

June 18, 1940.

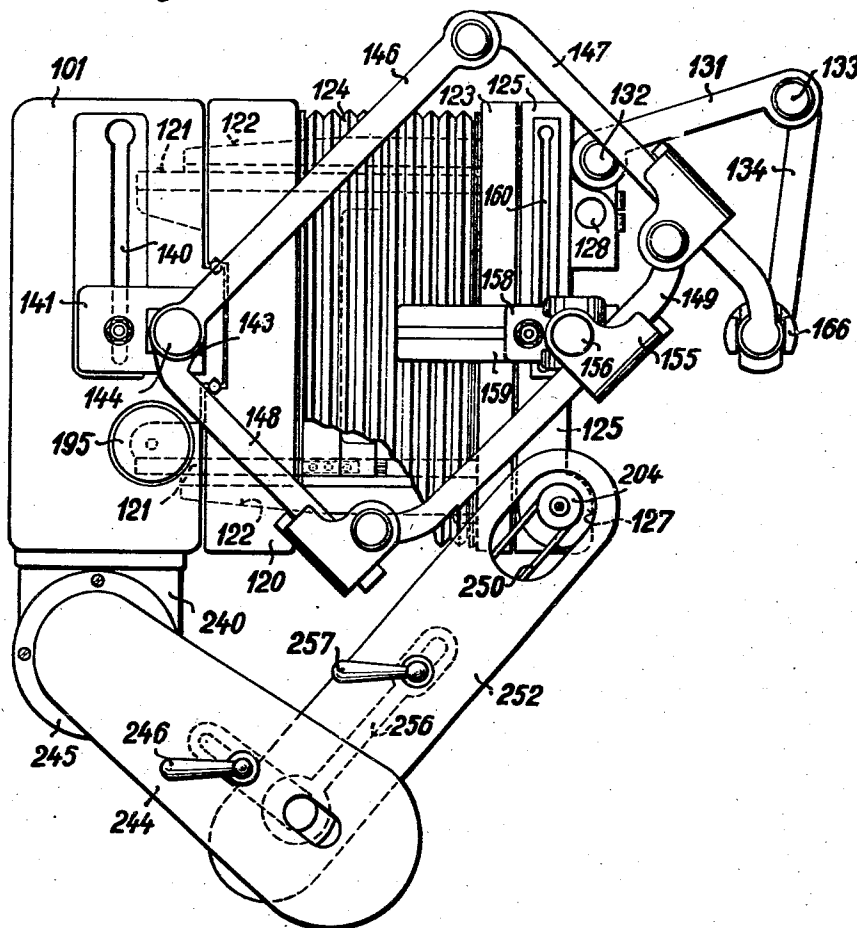
K. ZWICK

2,204,841

DRIVING MEANS FOR ENGRAVING AND COPYING MACHINES

Original Filed March 28, 1936 2 Sheets-Sheet 1

Fig. 1



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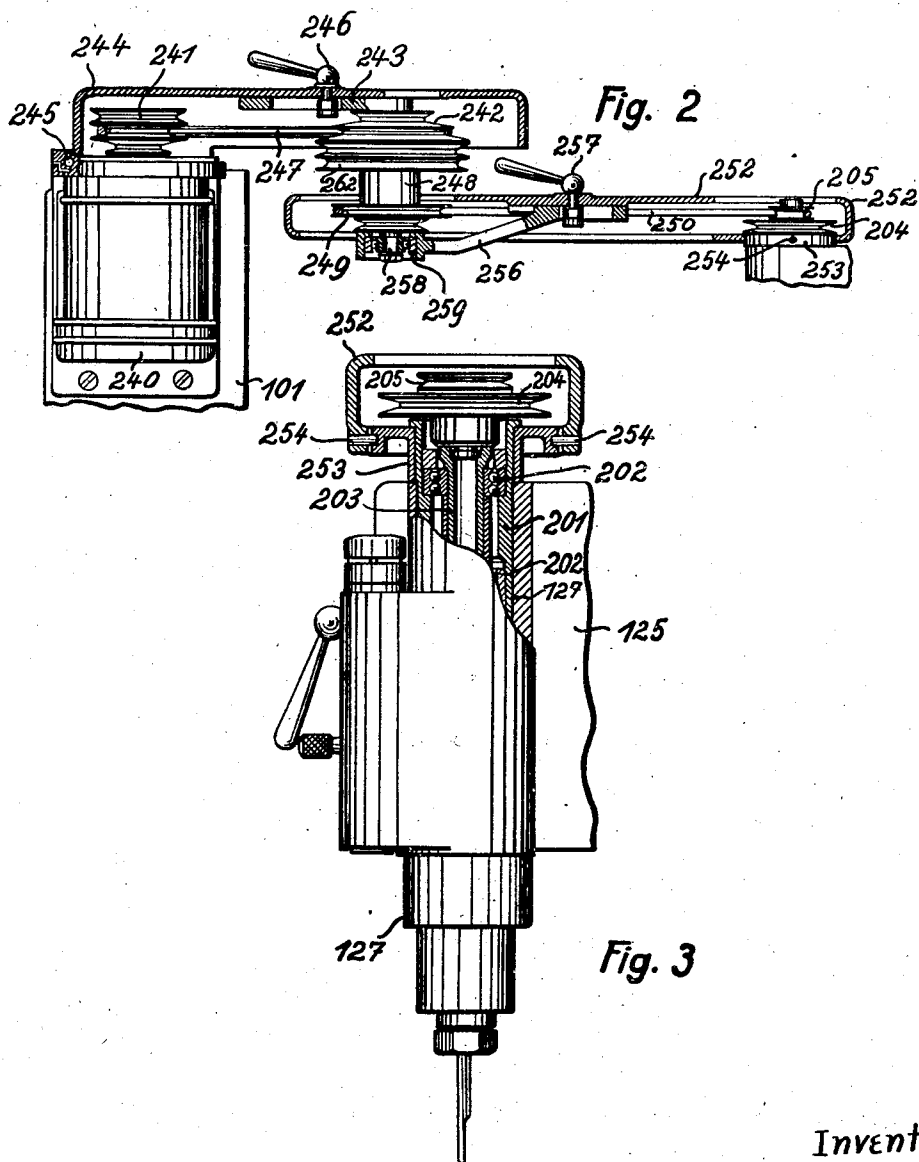
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DRIVING MEANS FOR ENGRAVING AND
COPYING MACHINES

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Original application March 28, 1936, Serial No.
71,483, now Patent No. 2,176,193, dated October
17, 1939. Divided and this application April
16, 1938, Serial No. 202,567

11 Claims. (Cl. 90—13.1)

This invention relates to engraving and copying machines, using these words in a broad sense as including die sinking machines.

An object of the invention is the provision of a generally improved and more satisfactory drive for engraving and copying machines and the like.

Another object is the provision of a belt drive arranged for machines of this character, in which the tension of the belt may be easily and quickly adjusted, and in which the belt is protected from accidental contact by the operator.

A further object is the provision of driving means of the above mentioned character, so designed as to be well adapted to drive a tool spindle movable in all directions over three dimensional or relief work.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a plan or top view of a machine constructed in accordance with a preferred embodiment of the invention;

Fig. 2 is a vertical section through the driving means of the present invention, and

Fig. 3 is a vertical section through part of the driving means, taken in a plane substantially at right angles to Fig. 2.

The same reference numerals throughout the several views indicate the same parts.

The present application is a division of my United States patent application, Serial No. 71,483, filed March 28, 1936, for Engraving and copying machine, now Patent 2,176,193, Oct. 17, 1939. Certain subject matter disclosed but not claimed in the present application is claimed in said parent application No. 71,483, or in other divisions thereof.

Referring now to Fig. 1 of the drawings, there is shown for purposes of illustration, but not as a limitation, one form of engraving and copying machine with which the driving means of the present invention may be used. This illustrative form of machine includes a main frame or standard 101 on which a member 120 is mounted for vertical movement along guideways. The member 120 carries a pair of forwardly projecting horizontal arms 121 having ball bearing guideways for cooperation with side arms 122 projecting horizontally rearwardly from a cross bar 123, to which the arms 122 are rigidly connected. An accordion pleated bellows 124 may enclose the

arms 121 and 122 to protect them from dust and dirt.

