HAND OR FOOT OPERATED VISE

John H. De Hart, 497B New Haven Ave., Milford, Conn.
Filed July 24, 1959, Ser. No. 829,318
7 Claims. (Cl. 81—33)

This invention relates generally to bench vises and particularly to those which may be operated either by hand or foot.

It is an object of the invention to provide an improved bench vise which may be operated either by hand or foot, wherein improved means is provided for moving the usual movable jaw member of the vise.

It is another object of the invention to provide an improved vise as set forth in the preceding paragraph, which includes improved foot-operated mechanism for driving the means for moving the movable jaw member of the vise.

The above and other objects and further details of that which I believe to be novel and my invention will be clear from the following description and claims taken with the accompanying drawings, wherein:

Fig. 1 is a partial side elevational view and a partial sectional view taken substantially on line 1—1 of Fig. 6, of an improved bench vise and the upper portion of foot-operated mechanism therefor which incorporates the invention;

Fig. 2 is an enlarged sectional view taken substantially on line 2—2 of Fig. 1;

Fig. 3 is a sectional view through the bottom portion of the foot-operated mechanism taken substantially on line 3—3 of Fig. 7;

Fig. 4 is a sectional view taken substantially on line 4—4 of Fig. 3;

Fig. 5 is a front elevational view in the direction of the arrow in Fig. 1;

Fig. 6 is a sectional view taken substantially on line 6—6 of Fig. 5;

Fig. 7 is a front elevational view looking in the direction of the arrow in Fig. 4;

Fig. 8 is a view similar to Fig. 2, but of a modified form of drive chain mounting;

Fig. 9 is a sectional view of a modified form of foot-operated mechanism taken substantially on line 9—9 of Fig. 11;

Fig. 10 is a sectional view taken substantially on line 10—10 of Fig. 9, and

Fig. 11 is a front elevational view looking in the direction of the arrow in Fig. 9.

Referring to the drawings, and particularly to Figs. 1—7, wherein one form of the invention is illustrated, the improved vise is generally indicated by reference numeral 10 and is shown as being rigidly mounted above a floor surface F (see Figs. 4 and 7) on a work bench B (see Figs. 1 and 5). The vise 10 includes a vise body 12 having a flat disk-like horizontally disposed mounting plate 14, and an upstanding portion 16 having a longitudinally extending guideway 18 formed therethrough, and a stationary vise jaw 20 supported near its upper end.

The vise body 12 may be considered to be stationary, for during operation of the vise 10 after its angular position relative to the bench B initially has been set, it is stationary. It is desirable in practice, however, to permit the vise 10 to be pivotal about a vertical axis so as to permit selective angular positioning of the vise relative to the bench. To accomplish this, the downwardly facing lower surface of the mounting plate 14 is provided with a plurality of concentric circular V-shaped grooves 22 which cooperate with a plurality of complementary concentric circular V-shaped ribs 24 formed on the upwardly facing upper surface of the vise bed 26. The bed 26 is rigidly secured to the bench B as by nut and bolt assemblies 28 or equivalent securing means. The vise body 12 rests on the bed 26 and is pivotal about a vertically extending swivel bolt 30 which loosely passes through a vertically extending plain opening 32 formed in the bed 26 and is anchored in a vertically extending threaded opening 34 formed in the mounting plate 14. In order to rigidly fix the angular position of the vise body 12 relative to the bench B, an arcuate slot 36 is formed in the front of the bed 26, and a clamping stud 38 and associated clamping nut 40 and washer 42, which may be a lock washer, are utilized. The clamping stud 38 loosely passes through the slot 36 and is anchored in a vertically extending threaded opening 44 formed in the front of the mounting plate 14, and receives the washer 42 and clamping nut 40 on its lower threaded end. In order to selectively adjust the angular position of the vise body 12 relative to the bench B, the clamping nut 40 is loosened, the vise body is pivoted the desired amount about the swivel bolt 30, and the clamping nut is then tightened. It should be understood that the vise body 12 carries with it the other elements of the vise, when angularly displaced, including the foot-operated mechanism for causing movement of the movable jaw of the vise, as will become apparent subsequently. After the vise body 12 is adjusted angularly, it may be considered to be stationary during operation of the vise.

