

[54] **MECHANISM FOR FEEDING BAR STOCK TO A MULTI-SPINDLE LATHE**

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[51] Int. Cl.B23b 13/00, B23b 3/34

[58] Field of Search.....82/2.5, 2.7, 3

[56] **References Cited**

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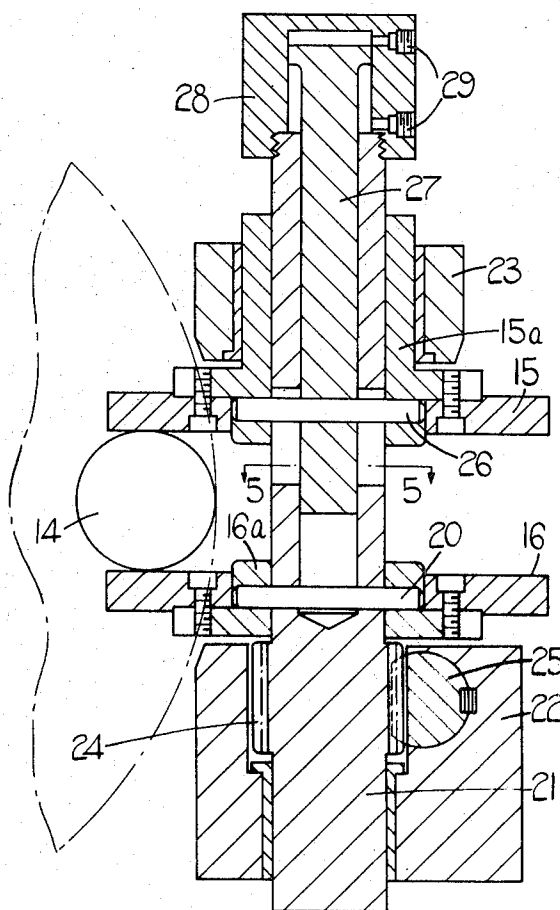
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[57] **ABSTRACT**

Mechanism for feeding bar stock to a multi-spindle lathe in which a plurality of rotatable spindles provided respectively with collets for gripping the stock are equiangularly mounted within a drum which is intermittently rotated through an angle equal to the angular spacing of the spindles in the drum. The feed member is adapted to make frictional contact with a stock bar to feed it through the collet whilst the drum is stationary, and is rotatable about an axis extending tangentially to a circle described about the axis of rotation to the drum. The feed member has a cut away portion whereby sufficient clearance is provided to enable the drum and carrier to rotate when the said portion is presented towards the bar.

7 Claims, 19 Drawing Figures



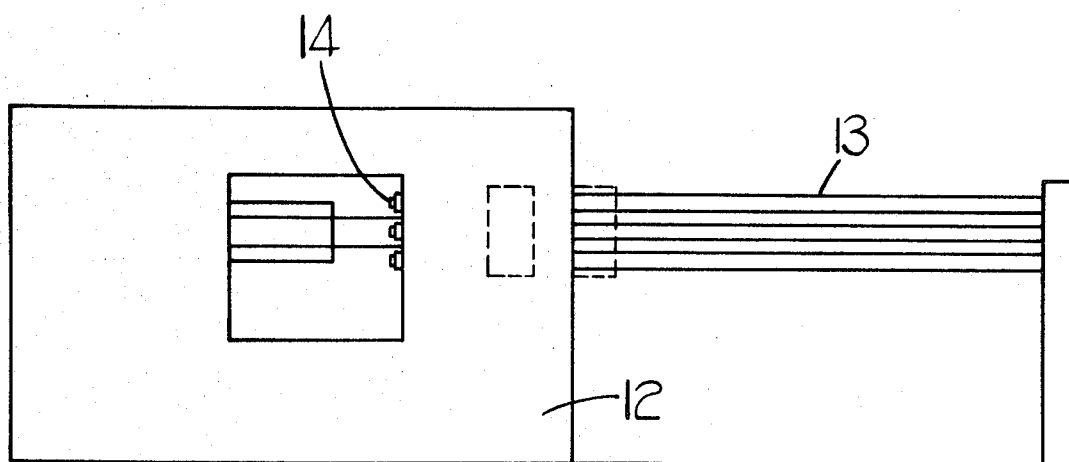


FIG. 1.

