Dec. 16, 1952 C. E. MILLER 2,621,522

TOOL SLIDE ACTUATING MECHANISM

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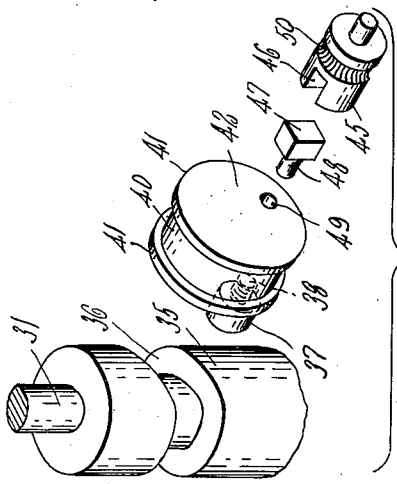


Fig. 3.

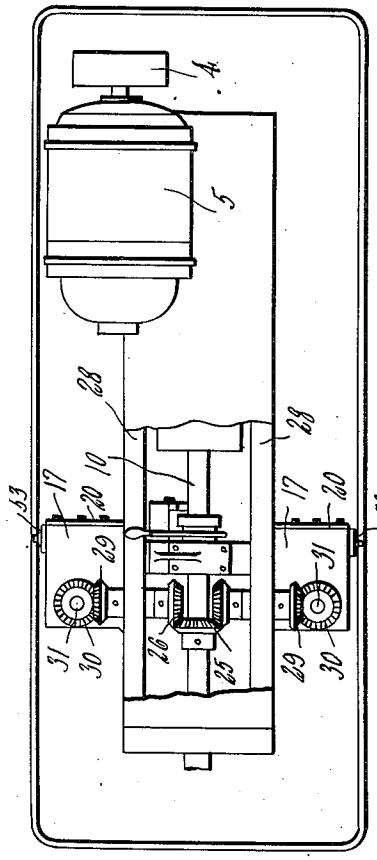


Fig. 1.

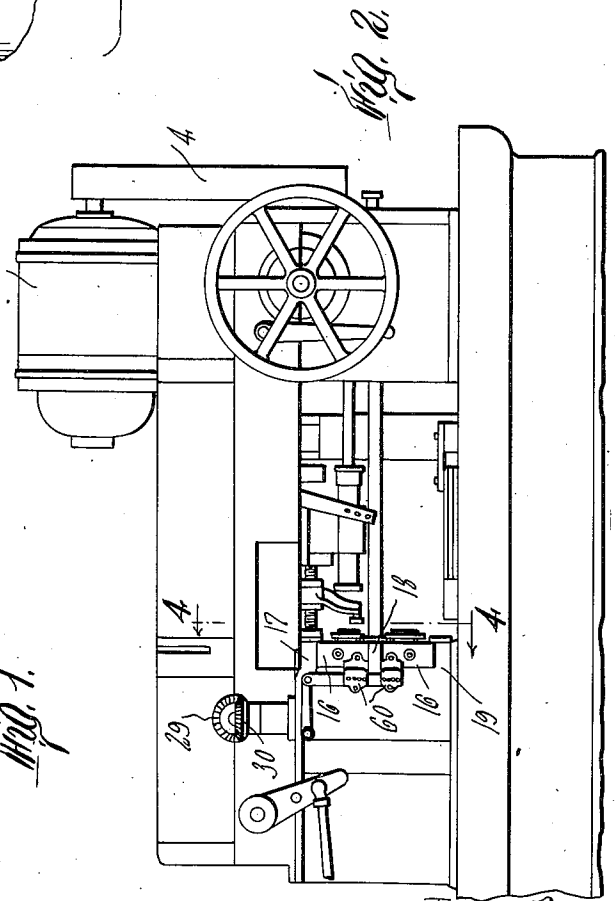


Fig. 2.

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TOOL SLIDE ACTUATING MECHANISM

