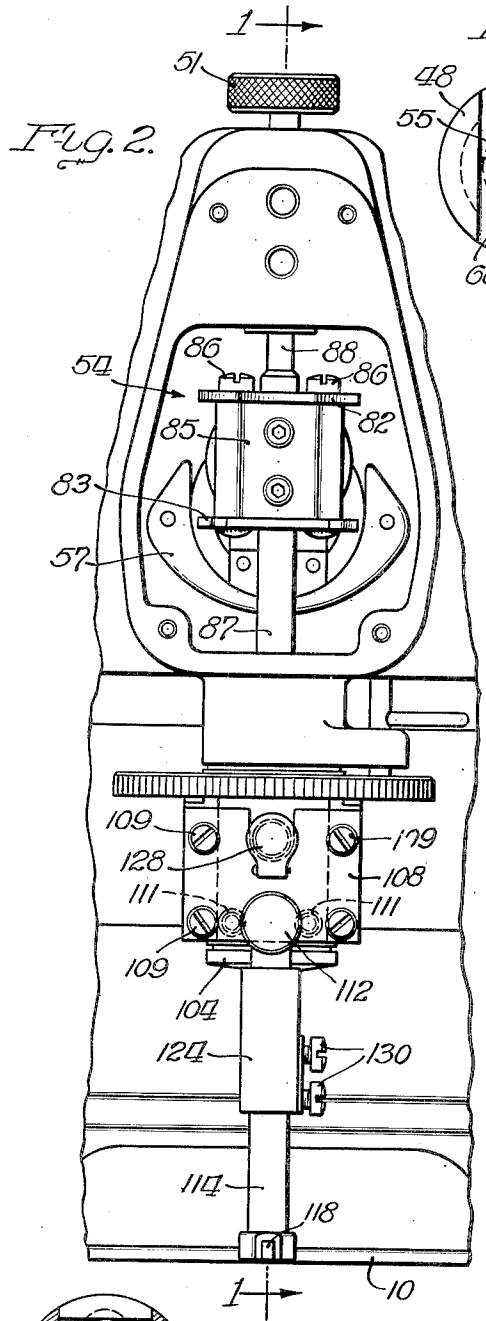


Fig. 2.

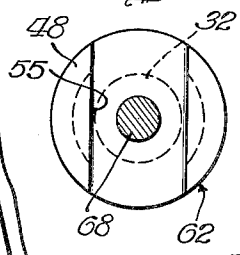


Fig. 6.

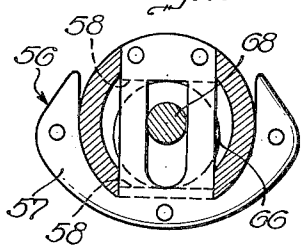


Fig. 7.

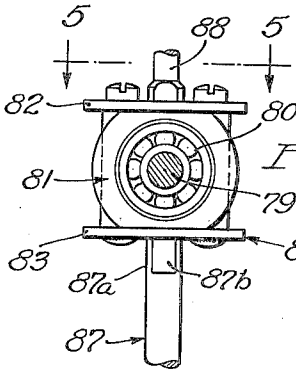


Fig. 4.

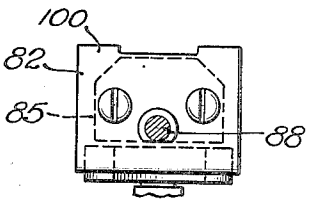


Fig. 5.

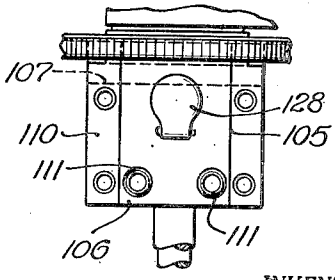


Fig. 3.

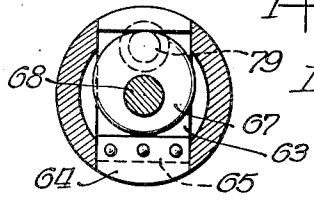


Fig. 8.

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CUTTING MACHINE DRIVE MEANS

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Application September 21, 1949, Serial No. 117,037

2 Claims. (Cl. 74—50)

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This invention relates to cutting machines, and has to do with a cutting machine of the type in which the machine is moved over the material being cut by means of a reciprocating tool connected to a plunger for reciprocation therewith and for swinging movement thereabout, the tool being eccentric to the plunger so as normally to trail the latter in the movement of the machine over the work.