Movable jaw 46 of the vise 10 is moved by a movable jaw member 48 that includes a longitudinally extending shank 50 that is channel-shaped in cross section and slidably guided for longitudinal movement relative to the vise body 12 in the guideway 18 thereof. The movable jaw member 48 may be moved either by hand or foot operated means 52 on which is mounted control means for the operator. Each of these means is selectively utilized independently of the other and is capable of providing the desired longitudinal movement of the movable jaw 46 relative to the stationary jaw 20 to either clamp or release a piece of work therebetween.

The hand-operated means for moving the movable jaw member 48 will be described first, however, it should be understood that some of the elements of the hand-operated means are common to the foot-operated means, principally the means for effecting movement of the movable jaw member apart from either the hand-operated mechanism or the foot-operated mechanism for driving the movement effecting means. Rigidly fixed to, or if desired integrally formed with, the vise member 12 is a bearing and feed nut block 52. If the block 52 is a separate element, it is rigidly secured to, and extends above, the upper surface of the mounting plate 14 by the securing bolts 54. The block 52 is disposed within the guideway 18 of the vise body member 12, and the cavity formed by the channel-shaped shank 50 of the movable jaw member 48. The block 52 comprises an upwardly extending feed nut projection 56, a laterally spaced upwardly extending bearing projection 58, and a horizontally extending connecting bridge 60. The feed nut projection 56 includes a longitudinal, horizontally extending, threaded bore 62 which is formed with a feed screw fast thread. The bearing projection 58 rigidly supports a bushing 64, which may be cylindrical, that is coaxial with the bore 62. The internal bearing surface of the bushing 64 is cylindrical and slidably supports the periphery of the feed screw fast
threads 66 formed on the feed screw 68, that is also received in the threaded bore 62. The feed screw 68 is an elongated, rod-like member having threads 66 formed over most of its axial extent and is rotatably supported in a bushing 72, which may be flanged and made of steel, that is rigidly mounted in an opening 74 that extends generally horizontally through the front portion of the movable jaw member 48. Rigidly secured to the front end 76 of the feed screw 68 is a projection 90, driven clutch member 86. The clutch member may be effected in any convenient manner, as by the pin 80. The clutch member 78 includes a clutch face having an elongated, transverse slot 82 which is dovetailed in cross section. Rigidly secured to and extending axially away from the front end 76 of the feed screw 68 is a swivel stud 84. Loosely rotatably mounted on a plain shank portion of the swivel stud 84 is a collar-like, driving clutch member 86 having a handle-bar 88 rigidly secured thereto. The clutch member 86 has a clutch face with an elongated, transverse projection 90 which is dovetailed in cross section formed thereon and positioned to oppose the slot 82 in the clutch member 78. The clutch members are normally biased axially apart by a compression spring 92, one end of which contacts the clutch face of the clutch member 78 and the other end of which is secured to the feed screw 68. The projection 90 and slot 82 are dimensioned so as to permit entry of the projection into the slot when these elements are properly aligned and the clutch member 86 and handle-bar 88 are pushed axially toward the clutch member 78. Thereafter, pivoting of the handle-bar 88 results in the projection 90 being forced into the slot 82 and thereby forming a temporary manual driving connection for the feed screw 68. Further pivoting of the handle-bar 88 causes direct rotation of the feed screw 68 by virtue of the engagement of the clutch members.

Rotation of the handle-bar 88 in either angular direction results in turning of the feed screw in the bore 62 and horizontal axial movement of the feed screw either inwardly or outwardly relative to the vise body 12. Such axial movement of the feed screw is accompanied by longitudinal movement of the movable jaw member 48 relative to the stationary jaw 12 because of the connection of the member 48 to the clutch member 78, which is effected by the arcuate plate 96. The arcuate plate 96 is rigidly secured to the lower front portion of the member 48, as by the bolts 98, and includes an arcuate upper edge portion that rides in an annular groove 100 formed in the chuck member 78. It shall, therefore, be apparent that the feed screw 68 is rotatably mounted in the front portion of the movable jaw member 48, that they are jointly axially movable, and that the jaw 46 may be moved toward and away from the stationary jaw 20 by manual engagement of the clutch members 78 and 86 and rotation of the handle-bar 88. Such action results in either joint axial advancement or retraction of the feed screw 68 and the movable jaw member 48 relative to the vise body 12, depending on the angular direction of movement of the handle-bar 88.