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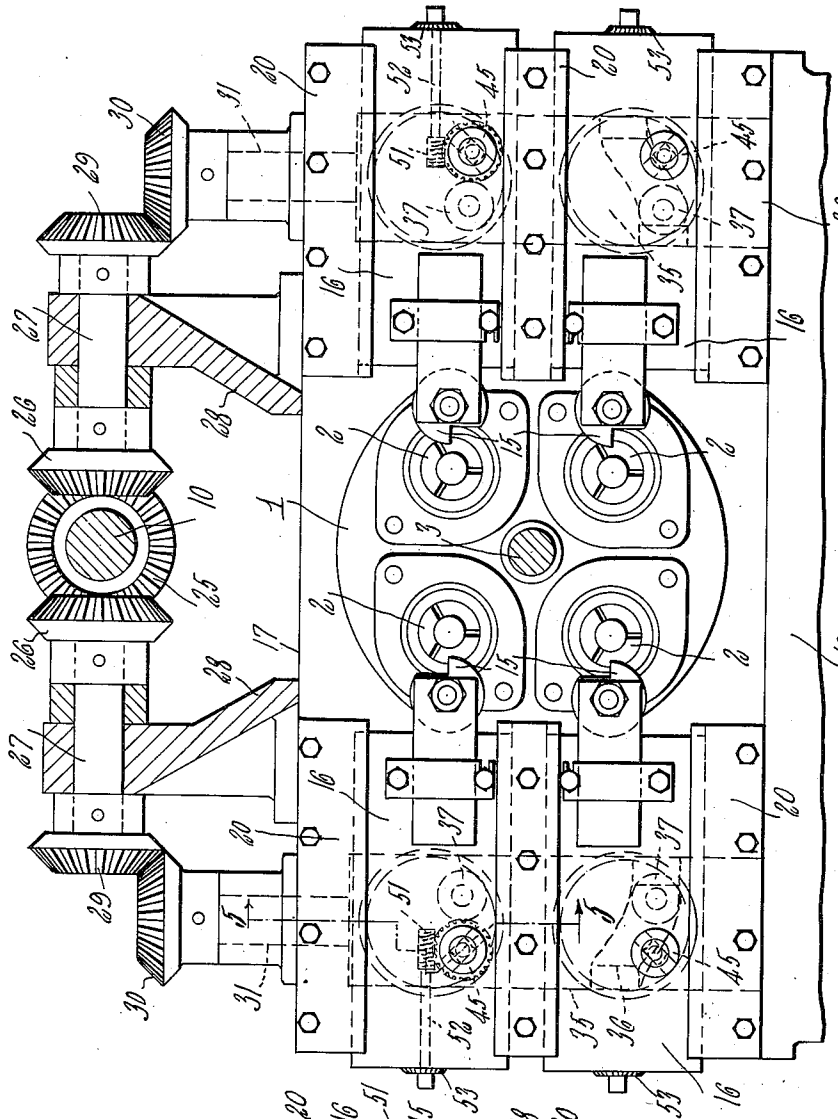


Fig. 4.