The present invention is in the nature of an improvement over the machine disclosed in my Patent, No. 2,239,287, issued April 22, 1941, and is directed to improved plunger mounting and operating means. The plunger is connected to the operating crank pin therefor by anti-friction bearing means and a cooperating yoke detachably secured to the plunger in such manner as to permit ready removal and replacement of the plunger, while also permitting ready removal and replacement of the yoke for access to the crank pin block and associated parts. Further objects and advantages of my invention will appear from the detailed description.

In the drawings:

Figure 1 is a lengthwise central vertical sectional view through a cutting machine embodying my invention, with parts broken away and other parts shown in elevation;

Figure 2 is a fragmentary front view of the machine of Figure 1 with the cover for the compartment in the upper portion of the housing removed and the guide rod supporting assembly turned through 180° from its position shown in Figure 1;

Figure 3 is a view of the guide rod assembly supporting sleeve as viewed in Figure 2, but with the cover plate of the recess in the sleeve omitted;

Figure 4 is a sectional view taken substantially on line 4—4 of Figure 1;

Figure 5 is a sectional view taken substantially on line 5—5 of Figure 4;

Figure 6 is a front view of the drive shaft and of the head secured thereon;

Figure 7 is a sectional view taken substantially on line 7—7 of Figure 1; and

Figure 8 is a sectional view taken substantially on line 8—8 of Figure 1.

The machine comprises a base plate 10 of generally rectangular shape having a planar underface of considerable area, which supports the machine upon the work for sliding movement thereover. At its forward end base plate 10 is provided with a substantially V-shaped notch 11, providing two forwardly extending projections, one of which is shown at 12, to each of which

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is secured a post 13 having a knob 14 secured upon its upper end. Base plate 10 is suitably secured, conveniently by means of screws, to the bottom of a lower housing section 15 having a front wall 16 and provided, at the top of each side wall, with an inwardly extending reinforcing flange 17. An upper housing section 18 extends over and seats upon the lower section 15 and is secured thereto in a suitable manner, conveniently by screws 19 passing through flanges 17 and threading into bosses 20 formed integrally with housing section 18 and projecting inward from the side walls thereof. Housing section 18 is provided with an elongated forwardly flaring opening 21 in its upper portion, with a top wall 22 below opening 21, a portion 23 of section 18 above opening 21 providing a convenient handle for lifting and carrying the machine. Sections 15 and 18 together form a housing within which the working parts of the machine are mounted.

An electric motor 26, preferably a universal motor, is suitably secured, conveniently by means of screws, on the upper face of base plate 10. A double pulley 27 is splined on shaft 28 of motor 26 for rotation with the shaft and relative movement lengthwise thereof, movement of pulley 27 outward along shaft 28 being limited by a stop member 29. The pulley 27 comprises two V-pulley elements either of which may receive a V belt 30 which passes about a V pulley 31 of known type which is suitably secured on the rearward end of a tubular shaft 32. The belt 30 is maintained under proper tension by means of a belt tightener 33 similar to that disclosed in my above identified patent. The motor 26 may be driven at either one of two speeds and is controlled by two switches, one of which is shown at 34, of suitable type, there being a suitable resistor (not shown) associated with one of the switches 34. Provision for driving the motor 26 at two speeds renders it possible, in conjunction with the double pulley 27, to drive shaft 32 at four different speeds to suit requirements or as desired.

The upper housing section 18 is provided with two interior relatively thick webs 37 and 38, defining annular supports spaced apart lengthwise of housing section 18 and disposed coaxially with their common axis in the central transverse vertical plane of housing section 18. The web elements 37 and 38 receive collars 39 and 40, respectively. These two collars 39 and 40 are secured to the ends of a sleeve 41 through which the tubular shaft 32 extends, this shaft being disposed eccentrically of the sleeve and adjustable, by turning thereof, toward and away from the