In addition to the hand-operated means for moving the movable jaw 46, set forth above, my invention includes foot-operated means for causing such movement. It will be understood that the block 52, feed screw 68 and feed screw movable jaw member 48 connection comprise means for moving the movable jaw member 48 which is common to both the hand-operated manual foot-operated means for moving the movable jaw 46. Disposed between the projections 56 and 58 of the block 52 is a driven sprocket 102 that is disposed for rotation about a horizontal axis. The driven sprocket 102 includes a plurality of angularly spaced, radially extending teeth that are adapted to cooperate with driving chain 104 in the form of an endless link chain. Sprocket 102 includes a central opening that defines a cylindrical bearing surface that is disposed about the feed screw 68 and rests on the feed screw 68. Plain portion 70 of the sprocket 102 is radially inwardly extending key 106 and the sprocket has a radially inwardly extending key 106 that is slidable received in the keyway. The structural relationship of the sprocket 102 and the feed screw 68 is such that, in operation, they rotate jointly but the feed screw is axially slidably mounted in the sprocket opening. Because the axial position of the sprocket is fixed, rotation of the driven sprocket 102 results in rotation and axial movement of the feed screw 68 relative to the sprocket 102 and projection 56, and consequential retraction or advancement of the movable jaw member 48, which is connected to the feed screw for joint axial movement therewith, depending on the angular direction of rotation of the driven sprocket.

Connected to and depending from the vise body 12 is an elongated, vertically downwardly extending, tubular, pipe-like assembly 110. Figure 1 and also FIGS. 2 and 7, are considered as single views, the assembly 110 will be seen to extend from the vise body 12 downwardly to foot-operated mechanism for driving the drive chain 104, though the assembly 110 is centrally broken for convenience in illustration. The assembly 110 includes a flanged upper collar 112 which is rigidly secured to the mounting plate 14 by the mounting screws 116 and has its flanged portion disposed in a recess 118 formed in the mounting plate. The collar 112 is rigidly connected to an upper tubular section 120, as by the pin 122, and extends downwardly through a horizontally disposed arcuate slot 124 formed in the bed 26. When the vise body 12 is pivoted on the swivel bolt 30, the collar 112 pivots jointly therewith, as does the remainder of the assembly 110 and the lower elements of the foot-operated driving mechanism, as will become apparent subsequently.

The assembly 110 includes a lower flanged collar 126 to which is secured, as by pin 127, the lower tubular section 128 that extends upwardly. The lower end of the tubular section 120 and the upper end of the tubular section 128 are oppositely threaded and threadedly received in adjusting nut 130, which has a central bore 132 that is oppositely threaded at its axial ends in a corresponding manner to the threaded ends of the tubular sections 120, 128 which it receives, so as to provide a fast acting means for adjusting the axial (vertical) length of the assembly 110, and are provided to lock the assembly in its adjusted length.

The foot-operated mechanism for driving the chain drive comprises a bottom swivel plate 136 which is rigidly secured to the floor surface F, as by the screws 138, and which includes a forward arcuate groove 140 in its upper surface and a rearward vertically extending threaded opening 142. Suspended above the swivel plate 136 is a generally rectangular bottom plate 144. The bottom plate 144 includes a rearwardly extending opening 146, through which a swivel stud 148 loosely passes and is anchored in the threaded opening 142 in the swivel plate 136. Mounted at the front of the bottom plate 144, and depending downwardly so as to have their tips received in the groove 140, is a pair of threaded adjusting screws 150, each of which has an associated lock nut 152. Mounted on the upper side of the bottom plate 144 is an arcuate-shaped, C-shaped, U-shaped bracket 154, the upper extremity of which is connected to the lower flanged end of collar 126, as by the screws 156. The bracket 154 has a pair of spaced aligned openings which support spaced horizontally coaxial bearing sleeves 158. Rotatably supported in the bearing sleeves 158 is one end of a collar 162, another end of which is rotatably supported in a bearing sleeve 162, aligned with bearing sleeves 158, mounted in an upwardly extending post 164.
The portion of the shaft 160 that is disposed between the bearing sleeves 158 has a driving sprocket 166 rigidly secured thereto for joint rotation therewith, and the radially extending teeth of which operatively engage the links of the drive chain 104 to drive the latter. Between the bracket 154 and the post 164, a ratchet-like, driving gear 168 is rigidly secured to the shaft 160 for joint rotation therewith, as by the pin 162. The arrangement of the shaft 160, driving sprocket 166 and driving gear 168 is such that these elements rotate in unison in either angular direction, and such rotation results in driving the drive chain 104 which, in turn, causes rotation of the driven sprocket 102 and consequential axial movement of the feed screw 106.

