

Feb. 16, 1954

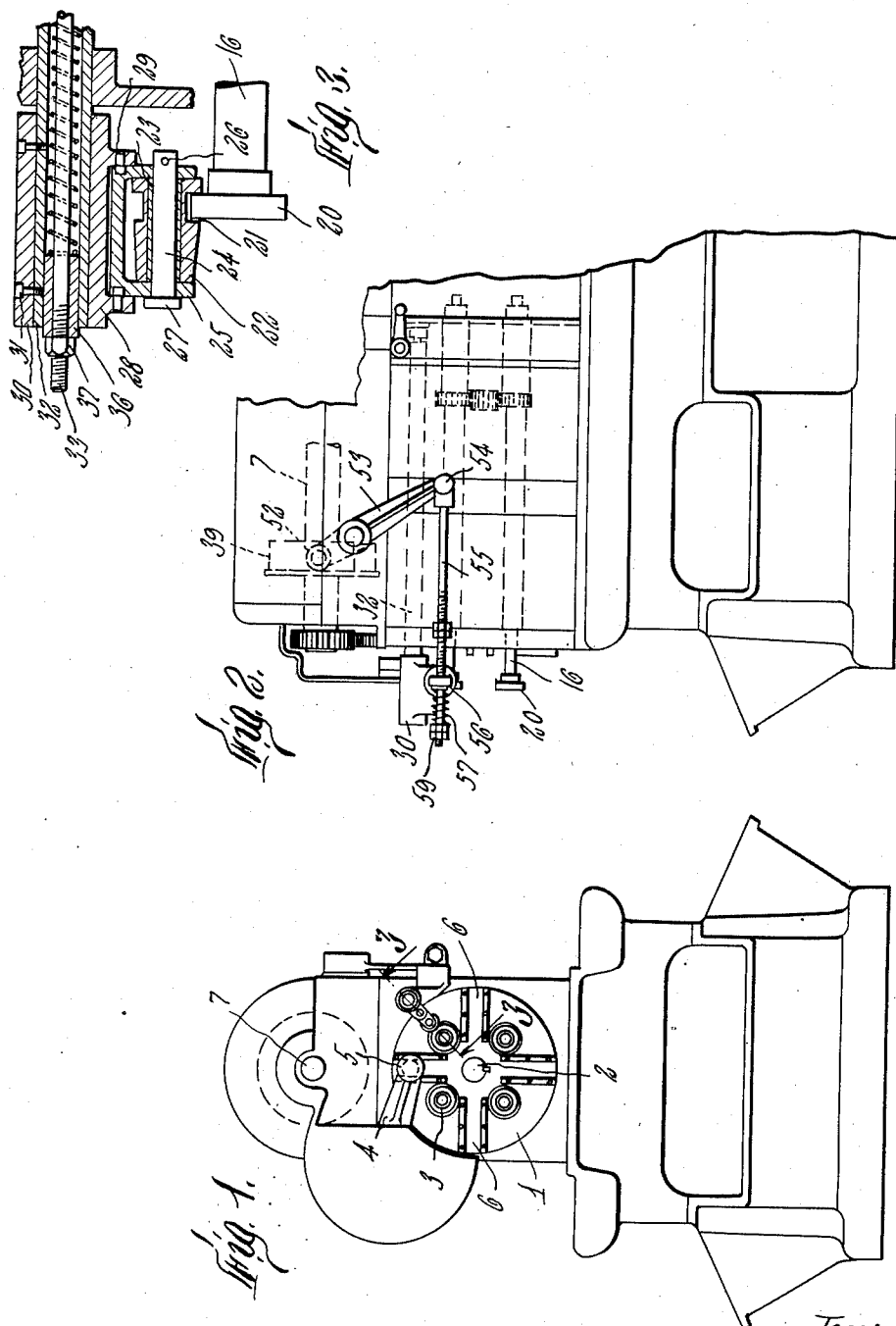
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2,669,345