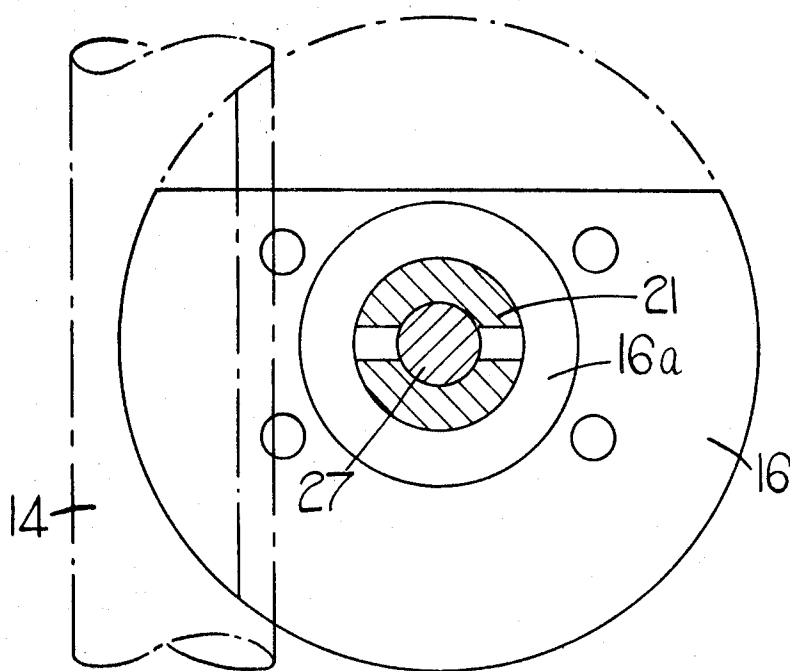
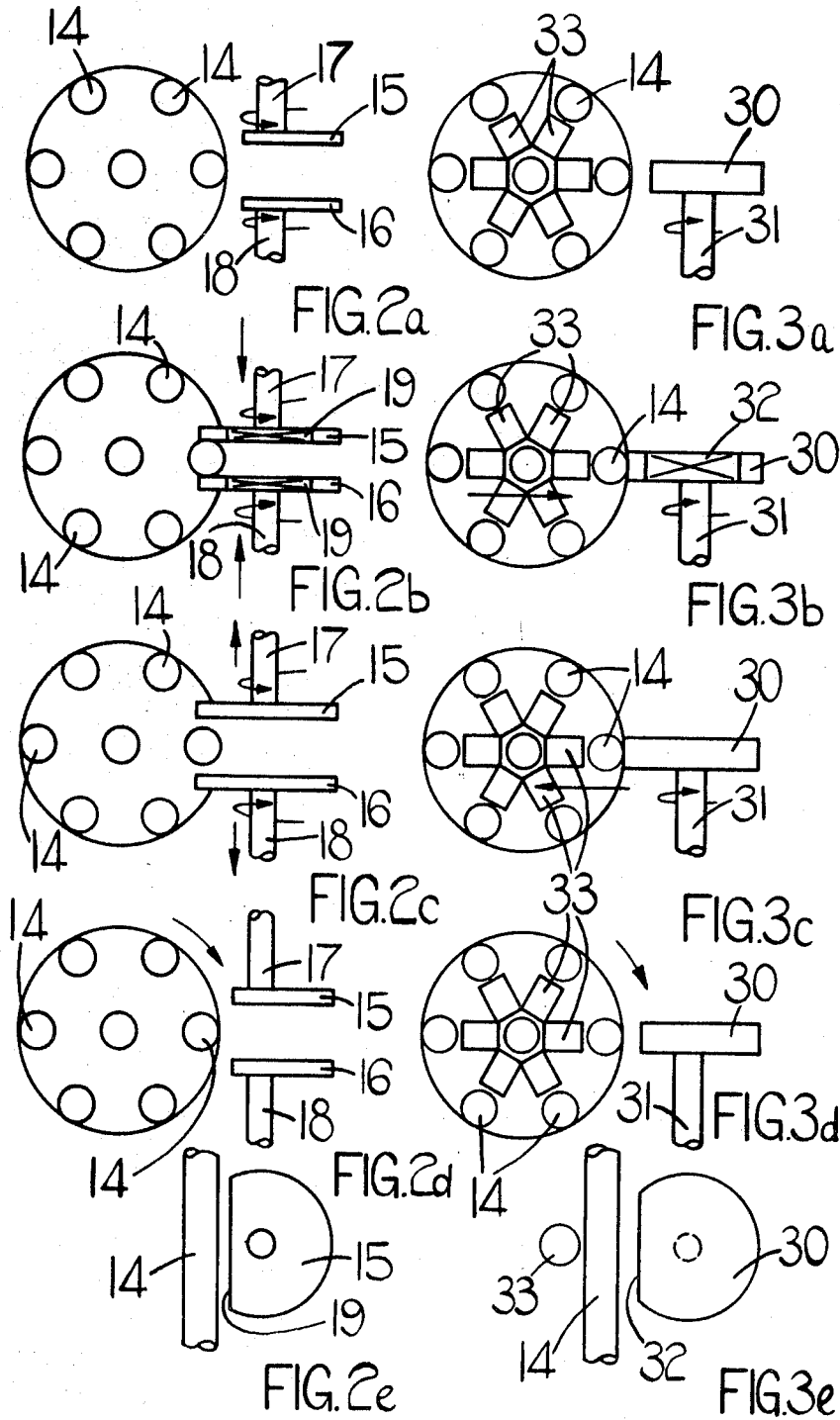