A beam 125 is movable horizontally on guideways extending along the cross bar 123. Hence the beam 125 may move universally in all directions. It may move horizontally in one direction along its guideway on the bar 123; it may move horizontally in a direction at right angles thereto by moving the entire beam 123 and its arms 122 along the guideways on the arms 121; and it may move vertically by moving the parts 121, 122 and 123 upwardly or downwardly along the vertical guideway on the standard or support 101.

This universally movable beam 125 carries a plurality of sockets, two of which are shown at 127 and 128, respectively, and all of which are adapted to receive interchangeably, as desired, either a rotary cutting tool or a tracing stylus. One or more of the sockets may be adjusted horizontally to various positions along the beam 125.

An arm or link 131 is pivoted at one end to the beam 125 by means of a vertical pivot 132, which pivot is mounted either directly on the beam 125 or on the movable holder or socket 128. The opposite end of the arm 131 is pivoted by another vertical pivot 133 to one end of the arm 134, the other end of which is provided with a socket for cooperation with a tracing stylus or cutting tool mounted on a lazytongs pantograph, as explained below.

At the top of the main frame 101, above the member 120, is a horizontal clamping slot 140, and a block 141 may be moved along this slot and clamped in any desired position thereon. The block 141 carries a horizontal pivot on which is pivoted a carrier 143 having a vertical pivot 144 forming the main or fixed pivot of a lazytongs pantograph system or linkage. The lazytongs linkage comprises, for example, the arms 146, 147, 148 and 149 pivoted to each other by vertical pivots in the usual lazytongs linkage manner, one of the arms (such as 149) being adjustable to different positions along its companion arms (such as 147 and 148) in order to set the lazytongs linkage for different ratios of reduction or enlargement. A member 155, settable to different positions along the arm 149, carries a vertical pivot 156 which extends downwardly below the bottom of the member 155 and is connected by a horizontal pivot to a bracket 158 which may be moved to and clamped in any desired position along a horizontal guideway on a bar 159 secured to the top of the beam 125 and extending horizontally in a direction transverse to the length of the beam. This bar 159 may be fixed immov-

ably to the top of the beam 125, but preferably it is movable to any desired position along a clamping groove 160, extending longitudinally along the top of the beam.

5 At the outer end of the lazytongs arm 147 is a downward projection on which is formed a universal joint indicated in general at 166. A tube projects downwardly from the universal joint and is slidable vertically within a vertical bore
10 formed in the end of the arm 134. The arm 134 thus holds the tube always vertical, notwithstanding upward or downward movements thereof, and notwithstanding tilting of the pantograph linkage about its horizontal pivot on the mounting
15 block 141.

A cutting tool spindle, or a tracing stylus, as desired, may be mounted within the tube which projects below the universal joint 166.

Suitable counterweight means is provided,
20 which counterbalances all or any desired part of the weight of the vertically movable member 120 and the various parts supported thereby. Limiting stop means, to determine the maximum extent to which the member 120 may move down-
25 wardly, is preferably provided, the limiting stop means being adjustable in any suitable manner, such as by the rotatable head 195 at the top of the machine.

Each of the holders 127 and 128 may be arranged so that the cutting tool spindle is completely removed when not in use, or may be arranged to retain a cutting tool spindle at all times, a tracing stylus being mounted in the chuck at the lower end of the spindle when it is
35 desired to place a tracing stylus in this holder 127 or 128, and a cutting tool being mounted in the chuck at the lower end of the spindle when it is desired to employ a cutting tool at this location. The holder 127, for example, as
40 shown in Fig. 3, may thus receive a bearing sleeve 201 having suitable bearings 202 for holding a rotatable tube 203 forming part of the spindle, the upper end of the tube being provided with a driving pulley having belt grooves
45 204 and 205.