OUT-OF-STOCK RESPONSIVE MECHANISM

Filed Sept. 10, 1949

4 Sheets-Sheet 1



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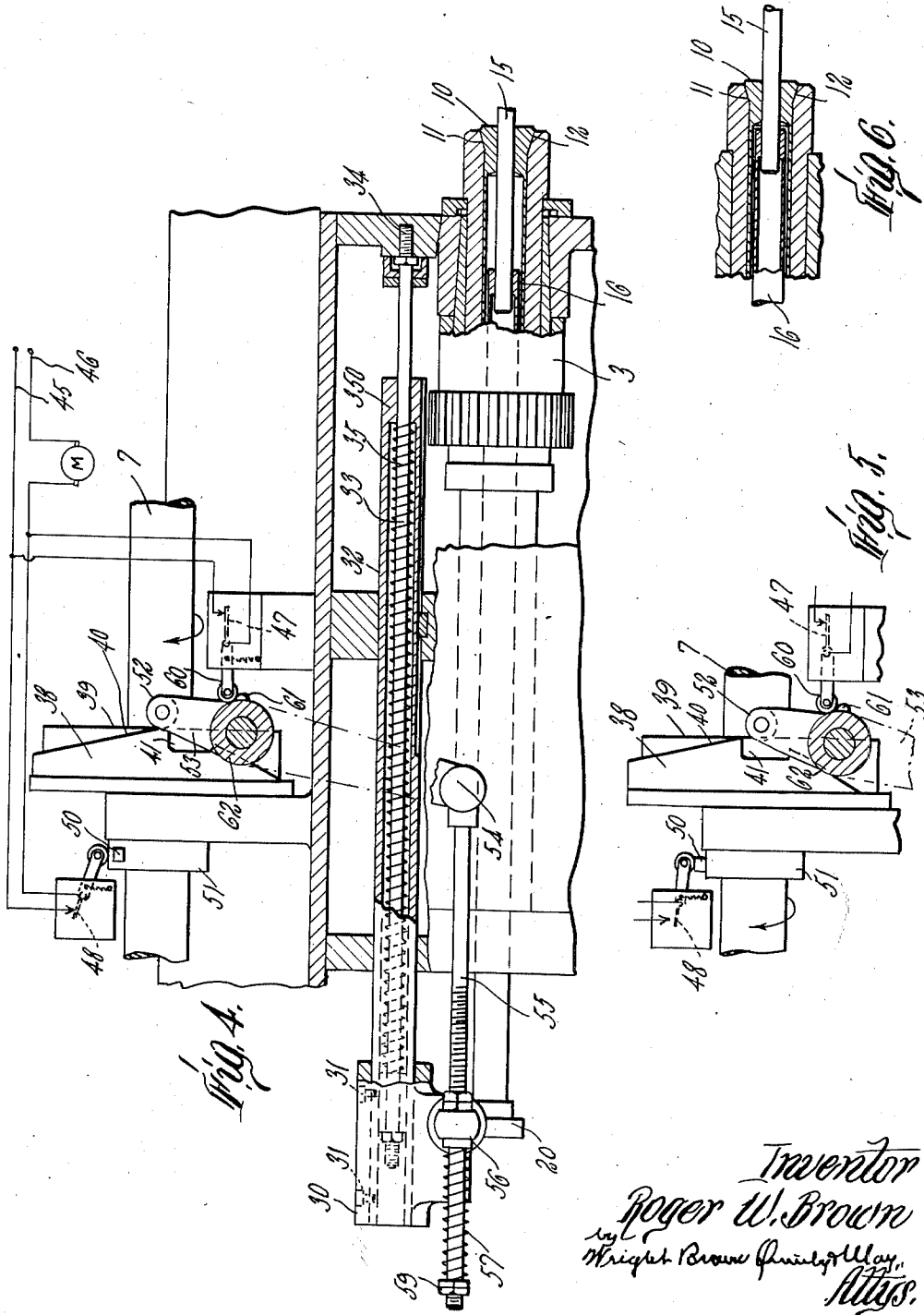
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OUT-OF-STOCK RESPONSIVE MECHANISM