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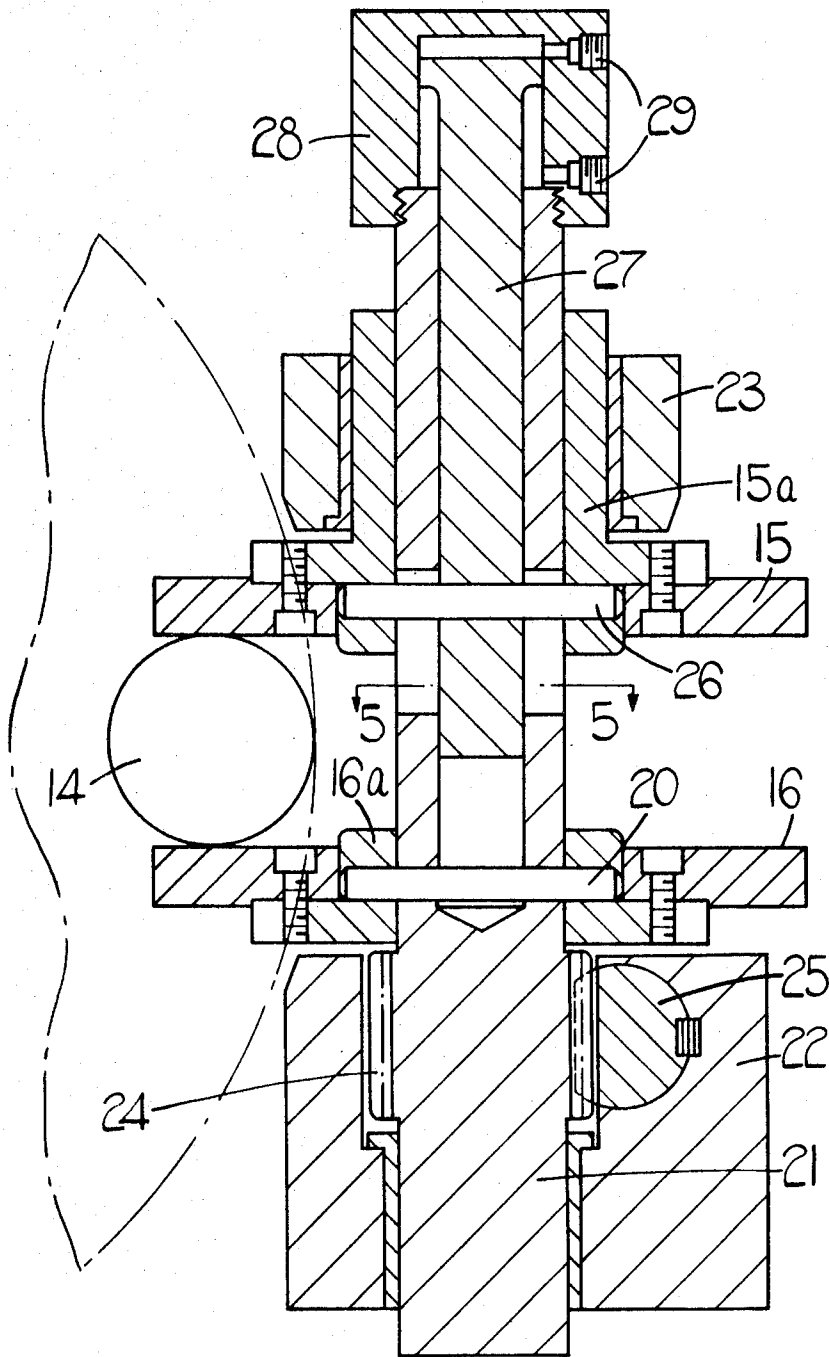


FIG. 4.

