FIG. 1.

FIG. 2.

FIG. 3.

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My invention relates to a stock-feed mechanism, as hereinafter described, which may be applied to a lathe or the like for feeding bar or the like stock internally into the rotating spindle of a machine tool. It is an object of the invention to provide an improved feed mechanism of the character indicated.

It is another object of the invention to provide an improved automatic stock-feeding mechanism adaptable for use in the normal cycle of operation of an automatic lathe or the like.

It is a further object to provide an improved stock-feeding mechanism which may set up a new grip on the stock for each feeding operation and which may nevertheless feed the stock a known longitudinal distance with such assurance that no stock stop need be required and that no stock feed actuation need be made for slip in the course of stock-feeding.

It is also an object to provide an improved feed mechanism providing equally effective grip on the stock for a range of stock diameters.

It is a specific object to provide readily replaceable jaw means for a stock-feeding mechanism of the character indicated, whereby a large range of stock diameters may be accommodated.

It is a further object to provide a stock-feeding mechanism for reestablishing a grip on the stock with each feeding operation and yet for accurately longitudinally feeding the stock the same given distance regardless of variations (within tolerance limitations) of stock diameter.

It is another object to provide an improved stock gripping-and-feeding mechanism with means biasing the mechanism in the direction of stock-gripping.

It is also a specific object to provide an improved stock-feeding mechanism which may, with a single operation initiate a feed or a retraction and at the same time produce a grip-setting or a relaxation, respectively, of the stock.

Other objects and various further features of the invention will be pointed out or will occur to those skilled in the art from a reading of the following specification in conjunction with the accompanying drawings. In said drawings, which show, for illustrative purposes only, a preferred form of the invention:

Fig. 1 is a fragmentary longitudinal sectional view of a stock-feeding mechanism according to the invention, with some of the parts schematically shown;

Fig. 2 is an enlarged sectional view more or less in the plane of section 2-2 of Fig. 1;

Fig. 3 is an enlarged fragmentary exploded perspective view of cooperating feeding and gripping parts of the arrangement of Fig. 1; and

Figs. 4, 5, and 6 are enlarged fragmentary longitudinal sectional views of parts of the feeding and gripping mechanism for various relationships of the parts, as would be encountered in the normal use of my mechanism.

Briefly stated, my invention contemplates an improved stock-gripping-and-feeding mechanism utilizing two relatively longitudinally movable members to establish a grip upon relative longitudinal movement thereof, and feed means for one of the longitudinally movable members. In the form to be described, both members are tubular and concentrically arranged, and the member which is directly fed also carries the stock-gripping parts which are to bear upon the stock. The stock-gripping parts may comprise a number of independent jaw members angularly spaced and retained by one of the tubular members and axially locatingly interlocked with the tubular member which is subjected to direct feed actuation. Cam means may cooperate between the jaws and the other tubular member so as to produce a cammed jaw-gripping action upon relative longitudinal movement of the tubular members. Means are described for suitably retaining the jaws and for suitably coordinating the gripping and feeding operations for fully automatic functioning.

Referring to the drawings, my invention is shown in application to a stock-feeding mechanism for use in feeding bar or the like stock internally within a collet or a collet member of a rotating spindle 10, as on an automatic lathe. The collet may be of the drawback type, actuable by means of a tube 11 extending rearwardly of the spindle by conventional means, which need not be shown or described.

The collet itself may comprise a plurality of inclined independently moveable cylindrical jaws 12 suitably retained and guided within a collet holder 13 which may be attached to the collet tube 11, as by threaded engagement at 14. Collet constructions of the character indicated are more fully discussed and disclosed in my copending application Serial No. 745,563, filed May 12, 1954.

As indicated generally above, my novel stock-gripping-and-feeding mechanism may include two longitudinally relatively movable members, which in the form shown are concentric tubes 15—16. One of these tubes may carry the stock-gripping parts, and the other tube may include means cooperating with the stock-gripping parts upon relative longitudinal movement of the tube assembly 15—16 so as to produce a gripping action.

The stock-gripping parts may be independent of the tubular members and are in the form of jaw members 17. Each jaw member may include means for axially locating engagement with one of the tubular members, as with the inner tubular member 15 shown, and such tubular member 15 may be formed with a locating opening or slot 18 for the proper angularly spaced location of the jaw members 17. The jaw members may comprise essentially longitudinally extending bodies formed at the inner or rear end and with axially locating abutment means to engage the tubular member 15. At the other end the axial extremity may be provided with a sloping or cam surface 19 for contact with a generally conical cam surface 20 on the other tubular member 16, and the cam surface 19 may be generally in the same radial plane as the gripping portion 21.