base plate 10, as will appear more fully presently. The collars 39 and 40 are mounted for turning movement in the web elements 37 and 38, respectively. A ball bearing 42 of known type is mounted in collar 39 eccentrically thereto, and a roller bearing 43, of known type, is mounted in collar 40. The bearings 42 and 43 support the tubular shaft 32 for rotation in sleeve 41 eccentrically thereto. A dog pointed screw 44, threaded through the lower portion of web element 37, engages into a circumferential groove in collar 39, this groove being of appropriate length for limiting turning movement of collar 39 in either direction for effecting the desired adjustments of shaft 32 toward and away from base plate 10. An annular plate 45 is suitably secured, conveniently by screws, to the rearward end of the collar 39, this plate being provided with a handle element 46 or adjusting lever extending therefrom upward through a slot 47 in the top wall of housing section 18 and providing convenient means for adjusting the collar 39, and with it sleeve 41 and collar 40. In that manner, the tubular shaft 32 may be adjusted toward and away from base plate 10 as previously noted. A head 48 is secured upon the forward end of shaft 32, this head being provided with a reduced neck which contacts the inner race of the roller bearing 43, as will be understood. Two lock nuts 49 are screwed upon the rearward portion on shaft 32, the inner one of these nuts contacting the inner race of the ball bearing 42. The shaft 32 is thus confined against endwise movement relative to sleeve 41 and collars 39 and 40, and is rotatably mounted in the latter for adjustment toward and away from the base plate 10 by turning of collar 39 in proper direction, by means of the handle or lever 46. A dog pointed set screw 50, threaded through the top of housing section 18 adjacent the rear of opening 21, engages in a circumferential groove in collar 39 and may be turned into binding contact with the latter, providing convenient means for securing collar 39 and hence the sleeve 41 and shaft 32 in desired adjustment. Preferably, a second set screw 51, threaded through the top wall of the upper housing section 18, is disposed to be turned into binding engagement with collar 40, providing additional means for locking the sleeve 41 and associated parts in adjustment.

The head 48 is disposed within a compartment 54 at the front of upper housing section 18. Head 48 is provided with a diametrical groove 55 of considerable width opening from its outer face. A counterweight block 56 is slidably mounted in groove 55 and seats against head 48 at the inner or rearward side of groove 55. The block 56 is of approximately oblong shape and of laminated construction. It comprises two U-shaped plates 57 spaced apart by end bars 58 secured between them by riveting or in other suitable manner. A counterweight 59, also of laminated construction, is secured to one end of the counterweight block 56, conveniently by the rivets which secure the corresponding end bar 58 to the block 56, additional rivets being provided for securing the laminations of the counterweight 59 together. Preferably, the counterweight 59 is of arcuate shape and extends about the head 48 for movement transversely thereof toward and away from shaft 32.

A crank pin block 62 is slidable in groove 55 of head 48 at the outer face of the counterweight block 56. The block 62 is of elongated U-shape in

lengthwise section and comprises an outer plate 63 and an inner plate 64 integrally connected to plate 63 at one end, there being an end bar or filler plate 65 secured between plates 63 and 64 at the other end thereof. The blocks 56 and 62 receive between the arms thereof two oppositely disposed eccentrics 66 and 67, respectively, suitably secured upon an adjusting rod 68 extending through shaft 32, slidable therethrough and, under certain conditions which will be explained presently, rotatable relative to shaft 32 for varying the angular relation between the latter shaft and rod 68. As will be clear from what has been said, both arms or plates of block 56 and the inner plate of block 63 are slotted lengthwise to accommodate adjusting rod 68 and relative movement of blocks 56 and 62 transversely of head 48. The eccentrics 66 and 67 contact the end walls or plates of blocks 56 and 62, respectively, as shown and as will be clear from what has been said. By turning the rod 68 in proper direction, the blocks 56 and 62 may be adjusted in opposite relation and simultaneously and to equal extent toward and away from the axis of shaft 32 along the diameter thereof. Arcuate grooves 69 in head 48, opening from groove 55, accommodate the eccentrics 66 and 67 when the latter are turned into positions projecting beyond the sides of blocks 56 and 62.

An annular adjusting plate 72 is mounted about the rearward end portion of rod 68, this plate being provided with a squared opening fitting about a squared element of a stud 73 extending from the rearward end of shaft 68. A knurled thumb nut 74, screwing on the stud 73, normally holds plate 72 tightly against the rearward end of shaft 32, this nut 74 providing means for forcing rod 68 rearward through tubular shaft 32, so as to clamp the blocks 56 and 62 tightly within head 48 by means of the eccentrics 66 and 67, in an obvious manner, block 62 preferably being provided with bevelled shoulders which seat against corresponding bevelled surfaces of head 48 in binding contact therewith, as in my above identified patent. The adjusting plate 72 is provided with an arcuate slot 75 concentric with shaft 32, this slot being provided with a series of notches opening from its inner edge. These notches are adapted to receive the inner portion of a pin 76 secured in the hub of pulley 31 and projecting rearward therefrom, this pin projecting through the slot 75. By turning nut 74 off of stud 73 to proper extent, the adjusting plate may be moved rearward sufficiently to be disengaged from pin 76, after which, by holding pulley 31 and turning plate 74, rod 68 may be turned so as to vary its angular relation to shaft 32 and effect desired adjustment of the slidable blocks 56 and 62. After the desired adjustment has been effected, plate 72 is returned to normal position with the pin 76 engaging in the notch of slot 75 corresponding to the adjustment made, after which nut 74 is turned tightly onto stud 73 for locking the parts together in the manner previously described. It will be seen that the pin 76 and the adjusting plate 72 provide a positive driving connection between rod 68 and shaft 32, assuring rotation of the rod with the shaft and precluding possibility of casual variation in the angular relation therebetween. The arrangement is similar to that disclosed in my above identified patent and need not be described in further detail.