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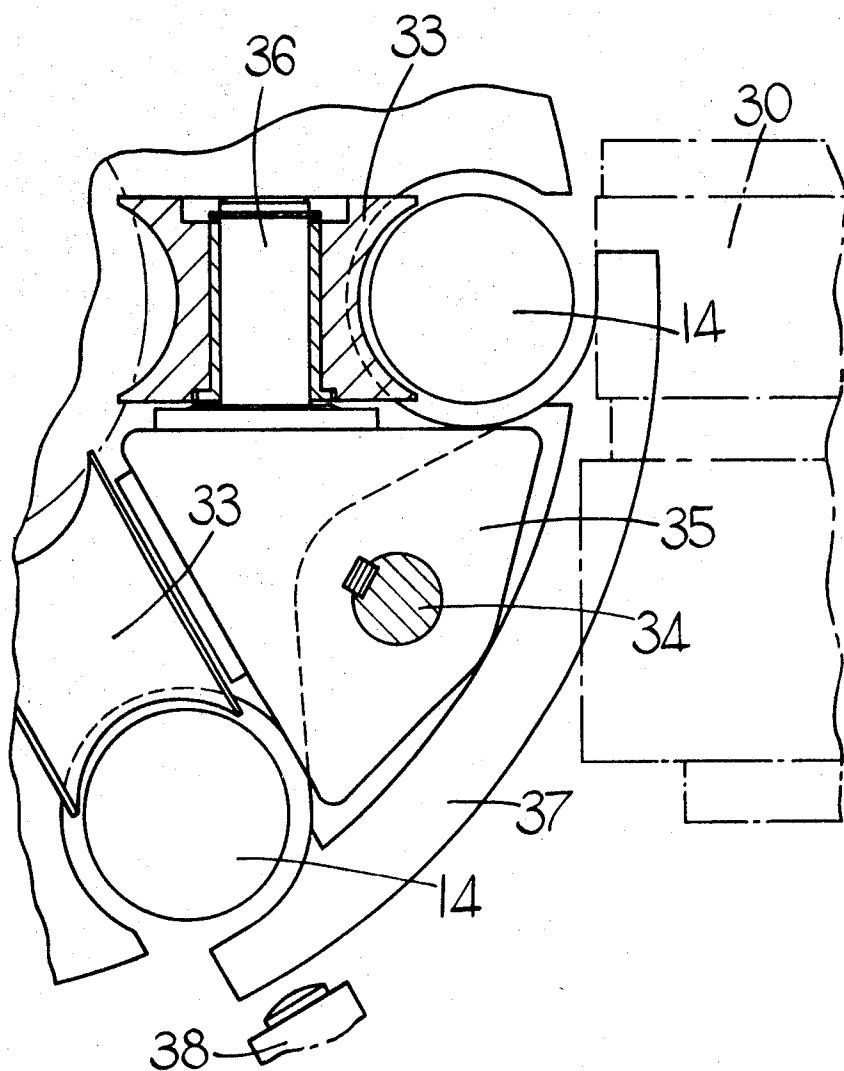
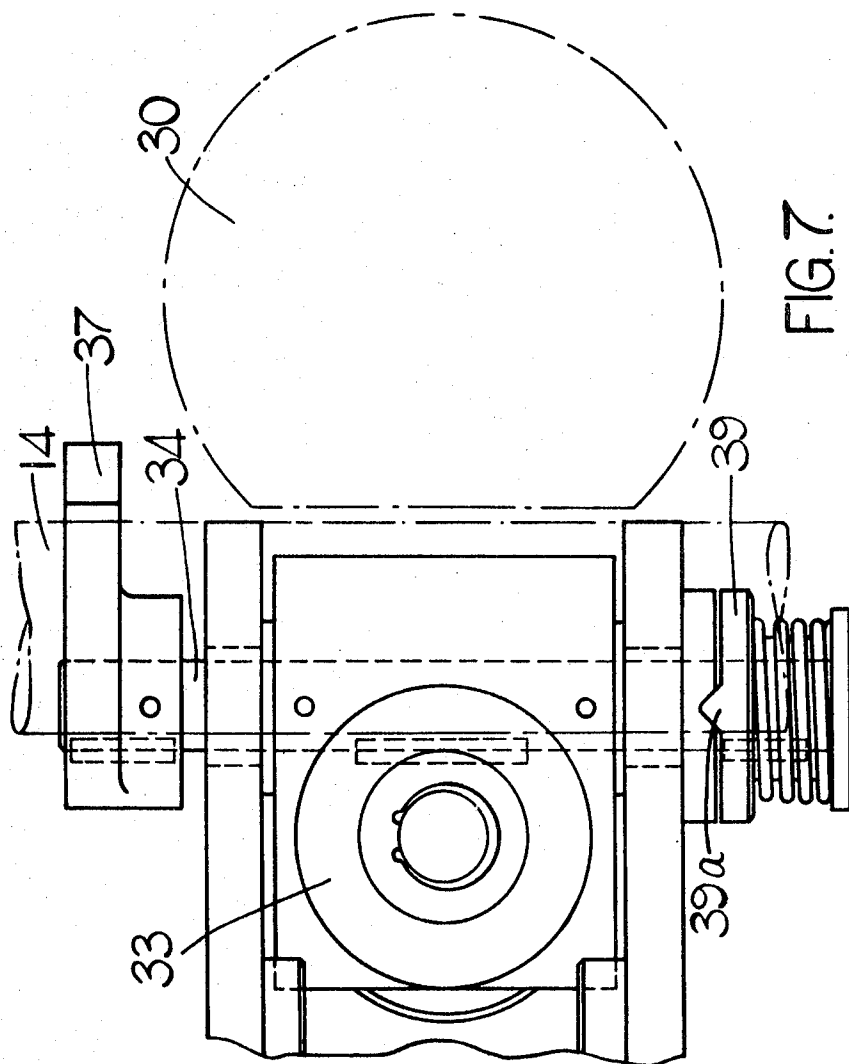


FIG. 6.

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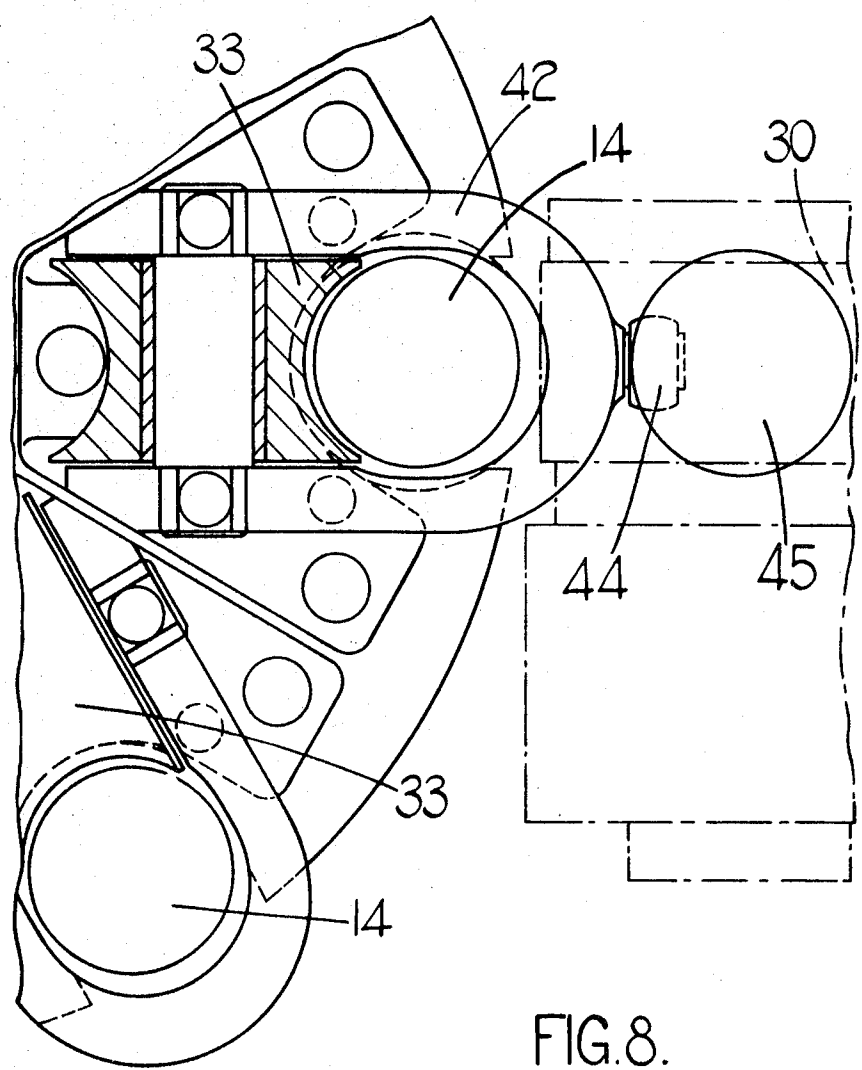


