Sept. 6, 1949. E. J. ROBICHAUD 2,481,153

DRIVING MECHANISM FOR AUTOMATIC BAR STOCK MACHINES AND THE LIKE

Original Filed Aug. 13, 1945 7 Sheets-Sheet 1

Fig. 1.

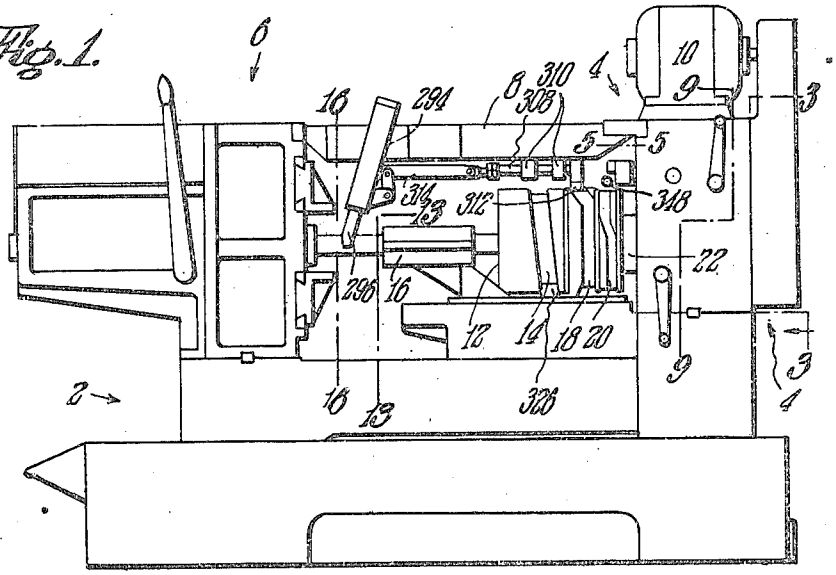
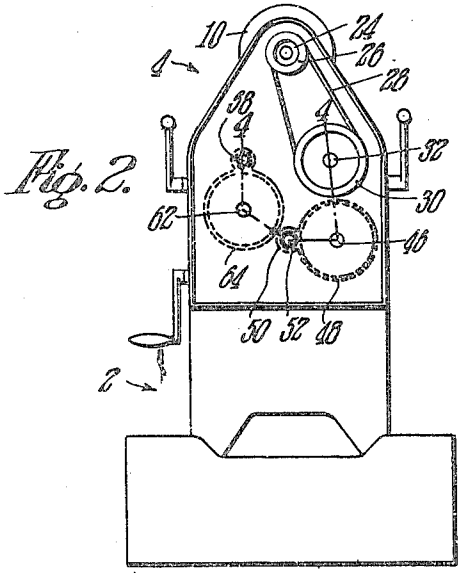


Fig. 2.



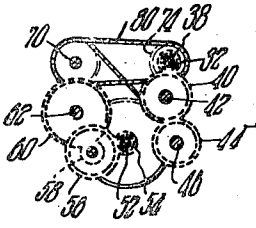


Fig. 3.

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DRIVING MECHANISM FOR AUTOMATIC BAR STOCK MACHINES AND THE LIKE

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Fig. 4.

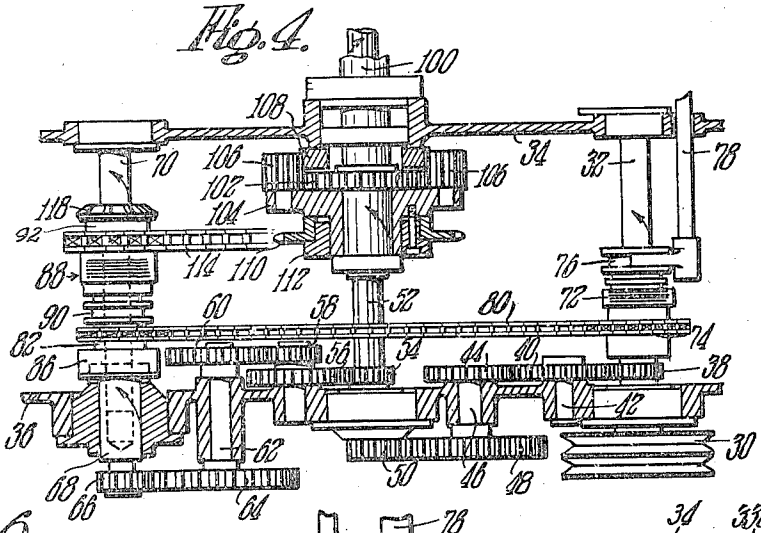


Fig. 6.

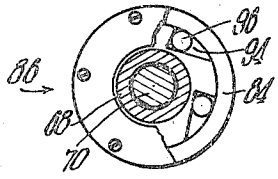


Fig. 5.

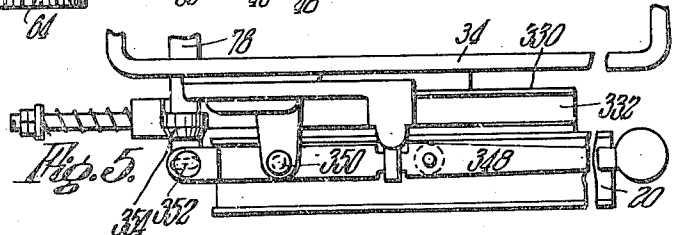
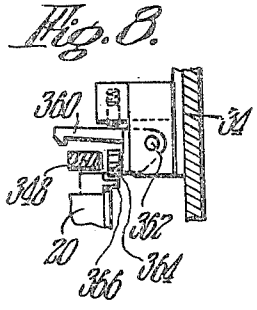


Fig. 8.