For a purpose which will later be clear, I prefer that the axial locating engagement between the jaw member 17 and the tubular member 15 shall be such as to permit certain radial freedom of movement of the jaw members 17 relatively to tubular member 15. At the same time I prefer that means on one or the other of the adjacent tubular members shall serve to limit inward displacement of the jaws so as to avoid premature undesirable dislocation and loss of a jaw whenever the stock has run out and the spindle has stopped rotating. The axial locating engagement may be by means of a dovetail or T-head, and the dovetail may be formed on the tail end of each jaw member. The dovetail may include a neck 22 and angularly spreading ears 23, and I prefer that at the location of dovetail engagement the body of each jaw member 17 shall be of radial thickness not substantially exceeding the radial thickness of the tubular member 15.

To receive the dovetail 22—23 the rear end of each jaw slot 18 in the tubular member 15 may include a radially open throat 24 slidable to accommodate neck 22, and the ear 23 may be accommodated in an arcuate enlargement or opening 25 which may be formed by transversely milling flats 26 on opposite sides of the throat 24.

For a purpose which will be clear, the radial dimensions or proportions are preferably as follows: The maximum radial thickness of the dovetail 22—23 exceeds the radial clearance between the outer diameter of the tubular member 15 and the inner diameter of the jaw member 16; this relationship will be understood to assure axial location of the jaw, and therefore to guard against loss of a jaw by having the dovetail pass radially between the tubular member 15 and the jaw member 16; and the effective radial clearance between the flats 26 and the inner diameter of the outer tubular member 16 preferably substantially exceeds the maximum radial thickness of the dovetail ear portions 25; this will be understood to assure...
limited radial freedom of movement of the dovetail or rear end of each jaw member 16. It will be understood that with the described jaw-retaining-and-constructing a grip upon a piece of stock 9 may be obtained upon a relative longitudinal displacement of the jaw members 15—16, and in the form shown the jaw members are actuated inwardly when the outer tubular member 16 is moved to the left relatively to the inner tubular member 15. I prefer that results longitudinally acting compressionally stressed spring means 27 be employed normally to urge the tubular members 15—16 in this direction.

In order that the various desired longitudinal actuating means may be applied to the tubular members 15—16, I have provided shoulder means at the rear end of each of these members. Thus, the inner end of the tubular member 16 may be integrally formed with a flange, or, as in the form shown, a separate annular plate 28 may be mounted thereon; in the case of the tubular member 15, I have shown an annular thrust ring or plate 29 held on the end, as by means of a nut 30. The spring means 27 may act as shown between the two shoulder means 28—29.

I prefer that feeding thrusters be applied directly to the outer tubular member 16 which axially locates or determines the axial position of the jaw means 17, and in the form shown this feeding member is the inner tubular member 15. Feeding action may be derived from a fluid pressure-operated means such as a cylinder 31 driving a piston rod 32 directly connected to a thrust yoke 33. A two-way air injection through ducts 34 may assure free rotation of the tubular member 15 with the spindle and at the same time permit application of feeding and retracting thrusters to the tubular member 15. For purposes of actuating the jaw members 17, that is, in the form shown, for the purpose of relaxing a jaw grip, I employ actuating means which may include further fluid-pressure-operated means, such as one or more cylinders 35 carried by the yoke 33 and so positioned as effectively to oppose and overcome the compression of spring 27.

A plurality of angularly spaced cylinders 35 may be employed for a symmetrical application of the thrusters, and thrust-bearing means 36 may assure free rotation of the outer tubular member 16 with the spindle. The various cylinders 35 may be manifolded for uniform concurrent operation, and the fluid pressure-supply means 37 therefore may be connected in common with the fluid-pressure-supply means 38 for the feed cylinder 31. For a feeding stroke, no actuation of cylinders 35 is necessary, for the pressure fluid means is connected only to the head end of the feed cylinder 31, as via the pipe 39. A reversing valve 40 may be placed in control with the various described supply parts, and it will be understood that the valve 40 may be automatically operated, as by utilizing a roll 41 to follow a program cam (not shown) forming a part of the machine. The supply means 37 may carry a number of, or placed lock-nut means 42 to cooperate with a fixed part 43 of a frame of the machine in order definitely to limit the feed stroke of the mechanism to suit particular setups of the machine.