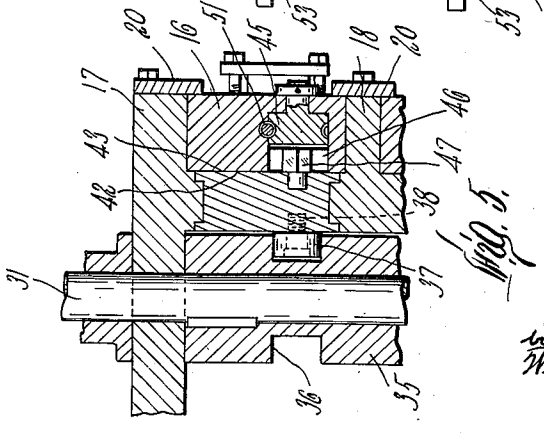


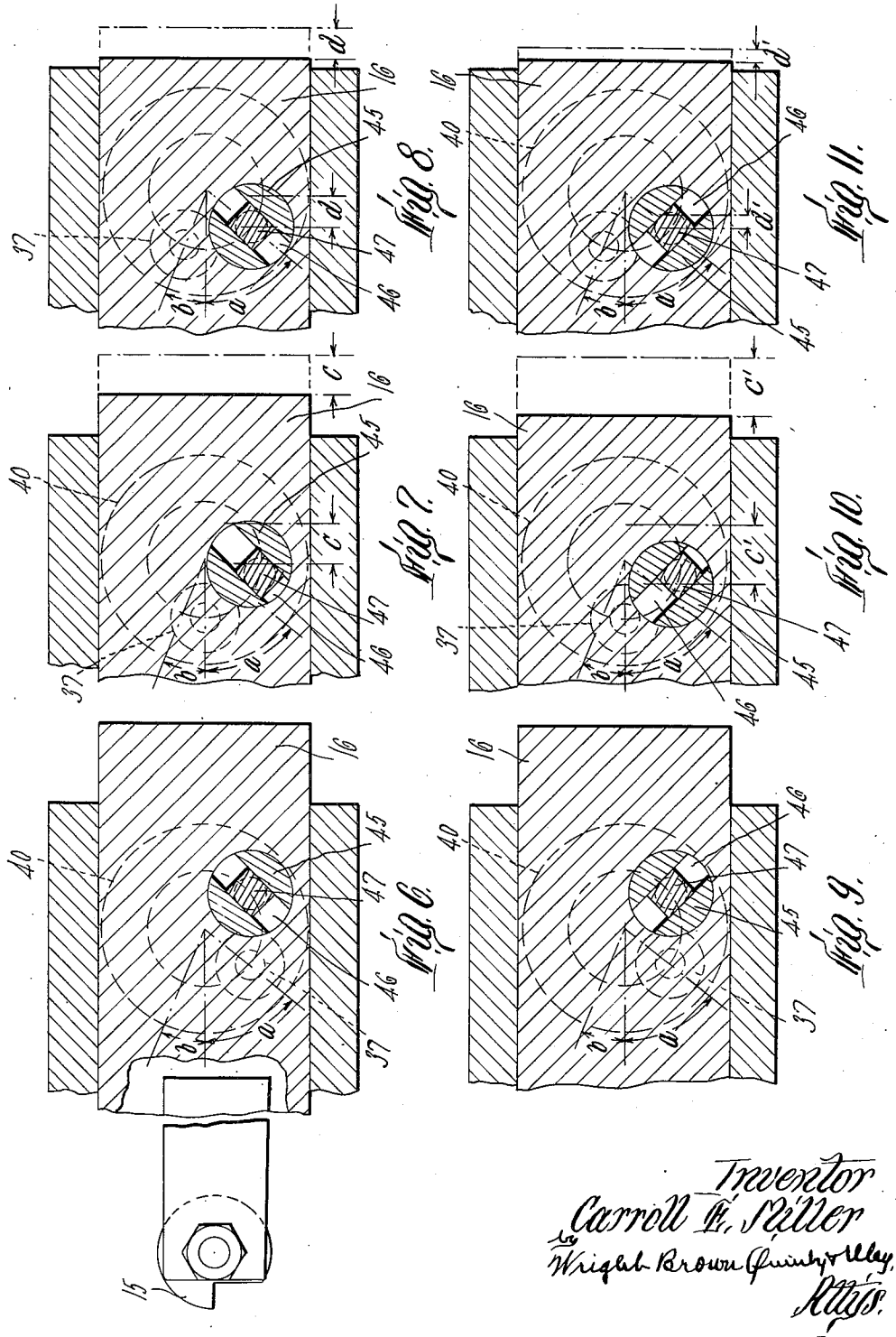
Fig. 5.

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TOOL SLIDE ACTUATING MECHANISM

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UNITED STATES PATENT OFFICE

2,621,522

TOOL SLIDE ACTUATING MECHANISM

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Application April 17, 1946, Serial No. 662,701

1 Claim. (Cl. 74—53)

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This invention relates to mechanism for actuating a tool slide, and has for an object to provide such a mechanism by which the proportions of motion of the slide occupied in rapid idle feed toward the work and a slow working feed may be adjusted. Heretofore it has been usual practice to produce such feed motion by the use of cams and where it has been desirable to alter the proportions of rapid and slow feed, a change of cams has commonly been necessary. This is not only costly in time, but requires a multiplicity of cams to be made and held in readiness. Moreover, the use of cams results in substantially invariable relationships between fast idle and slow working speeds so that continuous variations in such proportions are not obtainable.

A further object of the present invention is to eliminate the necessity of making and maintaining a set of different cams to provide for fixed differences in proportions between the feeds.

A further object of the invention is to provide simple mechanism capable of continuous variable proportionate adjustments.

Still another object is to provide a single operating mechanism for a plurality of tool slides, the proportions of fast idle and slow working feeds of which may be varied independently for different slides and each continuously between limiting relations.

For a complete understanding of this invention, reference may be had to the accompanying drawings in which

Figure 1 is a somewhat diagrammatic top plan view, partly broken away, of a multiple spindle lathe embodying the invention.

Figure 2 is a front elevation of the same.

Figure 3 is an exploded perspective view of certain parts of the tool feed mechanism.

Figure 4 is a vertical sectional view to a larger scale on line 4—4 of Figure 2, certain of the adjusting mechanism being shown in dotted lines.

Figure 5 is a detail sectional view on line 5—5 of Figure 4.

Figures 6 to 8, inclusive, are detail vertical sectional views showing different positions of the tool slide in one position of adjustment of the mechanism.

Figures 9 to 11, inclusive, are views similar to Figures 6 and 8, inclusive, respectively, but showing the mechanism under a different adjustment.