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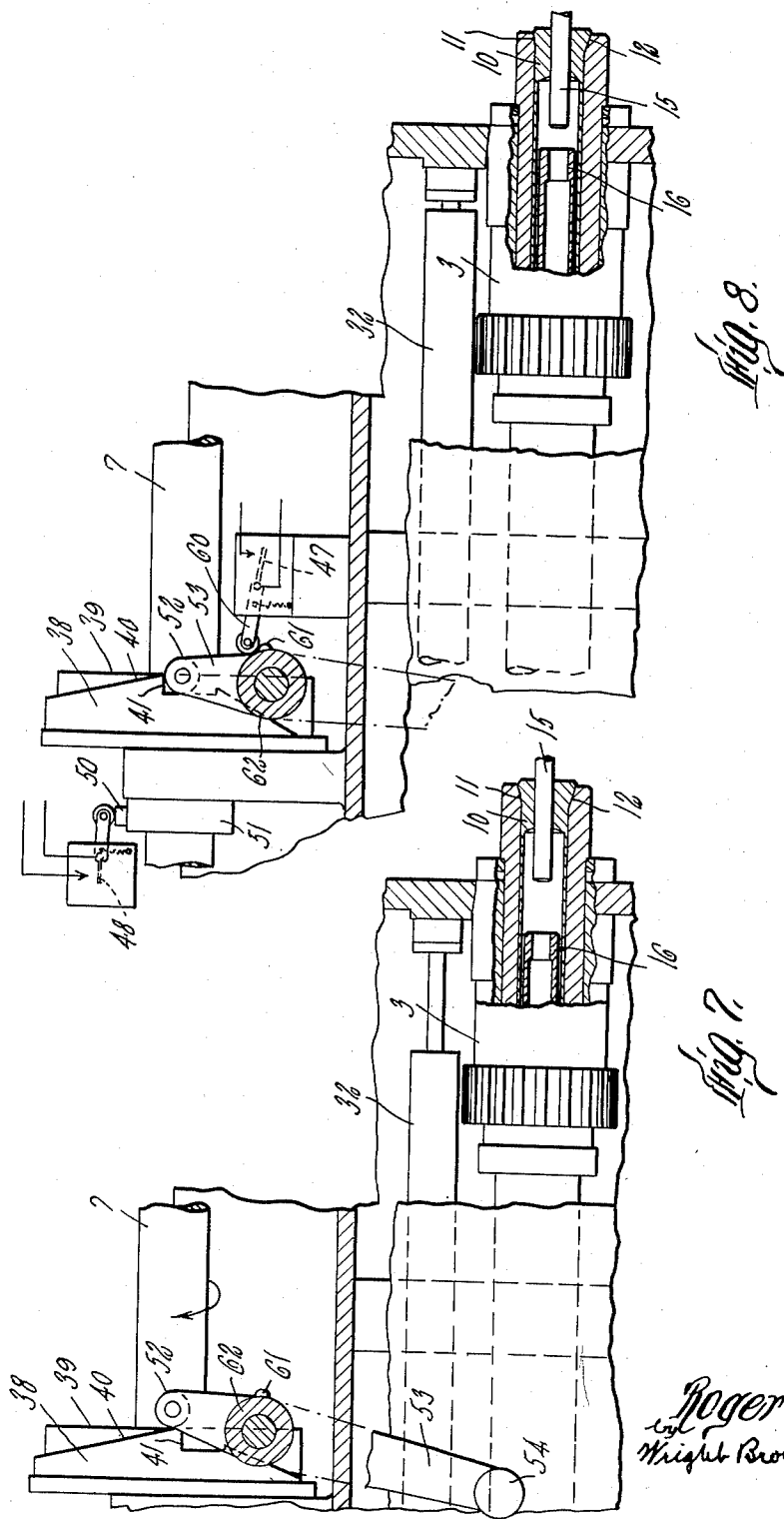
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OUT-OF-STOCK RESPONSIVE MECHANISM

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OUT-OF-STOCK RESPONSIVE MECHANISM