In operation, it will be understood that for the valve position shown, cylinders 35 will not be actuated, and, therefore, the feed means 27 will urge the tubular members relatively to each other so as to clamp or set the jaw members 17 upon the stock 9. At the same time, pressure fluid applied over the head end of cylinder 31 will exert a feeding force upon the yoke 33 and, therefore, directly upon the inner tubular member 15. The feed stroke imparted to the stock 9 will directly reflect the stroke adjustment of 42. When suitably cam-actuated, the follower roll 41 of control valve 40 will be reversed so as to apply jaw-relaxing forces via cylinders 35 and so as simultaneously to apply retracting pressures in the direction of withdrawal of the jaws 17 and of the tubular members 15—16 with the jaw members 17.

In order to show that the grip provided by a feed mechanism of the character described may be uniform for a range of stock diameters, reference may be had to Figs. 4 and 5. In Fig. 4, I show the gripping mechanism as applied to a piece of stock 9', slightly oversize. Since the stock 9' is oversize, the jaw members 17 will set on or bite the stock 9' at a slightly longitudinally forward position relatively to the cam surface 20 at the forward end of tubular member 16. This slightly forward setting of the jaw members 17 will in no way affect the longitudinal relation between the feed means 31—32, and it will be noted that, because of the described freedom of radial movement permitted to the tail end of the jaw members 17, these jaw members may freely set over the longitudinally extensive cam contact over the conical cam surface 20. The jaw members 17 will thus not be cocked in any way even though the stock 9' may be oversize, and, as a result, the grip upon the stock 9' will be substantially uniform and longitudinally extensive.

In Fig. 5, I show the relationship of parts when the mechanism is set upon a piece of stock 9 of the desired size. The cam surface 20 will then fit the stock 9 exactly and will be entirely uncocked. Because the stock 9' is of undersize dimensions, the jaw members 17 will set upon or grip the stock when in a rearwardly retracted longitudinal position, relatively to the conical cam surface 20 of the outer tubular member 16. Again, the described radial freedom permitted to the jaw members 17, particularly at the tail end thereof, will permit a substantial longitudinally extensive contact between the jaw cam 19 and the conical cam surface 20, and, as a result, the gripping portion 21 may be applied to the stock 9 over a longitudinally extensive area with the same force and effect as in the case of the gripping of oversize stock. It will be noted again that, even though the stock 9 is undersize, such fact in no way alters the longitudinally fixed retracted condition of themeans and said tubular members is effective to prevent dislocation and loss of said jaw means upon a run-out of stock.
3. In a feed mechanism of the character indicated, two relatively longitudinally movable tubular actuating members, a plurality of separate jaw members angularly spaced and angularly located by one of said tubular members, means longitudinally locating said jaw members with respect to said one tubular member with freedom for radial displacement relatively to said one tubular member, said jaw members having stock-gripping portions for parallel orientation so as to longitudinally uniformly seat upon stock of substantially constant cross-section, and cam means cooperating directly between said jaw members and said other tubular member for actuating said jaw members upon a relative longitudinal movement of said tubular members.

4. A mechanism according to claim 3, in which the stock-gripping portion of each jaw member is in essentially the same radial plane as said cam means.

5. A mechanism according to claim 3, in which said cam means includes a generally conical surface on said second tubular member and a similarly sloped cooperating surface on each of said jaw members.

6. A mechanism according to claim 3, in which a dovetail engagement is utilized for axial location of each said jaw member relatively to said first tubular member.

7. In a feed mechanism of the character indicated, two relatively longitudinally movable tubular actuating members, a plurality of jaw members angularly spaced and located by the inner of said tubular members, means longitudinally locating said jaw members with respect to said inner tubular member, said locating means providing a degree of freedom for generally radial movement of said jaw members relatively to said tubular members, and cam means cooperating between said jaw members and the outer of said tubular members for actuating said jaw means upon a relative longitudinal movement of said tubular members, said longitudinal locating means comprising a dovetail engagement for axially locating each jaw member relatively to said inner tubular member, said inner tubular member including means radially inwardly overlapping a part of the dovetail-engaging end of each jaw member, whereby the radially inward displacement of jaw members is prevented upon a run-out of stock.