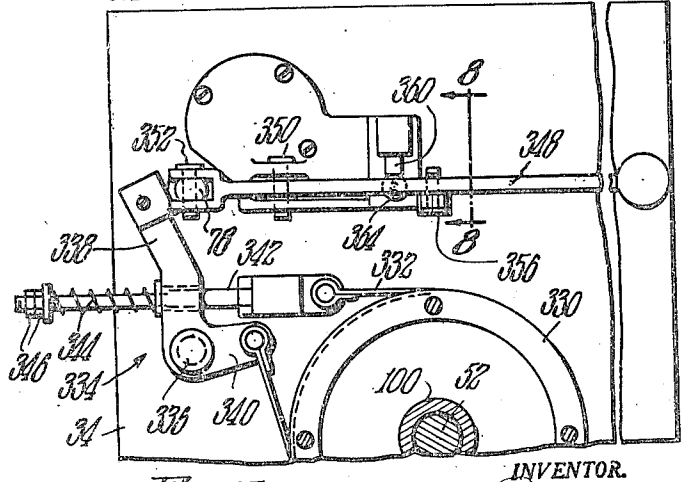


Fig. 7.

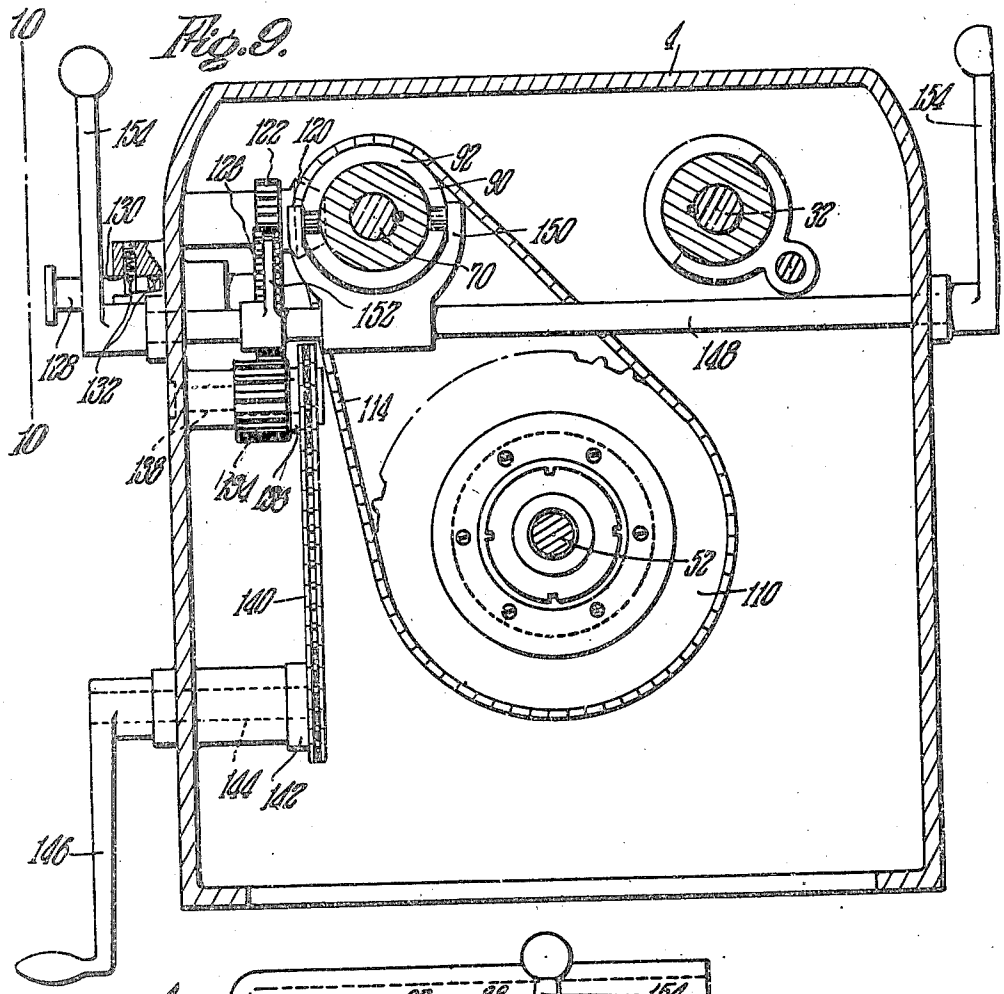
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Sept. 6, 1949. E. J. ROBICHAUD 2,481,153

DRIVING MECHANISM FOR AUTOMATIC BAR STOCK MACHINES AND THE LIKE

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Fig. 9.



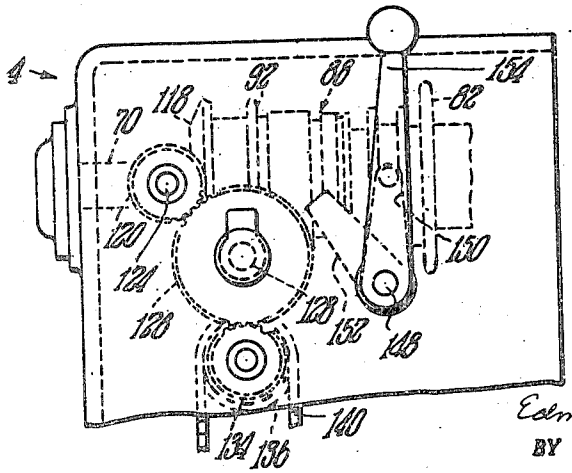


Fig. 10.

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DRIVING MECHANISM FOR AUTOMATIC BAR STOCK MACHINES AND THE LIKE

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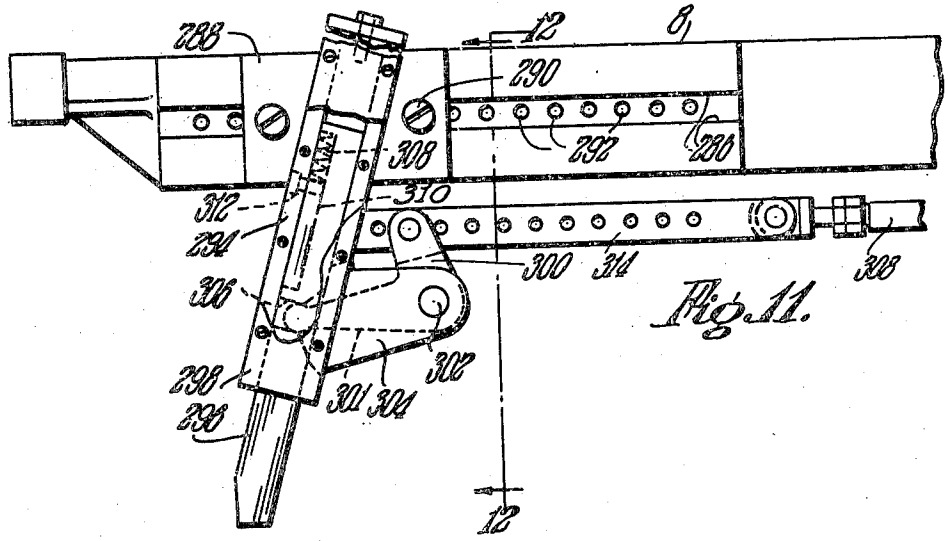


Fig. 11.