A crank pin 79 is secured to, preferably formed integral with, the outer or forward arm or plate

63 of the crank pin block 62. The crank pin 79 is disposed to one side of the axis of shaft 32, which axis coincides with the axis of the adjusting rod 68, and extends forwardly from plate 63. The crank pin 79 fits within the inner race of a ball bearing 80 mounted in a bearing block 81 of generally annular shape but flattened at its top and bottom. The bearing block 81 is slidably mounted between upper and lower plates 82 and 83, respectively, of a yoke structure 84. The yoke structure 84 comprises a body portion or block 85 preferably formed of a light metal, such as aluminum, and the upper and lower plates 82 and 83 are secured to body 85 by screws 86 passing through plate 82 and body 85, and threading into the lower plate 83, the lower ends of these screws being peened over as shown in Figure 4. The block 85 is provided with a noncircular bore extending vertically therethrough, this bore receiving the intermediate portion 87*a* of a plunger 87. The portion 87*a* of plunger 87 is slabbed off at one side to provide a flat 87*b*, the cross section of portion 87*a* of the plunger corresponding to the bore in block 85, as will be clear from Figure 5. The plunger 87 is also provided with an upper reduced portion 88 of cylindrical shape, i. e., circular cross section, which extends upward beyond the top of compartment 54 and is slidably mounted in a bushing 89 carried by a ferrule 90 suitably secured, conveniently by set screws 91, in the top wall of the housing section 18. Any suitable means, such as that illustrated in Figure 1, may be provided from lubricating the upper portion 88 of plunger 87, as will be understood. The body or block 85 of yoke 84 is releasably secured on the intermediate portion 87*a* of plunger 87 in any suitable known manner, conveniently by means of socket headed set screws 92. The lower cylindrical portion of plunger 87 is slidable through a guide sleeve 93 suitably secured, conveniently by set screws, one of which is shown at 94, in thickened wall 95 of housing section 18 at the bottom of compartment 54. Suitable known means, shown in Figure 1, is provided for lubricating the lower portion of plunger 87 in guide sleeve 93.

The front of compartment 54 is closed by cover plates 98 and 99 secured thereto by screws or in any other suitable manner. The upper plate 82 of yoke 84 is provided, at each side thereof, with a forwardly extending tab 100 the forward surface of which is flat and smooth. The tabs 100 are disposed to contact or be in close proximity to the inner face of the inner cover plate 98, which preferably is formed of a synthetic resin which is resistant to abrasion and provides a smooth surface presented to the tabs 100. The outer cover plate 99 may be and preferably is formed of a metal.

It will be clear, from what has been said, that when the shaft 32 is driven the plunger 87*a* is reciprocated and the bearing block 81 is reciprocated in the yoke 84 transversely of plunger 87. The tabs 100 cooperate with cover plate 98 to restrain the yoke 84 against turning movement about the axis of plunger 87 thereby eliminating any play or looseness of parts which might tend to cause objectionable vibration and interfere with proper drive of the plunger. As will be understood, the bore in block 85 of yoke 84 extends through the plates 82 and 83, which preferably are formed of hard metal, such as steel, to guard against any objectionable wear of the elements of the yoke defining the bore therethrough.

The guide sleeve 93 extends downward a considerable distance below the wall 95. A supporting sleeve 102 is rotatably mounted on sleeve 93 by ball bearings 103. As will be clear from Figure 1, the assembly comprising the sleeve 102 and ball bearings 103 is confined against endwise movement between wall 95 and a cap nut 104 screwing on the lower end of guide sleeve 93. The supporting sleeve 102 is provided with a lengthwise outwardly opening channel or recess 105 in which is pivoted, adjacent its upper end, a block 106, by means of a pivot pin 107. A cover plate 108 is secured in a suitable manner, conveniently by means of screws 109, to the side walls 110 of the channel recess 105. Compression springs 111, seating in bores in block 106 and confined between the latter and cover plate 108, yieldingly urge block 106 toward sleeve 102, the latter having a flat surface cooperating with the inner face of block 106 for positively limiting inward movement thereof, as will be clear from Figure 1. A thumb screw 112 is threaded through the lower portion of cover plate 108 and provides means for positively limiting outward movement of block 106 and for locking it, under certain conditions, against movement in either direction.