FIG. 8.

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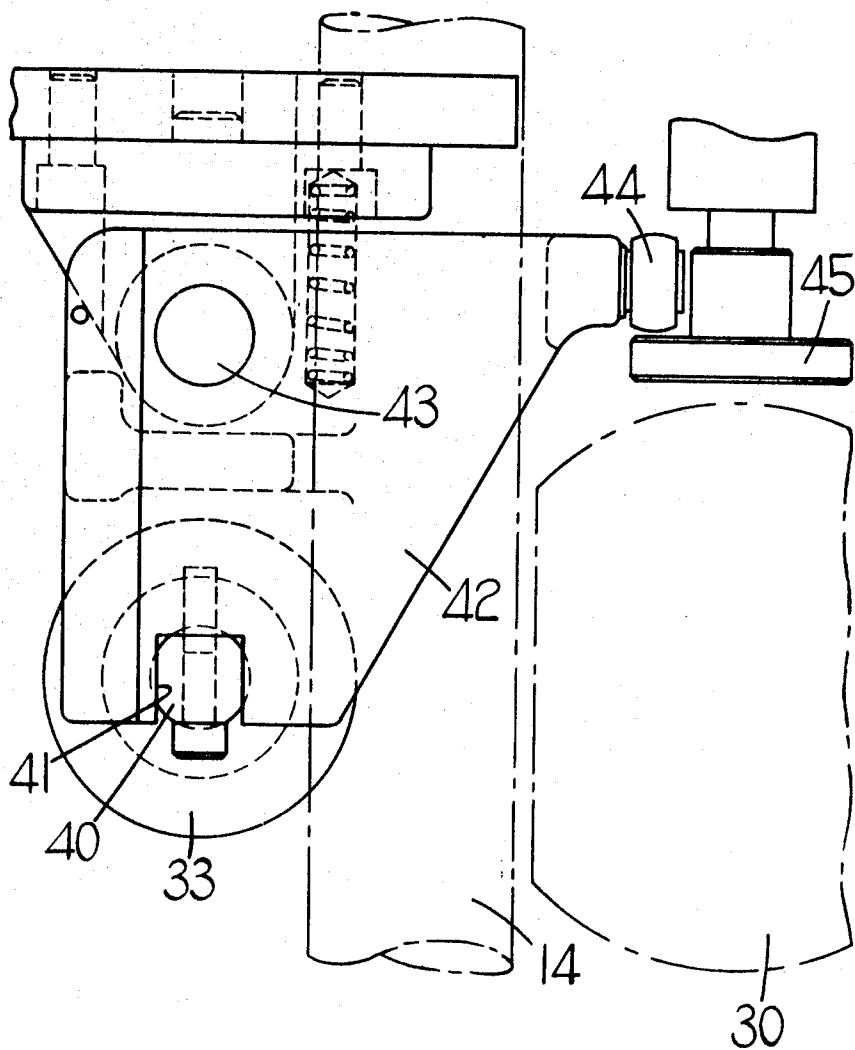
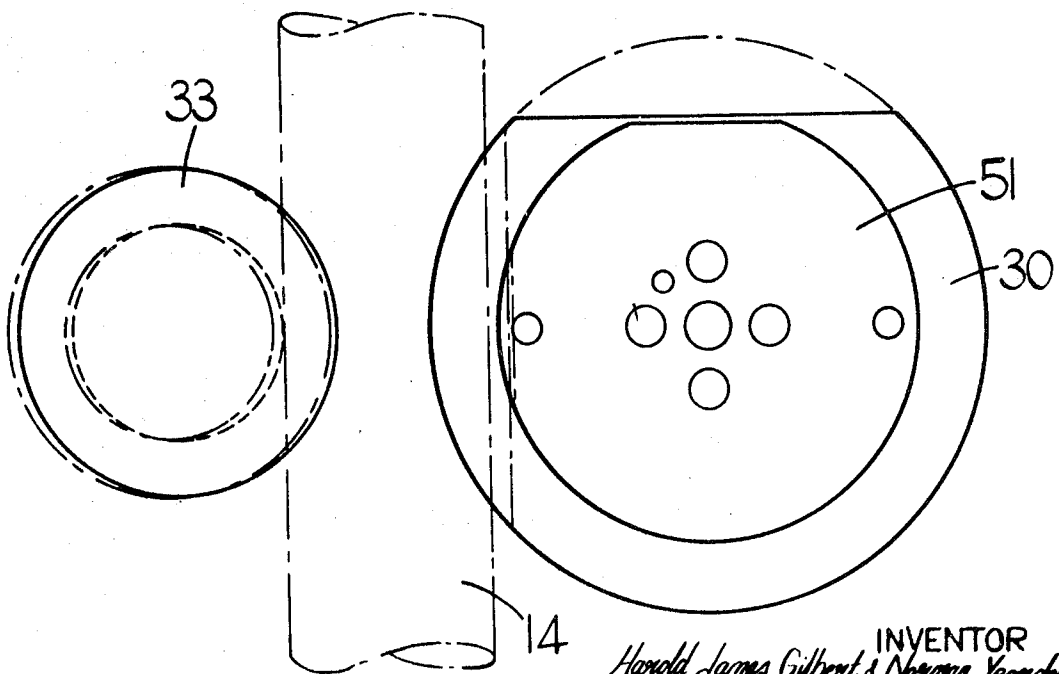
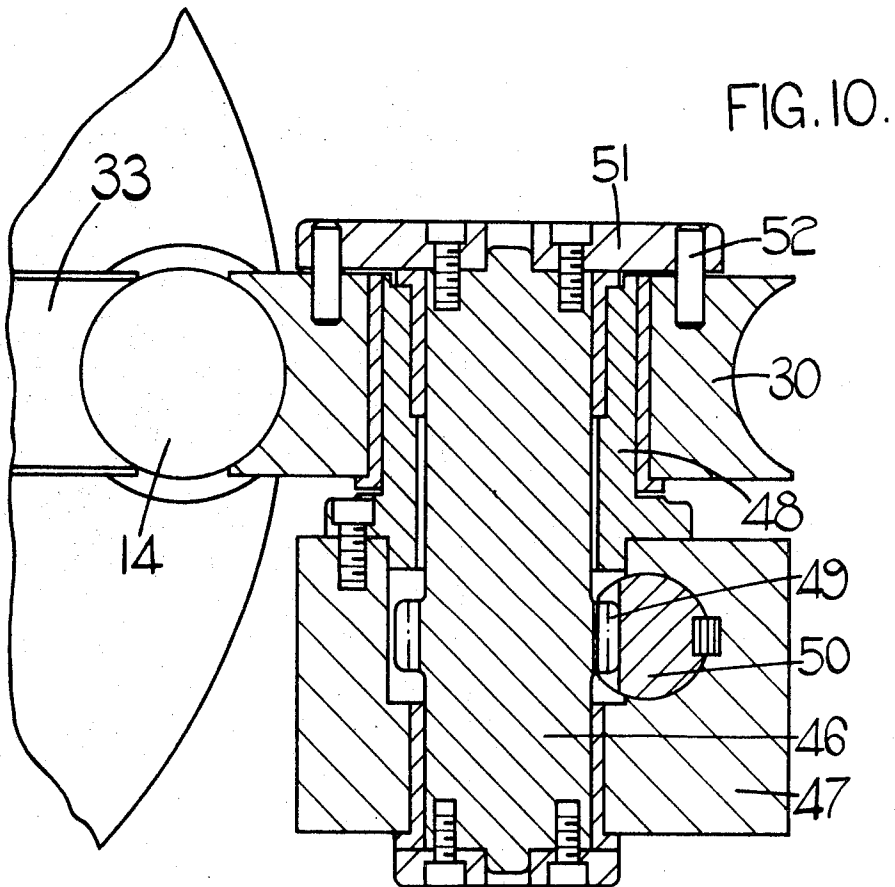