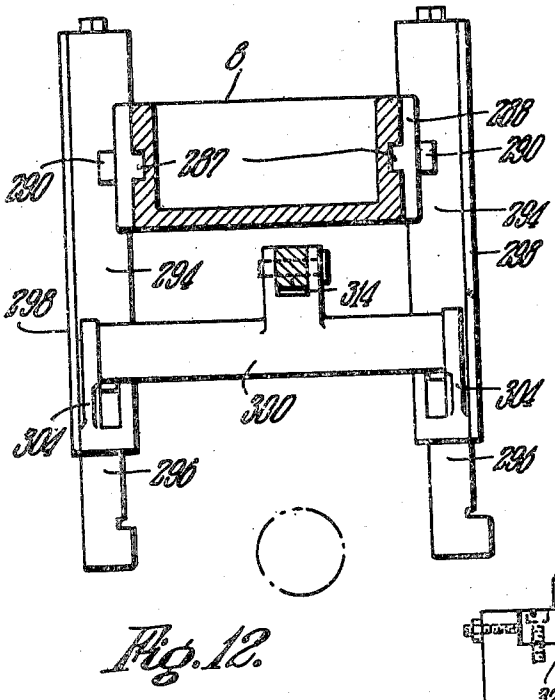


Fig. 12.

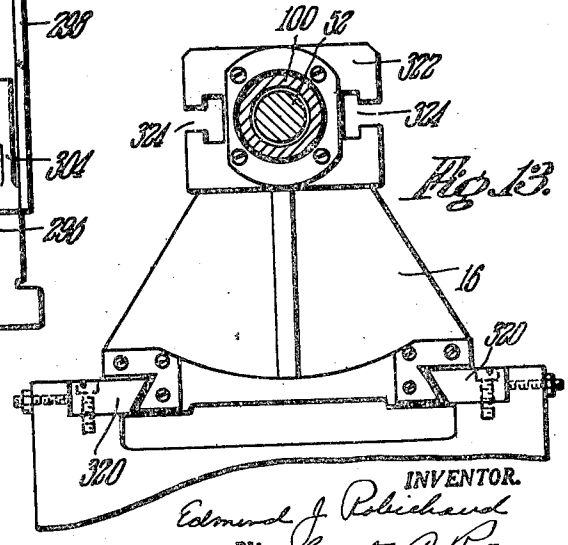


Fig. 13.

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DRIVING MECHANISM FOR AUTOMATIC BAR STOCK MACHINES AND THE LIKE

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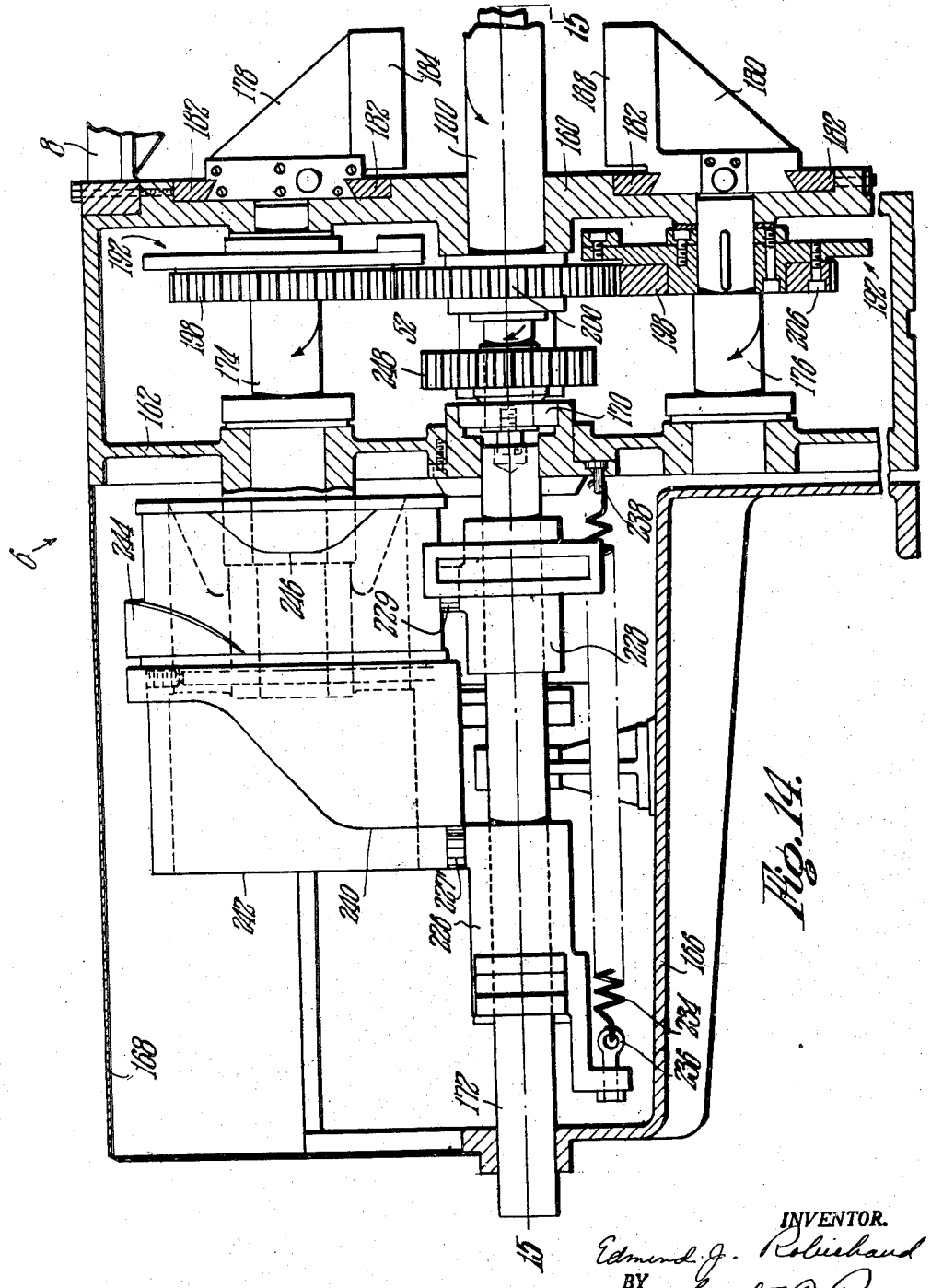