A tubular guide rod 114 is secured in block 106 and extends downward therefrom. A cutting tool guide member 115 is mounted in the lower portion of guide rod 114. The member 115 comprises a shank 116 pivoted at its upper end in rod 114 by a pin 117, and a foot 118 at the lower end of shank 116, this foot comprising a heel 119 and a toe 120. The foot 118 operates in slots 121 in rod 114, extending from the lower end thereof. At its inner end toe 120 is provided with a V-shaped slot 121 disposed to receive the outer edge portion of a cutting tool, such as a chisel. A wire spring 122, of appropriate form, is mounted on pivot pin 117 and contacts shank 116 of guide member 115, urging the latter inward toward the axis of plunger 87 so as to maintain toe 120, at groove 121 thereof, in contact with the cutting tool, as will appear more fully presently.

A guide sleeve 124, provided with an interior bushing 125, is slidably mounted on rod 114 for vertical reciprocation thereon. The contacting surfaces of bushing 125 and rod 114 may be lubricated in any suitable manner, conveniently by means of appropriately arranged wicks 126 and 127, the wick 126 being disposed within guide rod 114, there being a fitting 128 mounted in block 106 for supplying lubricant to wick 126, the cover plate 108 being suitably notched to accommodate fitting 128, as will be clear from Figures 1 and 12. Sleeve 124 carries a tool block 129, conveniently formed integral therewith. The block 129 is provided with a vertically extending socket for reception of the shank portion of a cutting tool, such as a chisel or a saw blade, secured in block 129 by suitably disposed set screws 130. The block 129 is further provided with an inwardly extending finger 131 having in its inner end an arcuate groove 132 shaped to fit about a reduced neck 133 at the lower end of plunger 87, which extends downward beyond the supporting sleeve 102 as will be clear from Figures 1 and 2. The lateral portions of finger 131 provide elements disposed between shoulder 134 at the upper end of neck 133 and abutment member 135 suitably secured about the lower end of neck 133, conveniently formed integral therewith. The sleeve 124 is thus connected to plunger 87 for reciprocation therewith, while being capable of swinging movement toward and away from the plunger

substantially radially thereof. In the movement of the machine over the work the cutting tool, such as a chisel or saw blade, is reciprocated and, being eccentric to plunger 87, trails the latter, the supporting sleeve 102 swinging about the axis of plunger 87 in accordance with changes in direction of movement of the machine, permitting the cutting tool to follow accurately the line or pattern being cut. It is desirable that the assembly comprising the supporting sleeve 102 and parts carried thereby be damped to a certain extent in order to avoid the tendency, due to inertia, of the cutting tool to swing in either direction beyond the line or pattern which it should follow. To that end, I provide brake means comprising a tubular housing 134 threaded through sleeve 102 and open at its inner end, this housing carrying a plunger 135 contacting the guide sleeve 93. The plunger 135 is provided with a reduced stem 136 slidable through a hexagonal head 137 at the outer end of housing 134, the outer end of stem 136 being spread so as to prevent complete withdrawal thereof through head 137. A compression spring 138, within housing 134, is confined between plunger 135 and head 137, effective for holding the plunger in pressure contact with the guide sleeve 93. That provides a desirable braking effect which retards free swinging of the sleeve 102 about sleeve 93 for the purpose stated.