The spindle driving means of the present invention comprises, for example, an electric motor 240 secured to one side of the machine frame 101. At the upper end of the armature shaft of
50 this motor is a pulley 241 over which a driving belt may pass to a second pulley 242 mounted on a bearing on an arm 243 slidable longitudinally along a housing 244 which has a bearing
55 245 concentric with the pulley 241 so that the housing may swing horizontally to any desired position around the pulley 241, but is restrained against any tilting movement, so that the housing 244 acts as a cantilever and supports the weight of the pulley 242 and other parts. A clamp
60 246 serves to hold the sliding member 243 in any desired position to produce the proper tension on the belt 247 running from the pulley 241 to the pulley 242.

The pulley 242 is secured to a sleeve 248 which
65 extends downwardly from the pulley and to which is secured a second pulley 249 over which may run a belt 250 extending to the pulley 204, 205 on the tool spindle. A housing 252 surrounds the belt and runs from the pulley 249 to the pulley
70 204, 205, not only protecting the belt, but also exerting the necessary force to resist or counterbalance the tension of the belt 250. Because of the fact that, during operation, the tool spindle may move vertically to a considerable extent relatively to the motor 240, this housing 252 must be

connected in such a manner as to permit such rising and falling movement of the spindle. One end of the housing is, therefore, pivotally connected to a sleeve member 253 surrounding and rotatable upon the sleeve 201 of the spindle, by means of pivot pins 254 extending generally transversely to the length of the housing 252, so that this housing may tilt about these pins 254 as an axis. A member 256 is slidable longitudinally along the housing and may be clamped in any desired position by means of the clamp 257. This member 256 is engaged with the lower end
10 258 of the shaft on which the pulleys 242 and 249 are mounted, by means of a spherical bearing 259, so that the housing 252 may tilt laterally as well as longitudinally, or in any desired direction, relatively to the shaft 258, although the housing is at all times supported by this shaft. Thus the housing forms a connection between the tool spindle shaft and the pulley shaft 258 which
20 is flexible in a vertical direction but rigid in a horizontal direction, so as to maintain the tension on the belt 250. As the tool spindle moves horizontally over the work, this results, of course, in horizontal movement of the pulley shaft 258, turning this shaft about the motor shaft as a center.

When a cutting tool rather than a tracing stylus is mounted in the tube which extends
30 downwardly from the universal joint 166, such a cutting tool is driven from a pulley mounted on the tool spindle substantially at the universal joint, and this pulley is driven from a belt placed in the special groove 262 on the pulley 242, which special groove is in a horizontal plane sufficiently
35 below the edge of the housing 244 so that a belt extending horizontally from this groove 262 will not scrape on the lower edge of the housing. The housing 252 is removed and replaced by a plain rod-like spacer connected on the one hand
40 to the member 256 and on the other hand to a suitable part of the tube which depends from the universal joint 166 and which forms the bearing for the spindle which is to be driven.

When a tool spindle mounted on the holder
45 128 is to be driven it may be driven by the arrangement above described for driving the spindle in the holder 127, or by the arrangement above described for driving the spindle below the universal joint 166. If tool spindles in both
50 holders 127 and 128 are to be driven, the spindle in the holder 127 may be driven in the manner above described, and the spindle in the holder 128 may be driven by a belt extending from the spindle in the holder 127 to the spindle in the
55 holder 128.

In operating the engraving or copying machine above described as an example of the mechanism with which the present invention is to be used, the tracing stylus mounted, for example,
60 in the tube depending from the universal joint 166, is moved at will over the surface of the pattern or model to be copied. The horizontal components of such movements are transmitted
65 through the lazytongs linkage to the pivot 156 and through this pivot to cause corresponding horizontal movements on a reduced scale of the beam 125 and of the cutting tool or tools mounted on this beam. The vertical movements of the
70 tracing stylus cause upward and downward tilting of the outer end of the lazytongs pantograph, and this, through the universal joint pivotal connection between the member 155 and the member 158, causes corresponding vertical movements on
75

a reduced scale of the beam 125 and the cutting tools mounted thereon.