Fig. 14.

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DRIVING MECHANISM FOR AUTOMATIC BAR STOCK MACHINES AND THE LIKE

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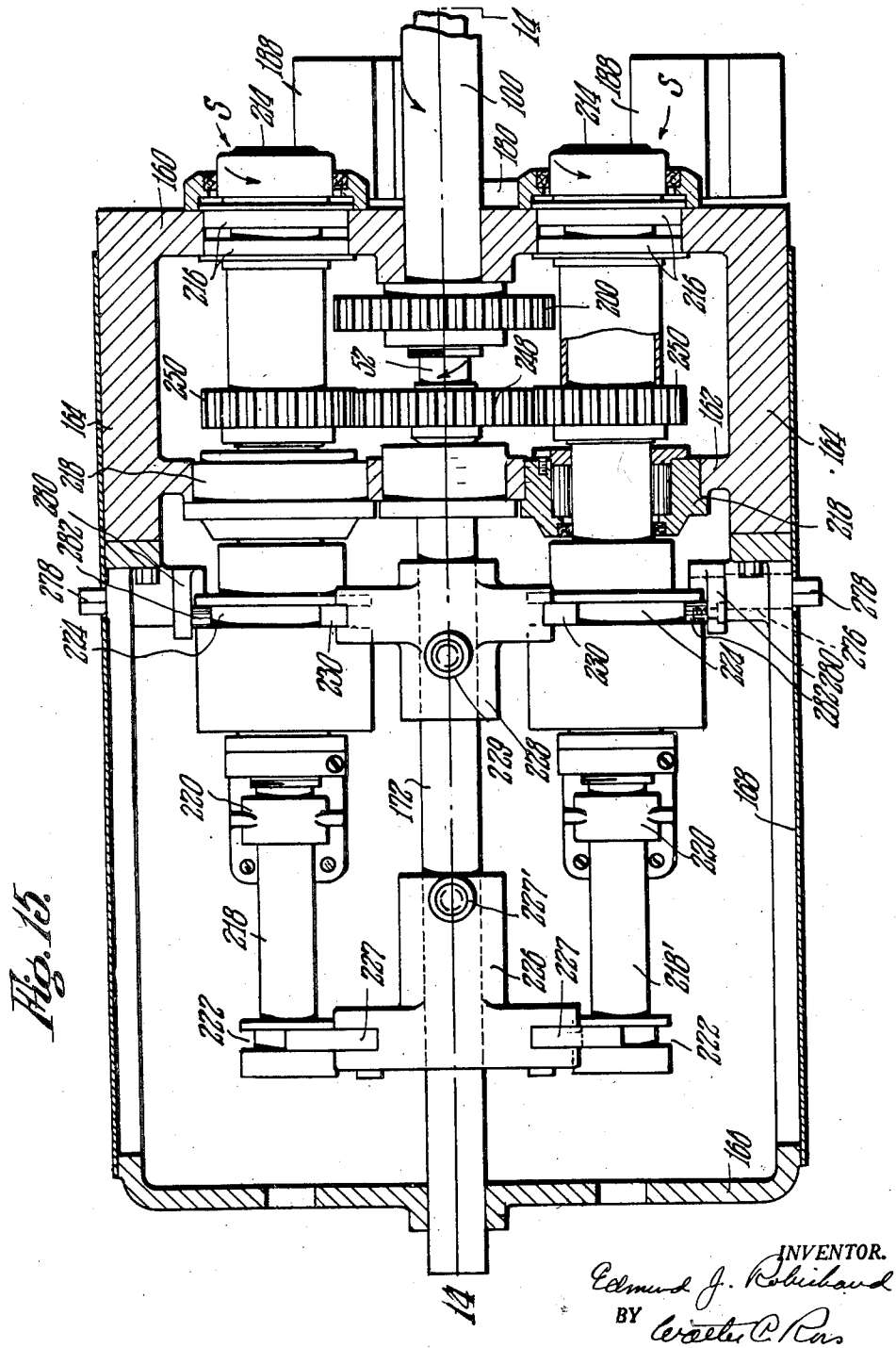


Fig. 15.

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DRIVING MECHANISM FOR AUTOMATIC BAR STOCK MACHINES AND THE LIKE

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Fig. 17.

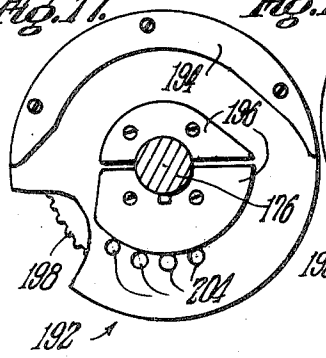
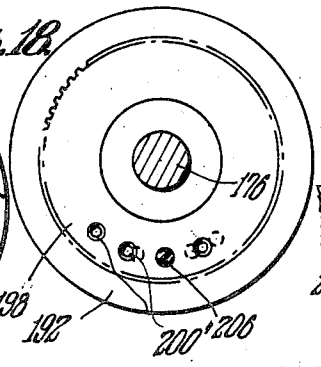


Fig. 18.