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4 Sheets-Sheet 4

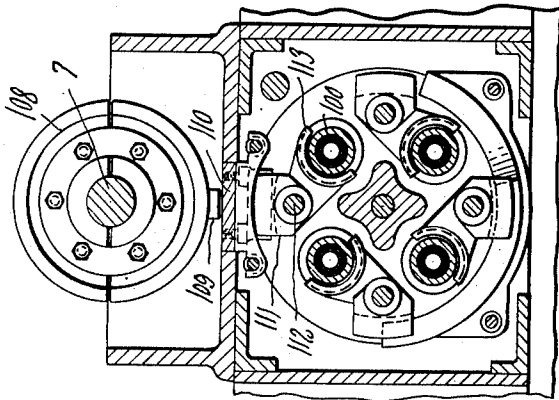


Fig. 10.

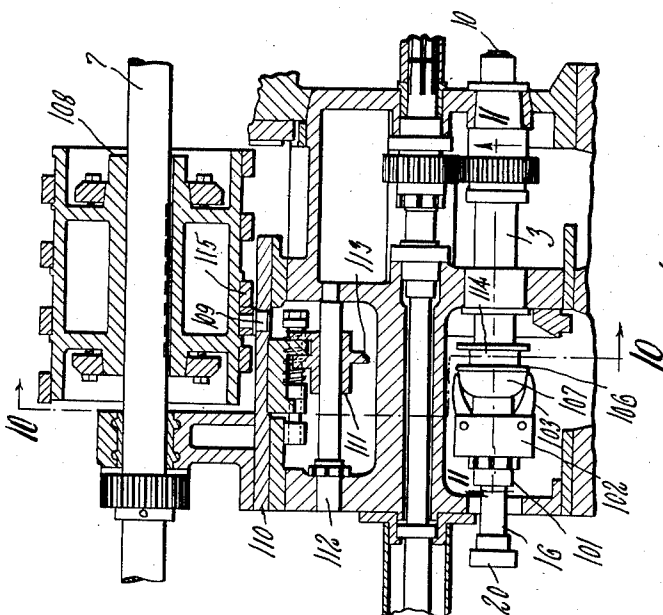


Fig. 9.

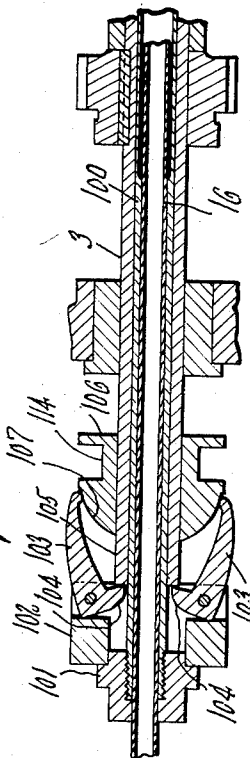


Fig. 11.

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UNITED STATES PATENT OFFICE

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OUT-OF-STOCK RESPONSIVE MECHANISM

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2 Claims. (Cl. 203-12)

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In connection with lathes and screw machines which operate upon lengths of stock fed through one or more rotary work spindles, it is desirable for the operator to know when the stock is exhausted in order that he may supply additional stock and avoid waste of power and time through idle operation of the machine.

An object of the present invention, therefore, is to provide simple and effective means for indicating out-of-stock condition to the operator, and, if desired, for stopping the machine automatically or performing any other desirable function on the occurrence of such a condition.

A further object of the invention is to associate such an indicator, together with such automatic controls as may be desired, with a stock feeding mechanism, the absence of the stock from such mechanism at any time resulting in the operation of the indicator and parts controlled thereby.

A further object is to provide means for imparting a slight forward and backward motion of a portion of the stock feed mechanism effective when the normal resistance to such motion produced by the presence of stock fails, as it would fail should no stock be present, to give notice and effect such automatic controls as are desired.

A further object of the invention is to provide indication of an out-of-stock condition whether or not the pusher has appreciable return stroke friction.