An elongated horizontally extending bar 170, which may be formed by a pair of parallel spaced plates 172 that are secured together by a pair of spaced tabs 174, is centrally pivotally mounted on the shaft 160 in a manner that the plates 172 straddle the driving gear 168 (see Fig. 4), but are independent thereof. The horizontal bar 170 extends transversely of the shaft 160 and is normally disposed generally horizontally by a pair of bent leaf springs 176 which are anchored at one of their ends to the bottom plate 144 by spring-supporting pins 178 and have their other ends in contact with the lower surface of tabs 174 so secured to said tabs by clips 179. Springs 176 are stressed when mounted, and therefore, bias both ends of the horizontal bar 170 upwardly. The arrangement is such that the horizontal bar 170 is normally horizontally disposed when at rest, but may be rocked about the shaft 160 during operation and will be returned to its normal horizontal position by the springs 176.

The horizontal bar 170 operatively carries a pair of spaced toothed levers 180, one on each side of the driving gear 168. The levers 180 are independently mounted on horizontally disposed swivel pins 182 that are supported by the plates 172. The outer ends of the levers 180 rigidly support foot pedals 184. Adjacent their outer ends, each of the levers 180 has a recess 186 formed which faces downwardly and receives an end of a separate compression spring 188, the other end of which is in contact with the upper surface of one of the tabs 174. The inner ends of the levers 180 have downwardly extending, pawl-like, arcuate fingers 190. A pair of lever stop pins 192 are rigidly carried by the plates 172 and are disposed so as to normally be contacted by their outer ends to limit movement caused by the springs 188, and thereby position the levers in such a manner that the teeth on the fingers 190 are spaced from the teeth on driving gear 168.

In operation of the foot-operated mechanism, selective individual depression of the pedals 184 results in the pivoting of their associated lever 118 and movement of their associated finger 190 against the bias of their associated spring 188 toward driving gear 168 to engage the teeth of driving gear 168 and rotate driving gear 168 an angular portion. As pointed out above, rotation of the driving gear 168 is accompanied by joint rotation of the drive shaft 160 and the driving sprocket 166, and the consequential driving of the drive chain 104. Depression of the foot pedals 184 overcomes the bias of the springs 188, which are thereby stressed, and thereafter on release of the foot pedals 184, the springs 188 unstress and return the levers 180 to their normal positions shown in Fig. 7. It should be clearly understood that only one foot pedal is depressed at a time, depending on the angular direction of movement of the driving gear 168 desired which, in turn, is dependent upon the ultimate axial direction of movement of the feed screw 68 desired. In operation, the foot pedals 184 may be independently "pumped" in order to effect a series of angular incremental movements of the driving gear 168 until the movable jaw member 48 has been moved to the desired extent.

In view of the foregoing, the manner in which my improved vise may be operated either by hand or foot should be apparent. Further, it should be understood that angular displacement in a horizontal plane of the vise body 12 is automatically accompanied by angular displacement of the foot-operated mechanism. Movement of the latter is permitted by the swivel mounting of the bottom plate 144 on the swivel stud 148, and the sliding action of the tips of the adjusting screws 150 in the groove 140. In order to provide for different bench heights, the assembly 110 is longitudinally extensible and contractible by utilizing the adjusting nut 130, and by adjusting the adjusting screws 150. It will be understood that adjustment of the assembly 110 alters the distance of the axes of rotation of the sprockets to effect the proper driving relationship of the sprockets of the drive chain 104. Under some circumstances, it will be understood, if the height adjustment is very large, the removal or addition of individual links in the drive chain 104 may be necessary. In view of the readily separable nature of the assembly 110, such alteration of the drive chain may be conveniently effected. It should also be understood that whenever the vise body is adjusted horizontally, the axes of rotation of the sprockets are maintained so as to be generally parallel and coplanar in a vertical plane. The adjustment afforded by the adjusting screws 150 is normally utilized after the assembly 110 is adjusted to provide the proper sprocket axes so that the tips of adjusting screws 150 lightly contact the swivel plate 140. This assists in the supporting of the bottom plate 144, which is essentially suspended by the assembly 110, and thereby reduces some of the strain on the assembly 110. In this connection, if desired, the tips of the adjusting screws 150 may include antifriction rollers or balls which ride in the groove 140 and reduce friction during angular adjustment to a minimum.