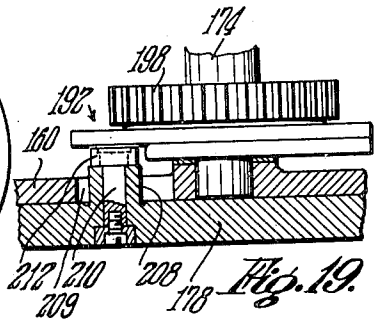


Fig. 19.

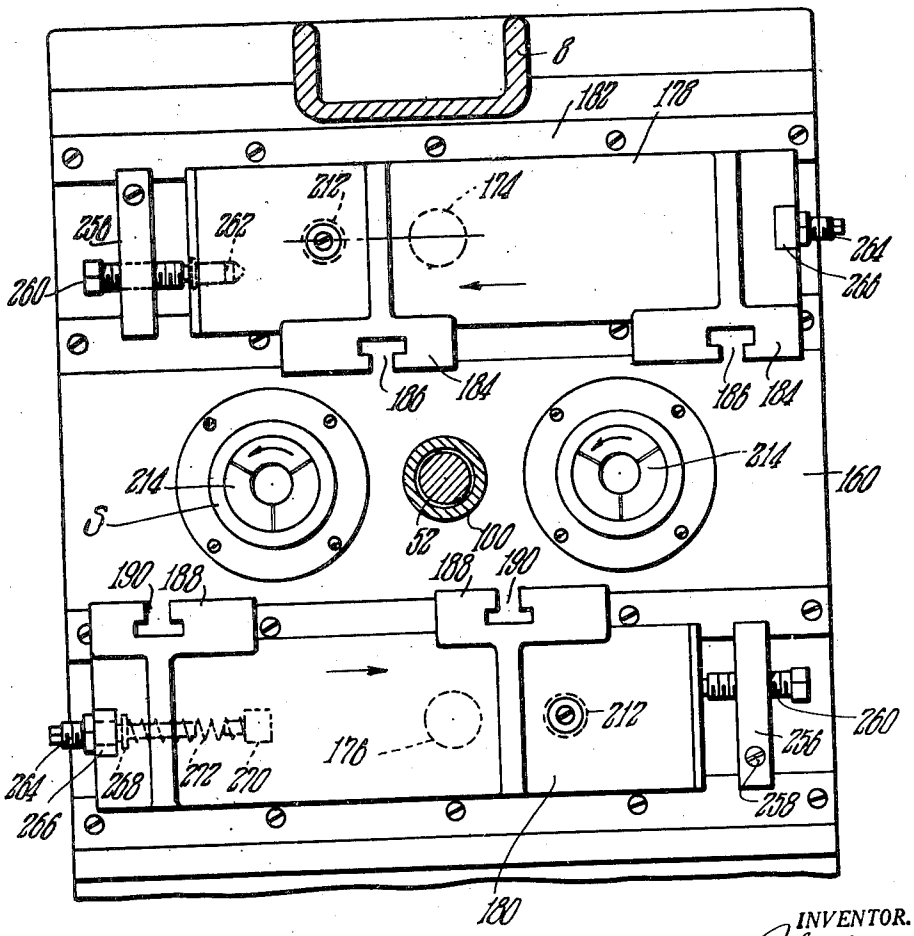


Fig. 16.

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Patented Sept. 6, 1949 2,481,153

UNITED STATES PATENT OFFICE

2,481,153

DRIVING MECHANISM FOR AUTOMATIC BAR STOCK MACHINES AND THE LIKE

Edmund J. Robichaud, Middletown, Conn., assignor to The Billings and Spencer Company, Hartford, Conn., a corporation of Connecticut

Original application August 13, 1945, Serial No. 610,566. Divided and this application November 5, 1946, Serial No. 707,909

3 Claims. (Cl. 192—4)

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This invention relates to the provision of an automatic bar stock machine and is directed more particularly to such a machine where a bar or bars of stock are fed forwardly and clamped in a rotating spindle so that an object is formed on the end of the bar and then cut off and this application is a division of an application Ser. No. 610,566 filed August 13, 1945.

The principal objects of the invention are the provision of novel driving mechanism for an automatic bar stock machine which is characterized by means for operating plural work spindles and tool slides cooperating therewith so that objects may be formed on bars carried by said spindles.

Various and numerous novel objects and advantages will be observed in connection with the following description of the invention in the form at present preferred, it being understood that various changes and modifications may be made without departing from the spirit and scope of the invention.

In the drawings:

Fig. 1 is a front elevational view of a machine embodying the novel features of the invention;

Fig. 2 is an end elevational view of the machine shown in Fig. 1 taken at the power end thereof;

Fig. 3 is a sectional elevational view on the line 3—3 of Fig. 1 to illustrate the driving mechanism;

Fig. 4 is a developed sectional plan view on the line 4—4 of Fig. 2;

Fig. 5 is a plan view on the line 5—5 of Fig. 1 to illustrate the brake mechanism;

Fig. 6 is an enlarged end view of the overrunning clutch of the driving mechanism;

Fig. 7 is a front elevational view of the brake mechanism shown in Fig. 5 taken outside the wall of the power housing;

Fig. 8 is a sectional elevational view on the line 8—8 of Fig. 7;

Fig. 9 is a sectional elevational view on the line 9—9 of Fig. 1;

Fig. 10 is a partial front elevational view on the line 10—10 of Fig. 9;

Fig. 11 is a front elevational view of the bar stop mechanism, and Fig. 12 is a sectional elevational view on the line 12—12 of Fig. 11;

Fig. 13 is a sectional elevational view on the line 13—13 of Fig. 1;

Fig. 14 is a sectional elevational view of the head stock of the machine taken on the longitudinal center line thereof and on the line 14—14 of Fig. 15;

Fig. 15 is a sectional plan view through the

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head stock shown in Fig. 14 and on the line 15—15 of Fig. 14;

Fig. 16 is an elevational view of the inner side of the head stock and on the line 16—16 of Fig. 1;

Figs. 17 and 18 are elevational views of the front working and rear faces of a cam for operating one of the cross slides; and

Fig. 19 is a sectional plan view on the line 19—19 of Fig. 16.