As the cutting tool mounted in the holder 127 moves horizontally, the belt housings 244 and 252 swing relatively to each other, but maintain the various pulleys always at the same distance from each other, thus maintaining the tension of the belts at whatever degree is desired, the degree of tension being readily adjustable by sliding the members 243 and 256 along their respective guideways or slots in the housings 244 and 252. When the spindle which is being driven moves vertically, the housing 252 tilts upwardly or downwardly about the pivots 254 at one end, and about the tilting or universal joint bearing 259 at the other end. Thus the spindle is driven properly at all times, notwithstanding either vertical or horizontal movements of the spindle relatively to the motor 240.

While one embodiment of the invention has been disclosed, it is to be understood that the inventive idea may be carried out in a number of ways. This application is therefore not to be limited to the precise details described, but is intended to cover all variations and modifications thereof falling within the spirit of the invention or the scope of the appended claims.

I claim:

1. Driving means for a tool spindle of an engraving or copying machine of the type including a frame, means mounted on and movable with respect to said frame for carrying a cutting tool spindle, and a driving pulley operatively connected to said spindle, said driving means comprising a motor mounted on said frame and having an approximately vertical main shaft, a driving pulley mounted on said main shaft, a belt housing mounted adjacent said motor for oscillation in an approximately horizontal plane about an axis substantially concentric with said main shaft and projecting a substantial distance laterally from said shaft and restrained against downward tilting movement relative to said shaft and plane, a slide mounted on said housing for movement toward and away from said main shaft, pulley means mounted on and deriving its support from said slide, a belt running over said pulley means and driving pulley on the motor shaft, and a second belt running over said pulley means and said driving pulley on the spindle.

2. Driving means for a movable tool spindle of an engraving or copying machine having a frame, a motor mounted on said frame, and a tool spindle mounted for movement relative to said frame, said driving means including a first belt housing mounted on said frame for oscillation relatively thereto substantially in a fixed horizontal plane, a second belt housing extending approximately horizontally substantially from said first housing to said spindle, pulley means adjustably connected to both of said belt housings and forming a connection between them for supporting one end of said second housing from said first housing, said connection being so formed that said second housing may tilt upwardly and downwardly relative to the plane of the first housing to accommodate itself to limited upward and downward movements of said spindle relative to said plane, belt means running through said first housing for driving said pulley means from said motor, and belt means running through said second housing for driving said spindle from said pulley means.

3. Driving means for a movable tool spindle of

an engraving or copying machine having a frame, a motor mounted on said frame, and a tool spindle mounted for movement relative to said frame, said driving means including a substantially rigid member mounted for oscillation 5 relatively to said frame substantially in a fixed horizontal plane about a substantially vertical axis of oscillation, a slide mounted for movement on said member to different positions closer to or farther away from the axis of oscillation of said member, a shaft carried by said slide, pulley means mounted on said shaft, a second slide attached to and supported from said shaft, a second substantially rigid member extending substantially from said spindle to said second slide, 15 said second slide being movably connected to said second member for movement thereon to different positions closer to or farther away from said spindle, and belt means extending from said motor to said pulley means and from said pulley means to said spindle for driving said spindle.

4. Driving means for a movable tool spindle of an engraving or copying machine having a frame, a motor mounted on said frame, and a tool spindle mounted for movement relative to said frame, said driving means including a substantially rigid member mounted for oscillation relatively to said frame approximately in a fixed horizontal plane and projecting a substantial distance laterally from the axis of oscillation, a substantially vertical shaft carried from and extending downwardly from said member near the projecting end thereof, pulley means mounted on said shaft, a substantially rigid belt housing extending substantially from said spindle to said shaft, said belt housing being operatively connected to said spindle to be moved by movements of said spindle relatively to said frame, a connecting member mounted on said belt housing for sliding movement thereon to different positions at different distances from said spindle, said connecting member being connected to and supported from the lower end of said shaft, clamping means for holding said connecting 45 member in any position to which it is set on said belt housing, and belt means extending from said motor to said pulley means and from said pulley means through said belt housing to said spindle.