Referring to the drawings which illustrate the application of this invention to a multiple spindle lathe, at 1 is indicated a work spindle carrier within which are journaled a plurality of work spindles 2. These spindles 2 are arranged in a

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group, all the spindles being parallel to each other and arranged in circular array about a central axis of rotation of the carrier 1, and, as is customary with machines of this type, means are provided (not herein shown) for indexing the carrier 1 from time to time to present work projecting from each of the work spindles 2 into successive tooling positions. The spindles are rotated, and commonly this is accomplished through driving connections (not shown) from a rotary driving shaft 3 positioned coaxially with the carrier 1 and which is rotated through a suitable drive connection, such as a belt 4, from a motor 5. As shown the spindles are arranged horizontally. Above them and parallel thereto is a shaft 10, which, in machines of this type as heretofore constructed, has been provided with cams for performing various operations in the cycle of the machine.

On either side of the group of spindles and in position for tools 15 adjustably carried thereby to operate on work pieces projecting from the ends of the work spindles, are a plurality of tool carriers in the form of slides 16. As shown there are two slides on each side of the group of spindles, an upper and lower slide at the forward face of the machine, and an upper and lower slide at the rear of the machine, but there might be more or less depending upon the number of work spindles and other factors. The upper tool slides may be mounted between top and intermediate frame members 17 and 18 which are provided with guideways for the slides as shown in Figure 5, and the lower slides may be similarly mounted between the intermediate frame portions 18 and lower frame portions 19. Retaining plates or strips 20 may be applied to these frame members to hold the tool slides removably within their guideways. Heretofore, commonly these slides have been actuated by cams on the cam shaft 10, but in accordance with the present invention the shaft 10, which is rotatable, is connected through trains of gearing, including the bevel gear 25 carried by the shaft 10, beveled gears 26 secured to shafts 27 extending outwardly from the shaft 10 and journaled in bearing brackets 28, bevel gears 29 at the outer ends of the shaft 27, and bevel gears 30, to vertical shafts 31 adjacent to the forward and rear faces of the machine and to which the gears 30 are secured.

These trains of gearing drive the shafts 31 at the same speed as the shaft 10. Each of the shafts 31 has keyed thereto a cam 35 (see Figures 3 and 5) having a peripheral cam groove 36 there-

in, there being one of these cams 35 for each tool slide 16 on the same side of the group of work spindles. As herein shown, since there are two such slides, two cams 35 will be employed. As the drive mechanism, including the cams 35, are the same for all slides, a detail illustration of one only is shown in Figures 3 and 5. Engaging within the cam groove 36 of each cam 35, is a follower roll 37 journaled on a screw 38 projecting from a rocker 40. As shown this rocker 40 is of spool shape, having a pair of end flanges 41 which are seated in enlarged diameter portions in the frame members 17 and 18 or 18 and 19, between which the corresponding tool slide 16 is positioned. The rocker 40 thus is mounted to rock on an axis transverse to that of the shaft 31 and with an end face 42 positioned close to the inner face 43 of the corresponding slide 16. Each slide 16 has a cylindrical guide member 45 journaled therein and presenting adjacent to the face 43, a guide slot 46 within which is slidably guided a rectangular block 47 having a journal member 48 journaled in a hole 49 in and eccentric to the rocker 40. With this construction, as the shaft 31 rotates, the cam follower 37 riding in the groove 36, is caused to oscillate about the axis of rotation of the rocker 42 between definite limits, and this rocking motion imparts a feed motion of the corresponding tool slide 16 longitudinally. The particular motion which will be imparted by the rocking of the rocker 40 depends upon the angular adjustment of the member 45, and this adjustment may be changed as desired. This may be done as shown by forming one axial portion of the member 45 at 50 as a worm wheel, which has meshing therewith a worm portion 51 of a shaft 52, shown in dotted lines in Figure 4 for the two upper slides 16, this shaft 52 being journaled lengthwise within the corresponding tool slide and being accessible at its outer end beyond the back end of the tool slide for turning adjustment. Its outer end may be formed polygonal for the reception of a suitable tool (not shown) and a graduated dial at 53 secured thereto cooperating with suitable index markings on the end face of the corresponding slide will serve to indicate to the operator the particular position of angular adjustment of the shaft 52 at any time.