FIG. 9.

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 FIG. 11.

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MECHANISM FOR FEEDING BAR STOCK TO A MULTI-SPINDLE LATHE

This invention relates to mechanism for feeding bar stock to a multi-spindle lathe of the kind in which a plurality of rotatable spindles provided respectively with collets for gripping the stock are equi-angularly mounted within a drum which is intermittently rotated through an angle equal to the angular spacing of the spindles. In such machines the stock bars are normally supported in alignment with the spindles respectively in a carrier rotatable about the axis of rotation of the drum. Mechanism is also provided for feeding the bar forwardly within its spindle at one of the stations after a component has been operated upon, and the object of the present invention is to provide such feeding mechanism in a relatively simple and convenient form.

According to the invention mechanism for feeding bar stock to a multi-spindle lathe of the kind specified includes a rotatable feed member adapted to make frictional contact with a stock bar to feed it through a collet whilst the drum is stationary characterized by the fact that the feed member is rotatable about an axis extending tangentially to a circle described about the axis of rotation of the drum, said member having a cut away portion whereby sufficient clearance is provided to enable the drum and carrier to rotate when said portion is presented towards the bar.

In the accompanying drawings,

FIG. 1 is a diagrammatic side elevation of a multi-spindle lathe, together with a rotary carrier for supporting the bar stock.

FIGS. 2a, 2b, 2c and 2d respectively are diagrammatic end views of one example of feed mechanism in accordance with the invention, showing successive stages in the operation of the mechanism,

FIG. 2e is a plan view of FIG. 2d,

FIGS. 3a, 3b, 3c and 3d respectively are views similar to FIGS. 2a to 2d inclusive but showing an alternative example of the invention,

FIG. 3e is a plan view of FIG. 3d,

FIG. 4 is a sectional view to an enlarged scale of a practical example of the mechanism shown in FIG. 2b,

FIG. 5 is a section on the line 5—5 of FIG. 4,

FIG. 6 is a part sectional view to an enlarged scale of a practical example of the mechanism shown in FIG. 3a,

FIG. 7 is a plan of FIG. 6,

FIG. 8 is a part sectional view to an enlarged scale of an alternative example of the mechanism shown in FIG. 3a,

FIG. 9 is a plan of FIG. 8,

FIG. 10 is a view similar to FIGS. 6 or 8 showing in section details of the means for driving the outer roller shown in dotted lines in FIGS. 6 and 8, and,

FIG. 11 is a plan of FIG. 10.