The form of the invention just described has the drive chain 104 disposed within the assembly 110, as can be clearly seen in Figs. 1–7, however, it may be varied slightly, if desired, so as to dispose the drive chain 104 on the exterior of the assembly 110, rather than on the interior thereof. Fig. 8 illustrates this variation, wherein it will be observed that the drive chain 104 which drives the driven sprocket 102 is disposed on the exterior of the collar 112' and upper tubular section 120'. A comparison of Figs. 2 and 8 will quickly reveal the distinction between the two drive chain dispositions, and it will be observed that in Fig. 8 common elements are designated by the same reference numerals utilized in Fig. 2 with a prime (') added.

A major modification of the form of the invention illustrated in Figs. 1–7 may be made by substituting the foot-operated mechanism illustrated in Figs. 9–11 for that of Figs. 1–7. It should be clearly understood that the foot-operated mechanism illustrated on Figs. 9–11 is utilized with the portions of the improved vise illustrated in Figs. 1, 5 and 6. In this regard, it should be clearly understood that the drive chain of the Figs. 9–11 foot-operated mechanism may be disposed either on the interior or exterior of the vertically extending, tubular, pipe assembly which connects the foot-operated mechanism to the vise body, notwithstanding the fact that it is illustrated on the exterior thereof.

The foot-operated mechanism of Figs. 9–11 includes a box-like housing 194 that is pivotally and vertically slidably mounted on a swivel pin 196 that is threaded and anchored in swivel plate 198. The lower flanged collar 200 of a vertically extending, tubular, pipe assembly 202 is rigidly secured to the top wall 204 of the housing 194. The top and bottom walls 204 and 206, respectively, are detachably secured to the side walls of the housing, as by the screws 208. Horizontally extending drive shaft 210 having positioning thrust collars 212 is rotatably supported in two spaced parallel side walls of the housing 194. The drive shaft 210 rigidly supports a driving
sprocket 214 centrally thereof and a bevelled drive gear 216 near one end thereof. The drive shaft 210, sprocket 214 and drive gear 216 are mounted for joint rotation. The driving sprocket 214 is operatively associated with a drive chain 218 which is of the endless link type and is illustrated as passing through a pair of spaced openings 220 formed in the top wall 204. The operative relationship of the driving sprocket 214 and drive chain 218 is generally the same as that of their counterparts in the first form of the invention disclosed.

On opposite lateral sides of the housing 194 there is mounted a pair of selectively independently operated, foot-operated lever means for driving the sprocket 214. A description of only the right hand lever means will be made, however, it should be understood to apply equally to the left hand lever means, wherein corresponding components are designated by the same reference numerals as those of the right hand lever means with a prime (') added.

The right hand lever means comprises a stub shaft 222 that is rotatably mounted in a housing side wall and rigidly carries a bevel gear 224 that is disposed within the housing side wall bevel drive gear 216. The stub shaft 222 also carries a ratchet-like driving gear 226, which is rigidly secured thereto on the exterior of the housing 194, as by the keys 228 for joint rotation therewith and with the bevel gear 224. Rotatably supported on the stub shaft 222 and disposed about the gear 226 is a hollow lever supporting body member 230. The body member 230 may be built up of a number of detachable parts to facilitate assembly and maintenance and is detachably retained on the stub shaft 222 by end plate 231 which is screw mounted to the end of said stub shaft. Body member 230 includes the upwardly extending tab 232 to which is pivotally secured an end of a lever 234, the free end of which rigidly supports a foot pedal 236. Near the pivotal end of the lever 234 a downwardly extending toothed arm 238 is rigidly carried by the lever and extends through an opening 240 in the top of body member 230 into the cavity therein. Spaced from the arm 238 an oblong slot 242 is formed in lever 234 which receives a normally vertically extending stud 244 which is anchored at one of its ends in the body member 230 and receives a washer and nut 246, 248 respectively, on its free end which is disposed on the upstanding end of the lever 234. The stud 244 contacts the washer 252, that is mounted on the stud 244 adjacent the lower side of the lever 234, and normally biases the lever upwardly into its Fig. 10 position.