The effects of angular adjustment of the shafts 52 with corresponding angular adjustment of the corresponding guide member 45 are illustrated in Figures 6 to 11. In Figures 6 to 8, the guide member is in one angular position, while in Figures 9 to 11 it is in an angular position substantially 90° removed from that shown in Figures 6 to 8. The total extent of rocking of the rock member 40 as determined by the cam follower 37 riding in the cam groove 36 is represented by the total angle $a+b$ of these figures. This total extent of rocking produces a continuous feed, in or out, of the corresponding work slide, the first portion of the inward movement corresponding to angle a being a relatively fast idle motion, bringing the tool up from a retracted position to one where the tool is close to the work, further motion corresponding to angle b being produced at a relatively slow rate and including the working stroke of the tool. Commonly machines of this type provide for a relatively rapid angular motion of the cam or drive shaft 10 during the idle tool motion and a relatively slow motion during the feed action. This may be availed of in connection with the present application, or if desired, the relative fast and slow motions may be produced by properly proportioning slopes of the corresponding portions of the cam grooves 36. In any event, the first portion of the motion to bring the tools inwardly is a fast idle motion and takes place during the movement of the cam follower 37 from the position of Figure 6 to that of Figure 7, during which it moves through the angular distance a while the later slower feeding motion is produced while the cam follower 37 describes a further arc b, the cam follower 37 then being in the position shown in Figure 8.

It will be noted that while the cam follower is moving from its lowest position through the arc a, the block 47 moves within the guide slide 46 downwardly and inwardly so that the slide 46 moves inwardly a distance represented by c in Figure 7. The horizontal motion of the tool slide throughout this angular distance motion a of the follower 37 is thus decreased over what it would have been had the guide slot 46 been vertical by the horizontal component of the motion of the member 45 with respect to the block 47. As the follower 37 continues its motion through the further arc b, the block 47 reverses its direction of motion within the guide slot 46, moving from the position shown in Figure 7 to that of Figure 8, the resultant effect on the slide being to move it inwardly a further distance d of Figure 8, in which the distance which the slide would have moved with the guide slot 46 vertical is augmented by the horizontal component of motion of the guide member 45 relative to the block 47 due to the inclination of the slot 46 from the vertical. The total extent of movement of the slide is thus the summation of the distances c and d.

Referring now to Figures 9 and 11, it will be noted that the guide member 45 has been turned substantially 90° from that shown in Figures 6 to 8, inclusive. The motion upwardly of this follower 37 through the angle a results in sliding the block 47 downwardly and rearwardly to the position shown in Figure 10, and the horizontal component of this motion is added to that which would have been produced had the guide slot 46 been vertical, resulting in a forward movement of the tool slide in rapid idle motion through the distance c' shown in Figure 10, which it will be noted, is longer than the distance c shown in Figure 7. Continued motion of the follower 37 through the angular distance b results in moving the block 47 forwardly as well as upwardly in the guide slot 46, producing a horizontal component of the guide member 45 which is subtracted from that which would have been produced had the guide slot 46 been vertical, so that the total length of slow feed of the tool slide is represented by the distance d' of Figure 11. Thus the proportions of tool slide motion which are produced in rapid idle traverse and in the slow working traverse are quite different with these two different angular settings of the guide member 45. From this it will be understood that with angular positions of the guide member 45 intermediate between those shown in Figures 6 to 8 and 9 to 11, intermediate proportionings between the fast and slow motions may be produced, these varying continuously between definite limits. It will also be noted that since the angular adjustment of the guide members 45 may be effected independently for each of the tool slides, the effects of similar driving mechanism, including similar cams 35, are independently selectable for each of the tool slides, and this

without the use of separate cams for making the various adjustments.

The final inner positions of the tool slides may be adjusted individually for the individual spindles, as by the use of automatic positive stops as disclosed, for example, in the Cone Patent No. 2,142,557 granted January 3, 1939, for Automatic Lathe, such automatic stops being indicated generally at **60** on Figure 2, but as these constitute no part of the present invention, they are not further illustrated herein.

From the foregoing description of an embodiment of this invention, it should be evident to those skilled in the art that various changes and modifications might be made without departing from its spirit or scope.

I claim:

In combination, a tool slide, a pair of spaced guide members between which said slide is mounted, a rocker journaled between said guide members and having an end face adjacent to a face of said slide, means for rocking said rocker, a block journaled eccentrically to said rocker, a guide member journaled in said slide and having a transverse guide groove for slidably guiding said block, said guide member having a worm wheel portion, and a worm shaft journaled in said slide and having a worm portion engaging said worm wheel, said shaft projecting through the outer end face of said slide accessible for angular adjustment to thereby angularly adjust said guide member.

CARROLL E. MILLER.

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