Referring now to the drawings in detail the invention will be more fully described in connection with an automatic bar stock machine so as to explain the driving mechanism and its operation.

A power case or housing 4 with which driving mechanism is associated is fixed to the right-hand end of the base construction. This may be called the power end of the machine.

A head stock 6 is fixed to the opposite or tool end of the base construction which is connected to the housing 2 by a longitudinal strut 8.

A motor 10 is fixed to the housing 4 and through mechanism to be described longitudinal inner drive and outer cam shafts are operated therefrom. The outer cam shaft has a cam drum 12 fixed thereto and said shafts extend into the head stock for operating the spindles, etc., all as will later be described.

The cam drum 12 has a cam 14 for moving a tool slide 16 for end tools back and forth, a cam 18 for operating stop mechanism for bar stock, a cam 20 for operating high speed clutch mechanism and associated parts and a brake mechanism 22 all of which will presently be described.

The power mechanism will now be described with particular reference to Figs. 2, 3 and 4 to 10 inclusive.

A shaft 24 of the motor has a pulley 26 fixed thereto that is connected by a belt 28 in engagement with a pulley 30 fixed on a shaft 32. This shaft 32 may be called the high speed shaft and it is journalled in inner and outer walls 34 and 36 of the housing, see Fig. 4.

A pinion 38 fixed on shaft 32 is in mesh with an idler 40 rotatable on a stud 42 of wall 36. Said idler 40 is in mesh with a gear 44 fixed on a shaft 46 journalled in the wall 36. A gear 48 fixed on said shaft 46 meshes with a gear 50 fixed on a shaft 52.

The shaft 52 is journalled in the wall 36 of the housing 4 and extends longitudinally into the head stock. It will be called the main drive shaft and is rotated from the motor through the belt-pulley and gearing described at all times while the motor is in operation.

A pinion 54 fixed on shaft 52, see Fig. 4, meshes

with a gear 56 which has a pinion 58 fixed thereto. A gear 60 fixed on a shaft 62, rotatable in the housing wall 36, is in mesh with the pinion 58 and said shaft has a gear 64 fixed thereto which is in mesh with a pinion 66 of an inner clutch member 68 which is rotatable in the wall 36.

Thus through the belt pulley and gear connections described, the clutch member 68 is rotated when the motor is in operation.

The clutch member rotatably receives an end of a shaft 70 which has its opposite end journalled in the wall 34. Said shaft may be called the low-speed feed shaft.

A friction clutch mechanism 72 which may be called the high-speed clutch is associated with the high-speed shaft 32. This may be of usual form adapted when engaged to clutch a sprocket 74 to said shaft 32 as a collar part 76 thereof is moved downwardly into clutching position by a rod 78 which is slidable back and forth relative to wall 34.

A chain 80 is in engagement with sprocket 74 and with a sprocket 82 associated with an outer part 84 of the overrunning clutch 86 of which inner part 68 is a component.

A friction clutch 88 operable by a collar 90 has a part carrying a sprocket 92. The clutch 88 may be of any well known type adapted as its collar 90 is moved back and forth to engage and disengage the sprockets 82 and 92.

The overrunning clutch, best shown in Fig. 6, includes the usual inner member 68 having the inclined sockets 94 and rolls 96.

When the high-speed clutch 72 connects the sprocket 74 to the high-speed shaft 32 and the clutch 88 is engaged, the sprocket 92 is driven at high speed and the outer member 84 of the overrunning clutch overruns the inner member 68 thereof which is driven through the gearing. When clutch 72 is disengaged the sprocket 92 is driven at low speed through the gearing and overrunning clutch 86.

A hollow shaft 100 surrounding the shaft 52 and called the cam-shaft has an end journalled in housing wall 34, see Fig. 4, with a gear 102 fixed thereon. A spider 104 rotatable on the shaft 100 has pinions 106 which are in mesh with a gear 108 fixed to wall 34 in any convenient manner and in mesh with gear 102.

A sprocket 110 is frictionally engaged between spider 104 and a plate 112 and is connected by a chain 114 to sprocket 92. The gears 102 and 108 are preferably provided with fifty-eight and fifty-six teeth respectively. The frictional action of the members 104, 110 and 112 may be varied by means of adjusting screws, and as the sprocket 110 is rotated the spider 104 is driven through friction so that through the pinions and gear 108 and gear 102 is driven to rotate the cam shaft at high or low speed accordingly as high speed clutch is engaged or disengaged.

It is desired to provide means for hand cranking sprocket 92 and thereby the cam shaft and to that end the following is provided, see Figs. 4, 9 and 10.

A gear 118 is fast to sprocket 92 which meshes with a pinion 120 that is rotatable with a gear 122 on a shaft 124 of the housing. An idler gear 126 is in mesh with gear 122 on a shaft 128 which is slidable in the housing. A spring pressed detent 130 is spring pressed, as shown, into engagement with circumferential grooves 132 of shaft 128.

A connected together pinion 134 and sprocket 136 are rotatable on a stud 138 and the said

sprocket is connected by a chain 140 to a sprocket 142 fixed to a shaft 144 which is rotatable in the housing. A crank 146 is provided on said shaft 144.

A transverse shaft 148 is oscillatable in the housing and carries a fork 150 in engagement with the part 90 of the clutch 88. An arm 152 is fixed on said shaft 148 as are operating levers 154 on opposite ends thereof.

With the parts as shown in Figs. 9 and 10, the shaft 148 may not be oscillated to clutch engaging position, or counterclockwise as the arm 152 will on such movement of the shaft 148 bring up against idler 126. In this position the gear 118 and sprocket 92 may be rotated through the gearing and sprocket-chain connections by rotation of the crank 146.

To permit the clutch 88 to be engaged by swinging of lever 154 to the left in Fig. 10, the shaft 128 and thereby the gear 126 may be moved outwardly to disconnect gears 122 and 134 and remove the gear 126 from in front of arm 152. Thus clutch 88 cannot be engaged while the cam-shaft 100 is being hand-cranked and the cranking mechanism is inoperative when clutch 88 is engaged.