The body member 230 has a downwardly extending stop lug 254 which is normally biased into contact with a stop lug 256 that extends upwardly from a laterally horizontally extending plate portion 258 which is a part of the bottom plate 206 of the housing 194. On one lateral side of the body member 230 there is formed a pair of spaced laterally extending tabs 260. The tabs are normally engaged and biased by a pair of cooperating tabs 262 formed on a hollow housing 264 that is rotatably supported on an axle 266 which, in turn, is rigidly supported by an L-shaped bracket 268. The housing 264 is detachably retained on axle 266 by end plate 270 that is screw mounted to the end of axle 266. The bracket 268 has a vertical leg to which the axle 266 is rigidly secured, as by pin 270, and a horizontal leg which is anchored to the plate portion 258 as by the screw 272, which is disposed in a slot 273 in a manner to permit lateral adjustment of its bracket.

Within the housing 264, which is built up of a number of detachable parts to facilitate assembly and maintenance, there is disposed a coil spring 274 having one end 276 anchored to the axle 266 and the other end 278 anchored to the housing 264. The arrangement is such that the spring 274 is normally stressed and biases the housing 264 to rotate in a direction that causes its tabs 262 to contact the tabs 260 and bias the body member 230 into its Fig. 10 position, wherein its stop lug 254 engages the stop lug 256.

When it is desired to drive the driving sprocket 214 to cause the endless link type drive chain 218, and driven sprocket (not shown) to adjust the axial position of the feed screw (not shown) and move the movable jaw member, the user depresses the foot pedal 236. The initial effect of such depression is to overcome the bias of the spring 274, stress it and cause pivoting of the lever 234 relative to the body member 230, while the latter remains stationary. Further depression of the pedal 236 results in joint pivoting of the lever 234 and body member 230, counter-clockwise as shown in Fig. 10. Such joint pivoting of the lever 234 and body member 230 is accompanied by joint partial rotation of the shaft 222 and the bevel gear 224 therewith because of the temporary driving connection effected by the teeth on the arm 238 and the teeth on the gear 226 which is effected when the lever 234 pivots relative to the body member 230 on initial depression of the foot pedal 236. Pivoting of the body member 230 also stores energy in spring 274 by colling (stressing) it, because of the interengagement of tabs 260 and 262, and the forced pivoting of the housing 264. Rotation of the bevel gear 224 drives the bevel drive gear 216, the drive shaft 210 and the driving sprocket 214. Since only one foot pedal 236 is depressed at a time in the right hand side of the invention, one during the present explanation of the operation, rotation of the left hand bevel gear 224, is permitted at this time because the left hand toothed arm 238 is out of engagement with the teeth on the left hand ratchet-like gear 226 at this time. Release of the foot pedal 236 results in the spring 274 uncoiling (unstressing) itself, and, through the driving engagement of the tabs 260 and 262, pivoting the body member 230 and the lever 234 clockwise, as shown in Fig. 10, until the stop lug 256 re-engages the stop lug 254. Thereafter the spring 250 unstresses and simultaneously moves the lever 234 and the toothed arm 238 upwardly because of the engagement with the teeth on gear 226, to their positions shown in Fig. 10.

Therefore, in order to move the movable vise jaw with the Figs. 9-11 foot-operated mechanism, the user depresses either the foot pedal 236 or 256, depending upon the direction of movement of the movable jaw desired. In operation, the pedal depressing action may be similar to a pumping action to quickly effect the desired movement of the movable vise jaw. It should be clearly understood that in foot operation of the vise only one foot pedal is used at a time, and therefore, that when driving one of bevel gears 224, 244', by depressing its associated foot pedal, the other of said gears is allowed to rotate freely without contact of its associated ratchet-like gear (226 or 262') with its associated toothed arm (238 or 239').

In operation the driving of sprocket 166 or 214 by the foot-operated ratchet means will operate sprocket 102 by chain 104. As sprocket 102 is keyed to feed screw 68 by key 108 in the sprocket and keyway 106 in the screw, the screw will turn with the sprocket. As the screw is threaded in the stationary feed nut block 52 rotation of the screw will cause it to move longitudinally carrying with it the vise jaw 48. The sprocket is retracted against longitudinal movement with the screw, as it is mounted in a recess in the feed block 52 which provides stationary abutments on opposite sides of the sprocket. The vise may be turned to different angular positions through the use of the lip clamp 304 by first disengaging clamping screw 38. The foot-operated ratchet drive will be adjusted with it through the pipe connection 128. As will be evident from the foregoing description, certain aspects of my invention are not limited to the particular details of construction of the examples illustrated, and I contemplate that various and other modi-
9 
10 
2,985,048