In practice the work is placed upon a suitable support and the machine is moved over the work in such manner as to move the cutting tool along a line or pattern to which the material or work is to be cut. When the chisel or other cutting tool is out of the work it is in vertical position perpendicular to the work. When the chisel enters the work on its downstroke, however, in the continued forward movement of the machine along the cutting line, the chisel is caused to assume an inclined position. To permit of that, the tool guide member 116 may swing outward away from the reciprocating plunger 87, substantially radially of the latter, this swinging movement of the member 116 being permitted by the spring 122. Also, in such cases, further outward movement of the guide member 116 may be permitted by outward swinging movement of the guide rod 114 about pin 107, to extent permitted by the thumb screw 112. Such outward movement of the guide member 116 is sufficient to accommodate the required movement of the chisel or cutting tool. When the chisel, when used, is again withdrawn from the work on the upstroke, the guide member 116, and with it the chisel, is returned to vertical position, and then follows the succeeding or cutting stroke of the chisel. The ability of the chisel to assume an inclined position, when subjected to outward pressure resulting from continued movement of the machine when the chisel is in the work, avoids subjecting the chisel to objectionable stresses with resulting bending or breakage thereof, while permitting movement of the machine over the work at increased speed and with increased smoothness, which increases the efficiency of the machine. But slight clearance between finger 131 and abutments 134 and 135 is required to permit of the outward and inward swinging movements of guide member 116 and guide rod 114. That slight clearance is not objectionable in practice but, if desired, may be obviated by so forming abutments 134 and 135 and finger 131 as to maintain close contact therebetween at all times, as will be readily understood. In cutting material over approximately 3/8 of an inch in thickness with a chisel, the thumb screw 112 should be turned outward sufficiently to clear the block 106, permitting maximum outward movement of guide member 116, as above. In cutting material less than 3/8 of an inch in thickness, the block 106 should be locked in its inner position by means of the thumb screw 112, as above explained, thus reducing the maximum outward movement of guide member 116. When a saw blade is used instead of a chisel, the extent of outward movement of the guide member 116 may be regulated, by the thumb screw 112, to suit the thickness and other characteristics of the material being cut, as will be understood.

By removing the cover plate 108 for the recess or channel in the supporting sleeve 102, the guide rod 114 may be swung outward away from plunger 87 sufficiently to withdraw the slotted finger 131 from about neck 133 of plunger 87, clear thereof, it being noted, as shown in Figure 1, that the upper inner corner of the block 106 is appropriately cut away or bevelled to that end. By removing the cover plates 98 and 99 from the front of the machine, and threading the set screws 92 outward clear of the plunger 87, the latter may be withdrawn downward through bushing 89, yoke 84 and the guide sleeve 93, as will be clear from what has been said. The yoke 84 may then be removed giving access to the bearing block 81 and to the crank block 83 and counterweight block 56 and associated parts. That is advantageous in that it permits ready access to the plunger and the associated driving and adjusting means for inspection, replacement or repair as may be required. By reversing the operation the plunger 87 may be inserted through guide sleeve 93, yoke 84 and bushing 89 and the parts secured in assembled relation, after which the finger 131 of block 129 may be inserted between the abutment elements 134 and 135, about neck 133 of the plunger 87, and the cover plate 108 again secured in position.

A suitable lamp 140 is disposed at each side of the motor 26 and a plate 141 is suitably secured, conveniently by screws, to the front wall 16 of the lower housing section 50. This plate is cut out from its lower edge and for the major portion of its width to provide a slot 142 adjacent the guide rod 114. The light from the lamp 140 passes through the slot 142 and illuminates the work being operated upon. In addition, the motor 26 is provided with a fan (not shown) effective for discharging air through slot 142 so as to blow away any chips or small particles of material produced during the cutting operation, which is conducive to accuracy. The provision of the lamps and of the fan, as and for the purposes stated, is disclosed in my above identified patent and need not be described in great detail here.

I claim:

1. In a cutting machine of the character described, a housing having a compartment and a tubular guide member extending therefrom, a drive shaft rotatably mounted in said housing and extending into said compartment, a reciprocating plunger slidable through said guide member extending into said compartment and lengthwise removable and replaceable through said guide member, a cover plate secured over said compartment, a yoke in said compartment releasably secured on said plunger, and disposed in close proximity to said cover plate and restrained thereby against turning about the axis of said

plunger, the latter being lengthwise engageable with and disengageable from said yoke when released therefrom, and driving connections between said shaft and said plunger effective for reciprocating the latter.

2. In a cutting machine of the character described, a housing having a compartment and a tubular guide member extending downward therefrom, a drive shaft rotatably mounted in said housing extending into said compartment, a reciprocating plunger slidable through said guide member, a yoke in said compartment having a bore receiving said plunger, the latter extending upward beyond the top of said compartment with its upper end portion guided in said housing, means releasably securing said yoke on said plunger, the latter being lengthwise removable from and insertible into said compartment through said guide member when released from said yoke, a cover plate secured over said compartment, said yoke having tabs of relatively slight area disposed to contact the inner face of said cover plate and thereby restrain said yoke against turning about the axis of said plunger, and driving connections between said shaft and said yoke effective for reciprocating said plunger.

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