The spindle mechanism and driving arrangement therefor will be described in connection with Figs. 14 to 19 inclusive.

The head stock 6 includes a housing having inner and outer walls 160 and 162, side walls 164 and a rearwardly extending part 166 with a cover 168 around the upper part thereof.

The cam shaft 100 is journalled in the wall 160 and the end of the main drive shaft 52 extends therebeyond and is journalled in an anti-friction bearing 170 of wall 162. A stationary shaft 172 is carried by the wall 162 and extension 166, as shown, and will be held against movement by any suitable means, such as a set screw, in the part 166 in engagement therewith.

An upper cam shaft 174 and a lower cam shaft 176 are journalled at opposite ends in the walls 160 and 162.

Upper and lower cross-slides 178 and 180 are slidable back and forth between gibs 182 associated with the wall 160 and transversely of the axis of the shafts 52 and 100. The upper slide 178 may be the cut-off slide and is provided with pads 184 provided with T-slots 186 in which cut-off tools or tool holders may be clamped. This cut-off slide moves back and forth and as it moves to the left in Fig. 16 tools carried thereby may operate on a bar of stock carried by spindles S to cut off an object formed on the end portion thereof.

The lower slide 180 may be the forming slide and is provided with pads 188 having T-slots 190 in which tools or tool holders may be clamped. As this slide moves to the right in Fig. 16, the tools carried thereby may operate on and form an object on the ends of bars of stock carried by the spindles S.

Cam discs 192 are fixed to the shafts 174 and 176 for operating the slides described. These cam discs may have outer and inner cam members 194 and 196 secured to the face thereof to provide a roll groove. A gear such as 198 is associated with each cam which meshes with a gear 200 fixed on the cam shaft 100.

The gears 198 are provided with a plurality of bolt receiving holes 200' and the cam discs are provided with tapped holes 204. The holes of the gears and of the cams are spaced so that a certain hole of a gear and cam may receive a bolt 206,

In that way the angular relation of a gear and cam may be varied to vary the timing or operation of a cam.

The slides have rearwardly projecting hub 208 extending through slots 209 in wall 160 which carry studs 210 on which are cam rolls 212 engageable by the cams 194 and 196 see Fig. 17. As the cams are rotated the forming and cut-off slides are moved back and forth.

The spindles S are rotatable on axes disposed at either side of the shafts 52 and 172, see Fig. 15. The spindles may be of usual form having hollow collets 214 in their forward ends that are contracted to grip a bar of stock and allowed to expand to release said bar. Said spindles are journalled in the walls 160 and 162, by means of antifriction bearing 216 and 218, as shown.

Stock feed tubes 218' extend from the outer rear ends of the hollow spindles and through bearings 220 and have grooved collars 222 on the outer ends thereof. Grooved collars 224 on the spindles S are associated with the draw tubes thereof for contracting the collets.

A member 226 slidable back and forth on the shaft 172 has fingers 227 engaging the grooves of collars 222 and a member 228 slidable on said shaft has fingers 230 engaging the grooves of collars 224. As the member 226 is moved forwardly or to the right in Fig. 15 the bars of stock are fed forwardly in the spindles. As the member 228 is moved rearwardly or to the left in said figure the collets are contracted for gripping the bars for rotation thereof.

Rolls 227' and 229 are provided on the slidable members 226 and 228. A tension spring 234 has opposite ends connected by members 236 and 238 to the slidable member 226 and the wall 162, as shown in Fig. 14. This spring urges roll 227' into engagement with a cam pad 240 of a cam drum 242 which is fixed on shaft 174.

Cam pads 244 and 246 on said cam drum 242 act on roll 229 to move member 228 back and forth.

A gear 248 on shaft 52 meshes with gears 250 on the spindles S see Fig. 15 and as said shaft rotates the said spindles are rotated. Likewise when the cam shaft 100 is rotated the upper and lower shafts 174 and 176 are rotated thereby to move the slides back and forth while the collet actuating member and feed member 228 and 226 are operated by rotation of said shaft 174.

The strut 8 is connected at one end by bolts or some suitable means to the wall 160 while its other end is similarly connected to the housing 4.

Stops are provided for the slides 178 and 180, as shown in Fig. 16. Straps 256 adjacent one end of the slides are secured to wall 160 by screws 258 and stop screws 260 are adjustable in said straps which have end portions 262 receivable in holes in the slides. At the other ends of the slide screws 264 which are adjustable in blocks 266 carried by the slides have flanges 268 between which and abutments 270 secured to the wall 160 are springs 270.

The members 224 of the spindles for operating the spindle collets may be manually operated as in Fig. 15. Shafts 276 having squared outer ends 278 for receiving a hand lever and have levers 280 secured to inner ends thereof which carry rolls 282 disposed in grooves of the members 224. By oscillating shafts 276 the members may be moved back and forth to open and close the collets.

Stop means for the bars of stock in the spindles will now be described with reference to Figs. 1, 11 and 12.

The strut 8 is provided with longitudinal grooves 286 on its opposite sides in which tongues 287 of brackets 288 are slidable. Screws 290 receivable in holes 292 in the strut are provided to clamp the brackets 288 in adjusted positions. The brackets have generally vertically disposed guides 294 in which there are guideways for slides 296 with plates 298 overlying the guideways. A crank 300 is pivoted at 302 to ears 304 of the brackets 294 and lower arms 301 of the crank have end portions that are receivable in sockets 306 of the stop slides 296. Springs 308 in grooves 310 at one side of the slides are disposed above screws 312 of the brackets to urge the slides upwardly.

The lower ends of the stop slides 296 are arranged when the slides are in lower stop positions to lie in front of the spindles S and against which the ends of the bars of stock abut thereby to stop feeding of the bars and position them for the machining operation.

The crank is swung counterclockwise to move the stop slides downwardly while the springs tend to urge the slides upwardly. The brackets 288 are adjustable back and forth to vary the length of feed of the bars of stock.