fications and applications will occur to those skilled in the art. It is, therefore, my intention that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A vise comprising: a vise body having a stationary jaw; a longitudinally movable jaw member having a jaw that is arranged to move toward and away from said stationary jaw to cooperate therewith to grip or release work; and means for moving said movable jaw member toward said stationary jaw to grip the work and away therefrom to release the work; said means including a rotatable elongated feed screw that is connected to said movable jaw member for joint longitudinal movement therewith and which has a threaded connection with said vise body whereby rotation of the screw causes longitudinal movement of the movable jaw toward and from the stationary jaw, and foot-operated mechanism for selectively causing rotation of said feed screw including a rotatable driving sprocket, foot-actuated means for driving said sprocket, a rotatable driven sprocket spaced from said driving sprocket and splined to said feed screw for joint rotation therewith and for longitudinal movement of the screw in the sprocket, and a drive chain operatively connected to and connecting said sprockets for joint rotation, whereby on rotation of said driving sprocket said driven sprocket and feed screw are rotated, and longitudinal movement of said movable jaw member results.

2. A vise as defined in claim 1 wherein said feed screw is axially slidably mounted within an opening in said driven sprocket, and there are stationary abutments on opposite sides thereof, whereby it is restrained from moving axially.

3. A vise as defined in claim 1 wherein said driving sprocket is connected with a driving gear, said foot actuated means comprises a foot actuated lever means, and there is a driving connection from the foot actuated lever means to the said gear including means to selectively rotate the gear by angular increments in either direction.

4. A vise as defined in claim 3 wherein said driving gear is ratchet-like and said lever means comprises a pair of toothed levers which are disposed on opposite sides of said driving gear and arranged to individually and independently contact and rotate said driving gear in opposite angular directions.

5. A vise as defined in claim 1 wherein there is a support for the driving sprocket, there is an elongated tube extending between and connecting the support with the vise body, and said tube is longitudinally extensible and contractible.

6. A vise as defined in claim 5 wherein said sprockets are rotatable about vertically spaced horizontally extending axes; said tube depends vertically from said vise body; and said driving sprocket is mounted in said support in bearing means that is supported on a vertically adjustable horizontally extending bottom plate.

7. A vise as defined in claim 6 wherein said tube is rigidly connected to said vise body and said bottom plate; and said vise body and bottom plate are mounted for selective angular adjustment about a vertical axis.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Patent Number</th>
<th>Inventor</th>
<th>Date of Patent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,018,630</td>
<td>Reeder</td>
<td>Feb. 27, 1912</td>
</tr>
<tr>
<td>1,146,146</td>
<td>Fisher</td>
<td>July 13, 1915</td>
</tr>
<tr>
<td>1,431,114</td>
<td>Hansen</td>
<td>Oct. 3, 1922</td>
</tr>
<tr>
<td>1,617,129</td>
<td>Liabo</td>
<td>Feb. 8, 1927</td>
</tr>
<tr>
<td>1,658,411</td>
<td>Morgan</td>
<td>Feb. 7, 1928</td>
</tr>
<tr>
<td>1,794,614</td>
<td>Hochman</td>
<td>Mar. 3, 1931</td>
</tr>
<tr>
<td>1,901,120</td>
<td>Rankin</td>
<td>Mar. 14, 1933</td>
</tr>
<tr>
<td>2,114,637</td>
<td>Olsen</td>
<td>Apr. 19, 1938</td>
</tr>
<tr>
<td>2,240,737</td>
<td>Young</td>
<td>May 6, 1941</td>
</tr>
<tr>
<td>2,293,532</td>
<td>Call</td>
<td>Sept. 8, 1942</td>
</tr>
<tr>
<td>2,396,823</td>
<td>Burbank et al.</td>
<td>Mar. 19, 1946</td>
</tr>
<tr>
<td>2,407,541</td>
<td>Mayer</td>
<td>Sept. 10, 1946</td>
</tr>
<tr>
<td>2,489,731</td>
<td>Thomas</td>
<td>Nov. 29, 1949</td>
</tr>
<tr>
<td>2,565,999</td>
<td>Teglas et al.</td>
<td>Aug. 28, 1951</td>
</tr>
</tbody>
</table>