Referring first to FIG. 1 of the accompanying drawings, there is associated with a six spindle lathe 12, a carrier for supporting six stock bars to be fed respectively to the collets of the lathe. The carrier incorporates six equi-angularly spaced tubes 13 supported in end plates which are rotatable about the axis of rotation of the drum of the lathe, the tubes 13 being aligned respectively with the spindles of the lathe, and being adapted to contain respectively six stock bars to be intermittently fed through the collets associated with the six spindles respectively.

As the drum is rotated angularly through a distance equal to the angular spacing between the spindles each stock bar represented by the reference 14 is in turn brought into a position to be operated upon by a feed mechanism forming the subject of the present invention.

Referring now to FIGS. 2a to 2e, beside the carrier is a feed mechanism comprising a pair of discs 15, 16 which are secured respectively to angularly movable members 17, 18 which can also be moved axially. It will be seen that the members 17, 18 are coaxially disposed and extend tangentially relative to a circle described about the axis about which the carrier and the drum rotate. The two discs 15, 16 are concentrically disposed in relation to the members 17, 18, but are cut away to provide respectively a pair of parallel flats as shown at 19 in FIG. 2e. As will be seen from FIGS. 2a, 2d and 2e, when the flats 19 are presented towards the carrier there is sufficient clearance between the carrier and the stock bars to enable the carrier to rotate. However, when the discs 15, 16 have moved angularly the marginal parts of the disc will overlap a stock bar 14.

In operation whilst the carrier is moved angularly the discs 15 are in the position in which they are shown in FIGS. 2d, 2e. When the carrier has come to rest the members 17, 18 are moved axially towards one another whilst rotating in the direction shown by the arrows in FIGS. 2a, 2b, 2c so that the two discs are brought into frictional contact with opposite sides of the stock bar 14, and thereby (as shown in FIG. 2b) serve to feed it forwardly through the collets of the appropriate spindle which at this instant is released. By this means the stock bar is fed into contact with a stop of known type associated with a lathe. Subsequently the members 17, 18 move axially apart as shown in FIG. 2c and when the flats are again presented to the carrier as shown in FIGS. 2d and 2e, the carrier is moved angularly through the next increment.

Referring now to FIGS. 4 and 5 of the drawings, it will be seen that the disc 16 is connected by a dowel 20 to a shaft 21 which is rotatable and axially movable within housings 22, 23. The shaft 21 carries a peripheral pinion 24 which is in mesh with a rack bar 25 which can be reciprocated in timed relationship by a mechanical or hydraulic source not shown. The disc 15 is connected by a dowel 26 to a piston 27 which is slidable within a bore in the shaft 21; the shaft 21 being provided with slots through which the dowel 26 extends to permit relative axial movement of the shaft 21 and piston 27. The piston 27 has a head which is contained within a cylinder 28 secured to the one end of the shaft 21 and provided with ports 29, through which the fluid can be alternately admitted and exhausted.

It will be understood that as fluid under pressure is admitted to the upper end of the cylinder as viewed in FIG. 4, the discs 15, 16 will be moved towards one another and will move into contact with opposite sides of the bar stock 14 with a self-centering action. Conversely, when the direction of the fluid pressure is reversed and is admitted to the lower end of the cylinder 28 as viewed in FIG. 4, the discs 15, 16 will move apart and their outward movement will be restricted by contact respectively with the under side and upper side of the housings 23 and 22 as viewed in FIG. 4. It will be seen that the disc 15 is connected by screws to the flange of a collar 15a, whilst the disc 16 is

connected by screws to the flange of a collar 16a. By this arrangement, the discs may be changed readily for discs of a different size to suit different sizes of bar stock, or for replacement of worn discs.

The timing of the various functions including the gripping and feeding of the bar is controlled by any convenient means from the main cam shaft of the lathe. Alternatively, an overload device sensing the pressure of the stock bar on the stop of the lathe may be utilized for timing the various functions.

In the example of the invention illustrated in FIGS. 3a to 3e, a single roller 30 is provided to make frictional driving contact with the stock bars 14 in turn, instead of the pair of discs 15, 16 in the previously described example. The roller 30 is mounted on a rotatable shaft 31 the axis of which extends tangentially relative to the axis of a circle described about the axis about which the carrier and the drum rotate. The roller 30 and shaft 31 are not axially movable and the roller 30 is provided with a flat 32 which when it is directed towards the carrier provides clearance to enable the carrier to rotate. Moreover, the carrier incorporates a plurality of angularly spaced rollers 33 which can be moved radially in the carrier to force the bar stock opposite the roller 30 into frictional driving engagement with the roller 30 when the curved portion of the periphery of the latter is directed towards the carrier.

In operation the carrier is rotated whilst the mechanism is in the position shown in FIG. 3d, and when the carrier has come to rest the appropriate roller 33 is moved radially outwards to contact the inner side of the bar stock 14 and move it into frictional driving engagement with the curved periphery of the roller 30 which has now moved to the position shown in FIG. 3b. After the stock bar has been moved into contact with the stop on the lathe, the roller 33 is removed from the stock bar and after the collet has closed to grip the bar the roller 30 is rotated in the opposite direction until the positions shown in FIGS. 3d and 3e are reached, whereupon the next increment of rotation of the carrier can take place.