5. Driving means for a movable tool spindle of an engraving or copying machine having a frame, spindle holding means mounted for movement relative to said frame, and a tool spindle mounted on said holding means, said driving 55 means comprising a supporting part mounted on said spindle holding means for oscillation thereon about an axis substantially concentric with the axis of said tool spindle, a pulley shaft mounted for movement to different positions relative to said frame, pulley means mounted on said shaft, spacing means for holding said pulley shaft at a definite distance from said tool spindle, said spacing means being pivoted to said supporting part for oscillation relative thereto 65 about an axis lying approximately in a plane perpendicular to said axis of said tool spindle, and means for driving said tool spindle, said driving means including belt means running from said pulley means to said tool spindle.

6. A construction according to claim 5, in which said spacing means is in the form of a belt housing at least partially enclosing said belt means running from said pulley means to said tool spindle.

7. Driving means for a tool spindle of an engraving or copying machine of the type including a frame, a beam supported from said frame and guided for movement of translation to a plurality of different positions each of which is substantially parallel to the others, a lazytongs linkage supported from said frame, means operatively connecting said beam to said linkage at one point so that movements of one are transmitted to the other, means at another point on said linkage for holding a tracing stylus or a tool spindle, and means on said beam for holding a tool spindle or a tracing stylus, said driving means comprising a motor mounted on said frame, a swinging arm mounted on said frame, pulley means carried by said arm at a point spaced from said frame, and means for driving said pulley means from said motor, said pulley means including one belt groove for receiving a belt extending therefrom to a tool spindle on said beam when such tool spindle is being employed, and including a different belt groove for receiving a belt extending therefrom to a tool spindle on said linkage when such tool spindle is being employed.

8. A construction according to claim 7, further including rigid means connecting said arm to the tool spindle being employed, to move said arm in accordance with movements of said tool spindle.

9. Driving means for an engraving and copying machine of the type including a frame, holding means for holding an approximately vertical tool spindle for movement both horizontally and vertically relative to said frame, and a driving pulley mounted on said frame, said driving means including an approximately horizontally extending first housing of elongated form, bearing means mounting one end of said housing on said frame for oscillation about an approximately vertical axis and for supporting said housing against downward tilting, the opposite end of said housing extending laterally a substantial distance from said bearing means, a second elongated housing extending approximately horizontally and pivotally connected near one end to said spindle holding means and pivotally connected near its opposite end to said first housing near the end thereof remote from said bearing means, pulley means associated with said housings near the point where they are connected

to each other, and driving belt means extending from said driving pulley along said first housing to said pulley means and from said pulley means along said second housing to said spindle, both of said housings being of approximately inverted U-shaped cross section to enclose said belt means at top and sides and open at the bottom for free access to said belt means for changing the same.

10. Driving means for an engraving and copying machine of the type including a frame, holding means for holding an approximately vertical tool spindle for movement both horizontally and vertically relative to said frame, an approximately vertical drive shaft on said frame, and a pulley on said shaft, said driving means including an approximately horizontally extending first housing having one end in encircling relation to said pulley, bearing means encircling said shaft for mounting said end of said housing for oscillation substantially around the axis of said shaft and for supporting said housing against downward tilting, the opposite end of said housing extending laterally a substantial distance from said shaft and bearing means, an approximately vertical stub shaft mounted on said housing near said opposite end thereof, pulley means rotatably mounted on said stub shaft, a bearing member mounted on said stub shaft for limited tilting movement relative thereto, a ring mounted on said tool spindle holding means for oscillation substantially about said spindle as an axis, a second housing of elongated form having one end connected to and supported from said bearing member on said stub shaft and having its opposite end connected to and supported from said oscillatable ring by a pivotal connection, and driving belt means extending from said pulley on said driving shaft along said first housing to said pulley means and from said pulley means along said second housing to said spindle.

11. A construction as described in claim 10, in which at least one of said housings is formed with walls enclosing said belt means at least partially on three sides in cross section and open on the fourth side for access to said belt means for changing the same.

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