A rod 308 is slidable in bearings 310 of the strut 8, see Fig. 1. One end of the said rod carries a cam roll 312 which is operably related to the cam 18 and its other end is pivotally connected to a link 314 which in turn is pivotally connected to crank 300. Various holes are provided in the link 314, as shown, for connecting to the crank 300 to accommodate adjustment of the brackets 288. As the cam 18 rotates the rod 308 is reciprocated to bring about swinging of crank 300 thereby to operate the stops 296.

The slide 16 for the end tools will now be described with particular reference to Figs. 1 and 13.

The said slide 16 is slidable between gibs 320 and it has an upper head portion 322 through which the cam shaft 100 and drive shaft 52 extend. T-slots 324 in opposite sides of the head are provided in which a tool-holder or tool may be secured for operating on the ends of bars of stock in the spindles. A roll 326, see Fig. 1, is carried by said slide 16 which is in engagement with cam 14. The rotation of the cam moves the slide back and forth to bring the tools carried thereby into the bars of stock.

The brake mechanism will now be described with reference to Figs. 1, 4, 7 and 8.

A brake drum 330 is associated with the cam drum 12 rearwardly of cam 20 thereof and a brake band 332 is in frictional engagement therewith. A lever 334 is pivoted at 336 to the wall 34 and has an upper arm 338 and a lower arm 340. A rod 342 secured to one end of the brake band passes through lever part 338 and a spring 344 is disposed thereon between lever part 338 and nuts 346. The other end of the brake band is connected to the lower end 340 of the lever 334.

A manually engageable lever 348 is swingable at 350 in a horizontal plane and is connected at 352 to rod 78 for operating the high speed clutch 72. Said rod 78 is provided with a tapering cam member 354 which is adapted to engage the upper portion of lever part 338. A roll 356 on the underside of lever 348 is operatively related to cam 20 so that as the cam drum 12 rotates the lever 348 is actuated so as to operate the high speed clutch through rod 78 and also to act on

lever 334 by swinging it counterclockwise for applying the brake.

A latch 360 is pivoted at 362 and has an outer end for latching over and holding the lever 348 against swinging outwardly, see Fig. 8. A roll 364 on the inner end of the latch lever 360 is engageable by a cam patch 366 on cam 20 and as the cam rotates the latch is operated to release lever 348. A spring pressed detent 368 acts on the latch lever 360 to urge it downwardly into latching position.

The operation of the machine will now be described it being understood that the motor 10 is in operation and that bars of stock are clamped in the spindles S with inner ends thereof projecting outwardly for engagement by the tools for the machining operation.

The shaft 52 is driven through the gearing so that the spindles are rotated according to a speed depending upon the gearing ratios.

The high speed clutch 72 is disengaged so that shaft 70 through the overrunning clutch 86 and gearing is rotated at low speed to rotate cam shaft 100 at low speed whereby the forming end tool slide and cut-off slide are operated in timed relation by their respective cams to form objects on the ends of the bars of stock and cut them off.

Subsequently the cam 20 brings about movement of rod 78 to engage the high-speed clutch 72 so that shaft 70 is driven through chain 80 at high speed thereby to drive cam shaft at a faster speed. Thereupon the cams of cam drum 242 operate the members 226 and 228 so that the collets are expanded and the bars of stock are fed forwardly in the spindles S. The cam 18 operates the stop mechanism so that the stops 296 are in position in front of the bars of stock being advanced. Then the collets are contracted to grip the bars of stock.

With the bars of stock presenting inner ends beyond the spindles and on which objects are to be formed, the cam 20 operates lever 348 which through rod 78 disengages the high speed clutch 72 so that the shaft 70 and thereby the cam shaft 100 will be operated at low speed through the gearing and overrunning clutch. As rod 78 disengages the high speed clutch the cam 354 thereof acts on lever 334 to apply the brake band 332 thereby to retard cam shaft 100 as the driving connections are shifted from high to low speed operation.

The invention may be embodied in other specific forms without departing from the essential characteristics thereof. Hence, the present embodiments are therefore to be considered in all respects merely as being illustrative and not as being restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all modifications and variations as fall within the meaning and purview and range of equivalency of the appended claims are therefore intended to be embraced therein.

What it is desired to claim and secure by Letters Patent of the United States is:

1. Drive mechanism for a machine of the class described comprising in combination, a housing, a high speed shaft rotatable therein, a low speed shaft rotatable therein, concentric drive and cam shafts journalled in the housing, gearing connecting the high speed and drive shafts, an overrunning clutch associated with the low speed shaft having an inner and an outer member on the low speed shaft, gearing connecting said drive shaft and inner member, sprockets on said high speed shaft and outer member, a chain engaging the sprockets, clutch means for clutching the sprocket on the high speed shaft thereto, a driving connection between said outer member and cam shaft, and means operable by said cam shaft for operating said clutch means.

2. Drive mechanism for a machine of the class described comprising in combination, a housing, a high speed shaft rotatable therein, a low speed shaft rotatable therein, concentric drive and cam shafts journalled in the housing, gearing connecting the high speed and drive shafts, an overrunning clutch associated with the low speed shaft having an inner and an outer member on the low speed shaft, gearing connecting said drive shaft and inner member, sprockets on said high speed shaft and outer member, a chain engaging the sprockets, clutch means for clutching the sprocket on the high speed shaft thereto, a driving connection between said outer member and cam shaft, means operable by said cam shaft for operating said clutch means, and brake means operable by said cam shaft for acting on said cam shaft.

3. Drive mechanism for a machine of the class described comprising in combination, a housing, a high speed shaft rotatable therein, a low speed shaft rotatable therein, concentric drive and cam shafts journalled in the housing, gearing connecting the high speed and drive shafts, an overrunning clutch associated with the low speed shaft having an inner and an outer member on the low speed shaft, gearing connecting said drive shaft and inner member, sprockets on said high speed shaft and outer member, a chain engaging the sprockets, clutch means for clutching the sprocket on the high speed shaft thereto, a driving connection between said outer member and cam shaft, and means operable by said cam shaft for operating said clutch means, said connections between the cam shaft and outer member including a sprocket on the low speed shaft and a sprocket frictionally engaging said cam shaft and a sprocket chain.

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