One practical means of moving the rollers 33 in a substantially radial outward direction is shown in FIGS. 6 and 7. In this example, the carrier incorporates three equi-angularly spaced shafts 34 extending parallel to the axis about which the carrier rotates. On each shaft 34 is keyed a quadrant shaped member 35 carrying a pair of oppositely directed stub axles 36 on which a pair of adjacent rollers 33 are mounted respectively. Also keyed to the shaft is a rocker 37 with which are arranged to coact a pair of fluid actuated plungers, one only of which is seen at 38. The other plunger 38 is situated at an angle of 10° removed from the plunger illustrated and the two plungers are arranged to be actuated alternately as will be described. When the carrier has come to rest in the position shown in FIG. 6, the illustrated plunger 38 is actuated to rock the member 35 and thereby move the roller 33 opposite the roller 30 in a substantially radial outward direction, so as to cause the bar stock 14 to move into the position to be contacted by the roller 30 when the flat on the latter has been moved from the position shown. A self-centering device is provided comprising a spring-loaded collar 39 keyed to the shaft 34 and having formed thereon V-shaped projections 39a which are normally located

within V-shaped notches within a ring fixed to the frame of the carrier. By this means small angular movements of the rocker in either direction will be effected against resilient resistance. Moreover, when the projections 39a have been fully removed from their notches, the shaft 34 can be moved angularly to positions to enable the rollers 33 to be removed from their axles 36 for replacement by different sized rollers to suit different sizes of bar stock.

An alternative means of moving the rollers 33 in an outward direction to move the stock bar into contact with the roller 30 is shown in FIGS. 8 and 9 wherein each roller 33 is mounted on a spindle 40 which is clamped by screws within slots 41 at one end of a bifurcated bellcrank lever 42 pivoted on the carrier at 43. The opposite arm of the bellcrank lever 42 carries a roller 44. The roller 44 is arranged to co-act with a plunger 45 or cam so that when the appropriate bellcrank lever is opposite the roller 33, the lever will be rocked about its pivot 43 to move the roller 33 in a substantially radial outward direction, to move the roller 33 in a substantially radial outward direction, to move the stock bar 14 into firm driving engagement with the curved periphery of the roller 30. The fact that the spindle 40 can be readily detached from the bellcrank lever 42 enables the roller 33 to be changed to suit stock bars of different diameters.

The mechanism for driving the roller 30 is shown in FIGS. 10 and 11, and comprises a shaft 46 rotatable in bearings in a housing 47 and a flanged sleeve 48 secured to the housing. The shaft is provided with a pinion 49 which meshes with a reciprocable rack bar 50 and the roller 30 is rotatable on a bearing surrounding the sleeve 48, the roller 30 being connected to the shaft 46 by an end cap 51 and driving pins 52.

As will be seen from the drawings where a single roller 30 is used both this roller and the associated rollers 33 will have peripheries which are of concave arcuate form to suit the diameter of the stock bar.

It will be appreciated that with conventional stock carriers only one feed device is necessary but two or more feed devices as described could be used with an automatic stock carrier. Moreover, although the example described and illustrated is applied to a feed mechanism for use with a six spindle machine, it is equally applicable to multi-spindle machines having more or less spindles. Furthermore, occasionally in an eight spindle machine the stock bar is fed at two positions in order to create the effect of two four spindle machines in which case two feed mechanisms would be required. This feature can also be applied to machines with different numbers of spindles, for example, six or more than eight.

In all cases it will be understood that the tubes 13 will be cut away to expose the bar to the action of the discs or rollers.

We claim:

1. Mechanism for feeding bar stock to a multi-spindle lathe of the kind specified including a rotatable feed member adapted to make frictional contact with a stock bar to feed it through a collet whilst the drum is stationary characterized by the fact that the feed member is rotatable about an axis extending tangentially to a circle described about the axis of rotation of the drum, said member having a cut away portion

whereby sufficient clearance is provided to enable the drum and carrier to rotate when said portion is presented towards the bar.

2. Mechanism as claimed in claim 1 in which the rotatable feed member is a pair of axially movable discs which can be brought into frictional engagement with opposite sides of the stock bar.

3. Mechanism as claimed in claim 2 in which the pair of discs are connected respectively to a fluid operated piston and a cylinder so as to be alternately movable towards and away from one another, means being provided for preventing relative rotation of the discs.

4. Mechanism as claimed in claim 1 in which the rotatable feed member is a first roller arranged to make peripheral contact with the stock bar, at a position opposite a further roller comprising one of a plurality of angularly spaced further rollers carried by a stock car-

rier rotatable with the drum.

5. Mechanism as claimed in claim 4 in which said further rollers are movable in a substantially radial direction in the carrier to force the stock bar into frictional driving engagement with the first roller.

6. Mechanism as claimed in claim 5 in which adjacent pairs of said further rollers are mounted respectively upon a member rockable about axes parallel to the axis of rotation of the carrier by means of fluid actuated plungers.

7. Mechanism as claimed in claim 5 in which each further roller is mounted respectively upon one of a plurality of members which are rockable about axes extending parallel to the axis of the first roller, said member being rockable in turn by a plunger.

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