8. In a feed mechanism of the character indicated, two relatively longitudinally movable members, jaw means axially positioned on one of said members and including means cooperating with the other of said members upon longitudinal displacement thereof for producing jaw actuation, fluid-pressure operated feed means for said one member, and spring means for urging said members relatively to each other in a first direction, fluid-pressure operated jaw-actuating means actuable against the action of said spring means to urge said members relatively to each other in the first direction, fluid-pressure operated jaw-actuating means actuable against the action of said spring means to urge said members relatively to each other in the other direction, said feed means being effective to produce a forward stroke and a retracting stroke, and control-valve means connected in one position thereof in communication with said jaw-actuating means and said feed means, and connected in another position thereof in communication with said feed means to the effective exclusion of said jaw-actuating means.

9. In a feed mechanism of the character indicated, two relatively longitudinally movable concentric tubular members, gripping means attached to one of said members for engaging a piece of stock, axially reciprocable feed means directly connected to said one tubular member, cam means reacting between said gripping means and the other of said tubular members upon relative movement of said tubular members, biasing means longitudinally reacting between said tubular members and stressed in the direction to produce a stock-gripping action.

10. A feed mechanism according to claim 9, in which biasing means includes spring means concentric with said tubular members.

11. In a feed mechanism of the character indicated, two relatively longitudinally movable concentric tubular members, gripping means attached to one of said members for radial movement to engage a piece of stock, axially reciprocable feed means directly connected to said one tubular member, cam means reacting between said gripping means and the other of said tubular members upon relative movement of said tubular members, biasing means longitudinally reacting between said tubular members and stressed in the direction to produce a stock-gripping action, and direct-acting relieving means for said biasing means and connected for operation in direct relation with said feed means.

12. In combination, two concentric tubular members longitudinally movable with respect to each other, a jaw member comprising an elongated body including at one end a tail, means attaching said tail to one of said tubular members for radial movement, coating cam surfaces on said other tubular member and on the other end of said jaw member for actuating said jaw upon relative movement of said tubular members, said jaw member having an elongated axially extending tail, means separately attaching each of said tails and one of said tubular members for radial movement, said attachment being at points rearwardly of the forward end of said jaws, each said jaw member having an axially extending stock-gripping portion for parallel orientation with the stock axis, and cam means coating between the other of said tubular members and said jaw means upon relative longitudinal movement of said tubular means for actuating said jaws.

13. In combination, two relatively longitudinally movable concentric tubular members, a plurality of independent jaws angularly located by and at spaced locations about one of said tubular members, each of said jaws having an elongated rearwardly extending tail, means separately attaching each of said tails and one of said tubular members for radial movement, said attachment being at points rearwardly of the forward end of said jaws, each said jaw member having an axially extending stock-gripping portion for parallel orientation with the stock axis, and cam means coating between the other of said tubular members and said jaw means upon relative longitudinal movement of said tubular means for actuating said jaws.

14. In a feed mechanism of the character indicated, two relatively longitudinally movable members, jaw means axially positioned by one of said members for transverse movement and including means cooperating with the other of said members upon relative longitudinal displacement thereof for producing jaw actuation, direct axially reciprocable feed means for said one member, spring means directly longitudinally reacting between said members and stressed to urge said members relatively to each other in a second direction, and jaw-actuating means actuable against the action of said spring means to urge said members relatively longitudinally in the other direction, said feed means being effective to produce a forward stroke and a retracting stroke, and common driving-connection means interconnecting said actuating means with said reciprocable feed means for one of the strokes of said feed means, said actuating means and said reciprocable feed means being effectively disconnected for the other stroke of said feed means.

References Cited in the file of this patent

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,115</td>
<td>Bartholomew</td>
<td>Mar. 12, 1878</td>
</tr>
<tr>
<td>332,889</td>
<td>Gerry</td>
<td>Dec. 22, 1885</td>
</tr>
<tr>
<td>884,123</td>
<td>Brightman</td>
<td>May 1, 1909</td>
</tr>
<tr>
<td>921,721</td>
<td>Meliss</td>
<td>May 18, 1909</td>
</tr>
<tr>
<td>2,147,885</td>
<td>Dean</td>
<td>Feb. 21, 1939</td>
</tr>
<tr>
<td>2,250,088</td>
<td>Buxendale</td>
<td>July 22, 1941</td>
</tr>
<tr>
<td>2,573,145</td>
<td>White</td>
<td>Apr. 10, 1945</td>
</tr>
</tbody>
</table>

FOREIGN PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Country</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,668</td>
<td>Great Britain</td>
<td>July 31, 1874</td>
</tr>
</tbody>
</table>