Further objects and advantages will appear from a description of an embodiment of the invention shown in the accompanying drawings in which:

Figures 1 and 2 are end and fragmentary front elevations of a multiple spindle lathe embodying the invention.

Figure 3 is a detail sectional view to a larger scale on line 3-3 of Figure 1.

Figure 4 is a fragmentary view partly in front elevation and partly broken away and in section and to a larger scale than Figure 2, showing certain portions of the mechanism, the stock feed being in retracted position.

Figure 5 is a fragmentary view similar to a portion of Figure 4, but with the parts in different positions as when the stock is in the spindle and has been fed forwardly.

Figure 6 is a sectional detail of the forward end of the spindle, a piece of stock having been gripped and fed.

Figure 7 is a view similar to a portion of Figure 4, but showing the mechanism in condition

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of "out-of-stock" just before this is effective on the responsive mechanism.

Figure 8 is a view similar to a portion of Figure 7 and showing the parts in "out-of-stock" condition.

Figure 9 is a fragmentary vertical sectional view showing the stock gripper actuating mechanism.

Figure 10 is a detail sectional view on line 10-10 of Figure 9.

Figure 11 is a detail sectional view to an enlarged scale on line 11-11 of Figure 9.

Referring first to Figures 1 and 2, there is illustrated a portion of a multiple spindle lathe or screw machine having an indexing spindle carrier 1 mounted for indexing motion about its axis 2 to present successively a plurality of hollow rotary work spindles 3 in the various tooling positions. The indexing is produced by a Geneva motion comprising the rotating Geneva arm 4 having a cam roller 5 which cooperates with Geneva slots 6 in a suitable portion of the spindle carrier 1. This Geneva arm is rotated by means driven in time with a cam shaft 7 positioned above and substantially parallel to the axis of the spindle carrier. This cam shaft 7 carries suitable cams for controlling the various portions of the cycle of operation of the machine as is well understood in the art. Each of the work spindles is hollow, as shown best in Figure 8, and carries at its forward end a work-gripping collet 10 which may be moved axially and which is provided with jaws having tapered outer faces 11 which cooperate with a mating tapered inner face 12 of the spindle, so that the work piece 15 may be gripped while machining operations are being performed on an extended portion thereof, or released for feeding of the stock through the spindle. Mechanism for opening and closing the collet 10 in proper time is old and well known and may be as shown in the Cone Patent No. 2,142,557 granted January 3, 1939. This mechanism is shown more particularly in Figures 9 to 11, inclusive. The work gripping collet or clamp 10 is carried at the forward end of a sleeve 100 axially slidable within the spindle 3 and rotatable with this spindle. The sleeve 100 has a collar 101 secured to its outer or rear end, the forward end of the collar carrying a support 102 having slots for the pivotal reception of fingers 103. These fingers are each provided with a lug 104 which bears against the end of an outer axially fixed sleeve 105 forming a portion of the spindle and on which is axially movable a wedge collar 106. This collar

106 has a tapered end 107 against which the ends of the fingers 103 engage. When the wedge collar 106 is moved toward the left as viewed in Figure 4, the fingers 103 are wedged outwardly and the collar 101 and the support 102 are forced toward the left, retracting the collet 10 and clamping the work piece therein. Motion of the wedge collar 106 to the right will then allow the collet 10 to move in the same direction and release the work piece. This motion of the collar 106 is produced in proper timed relation to the other machine functions by a cam 115 on a cam drum 108 (Figures 9 and 10) carried by the cam shaft 7, the cam 115 acting on a follower 109 carried by a slide 110 which is yieldingly connected to a second slide 111 carried by a supporting bar 112. Slide 111 carries a yoke 113 engageable in a peripheral groove 114 in the collar 106 of a spindle which is in the proper angular position about the axis of the shaft 2 to have the stock fed therein.

The feeding is produced by a pusher 16 of any suitable type which is reciprocated. The forward motion of the pusher ordinarily occurs while the collet 10 is released, thus feeding the stock through the stock clamp up against a stock stop (not shown), and the pusher is retracted normally while the clamp is closed so that the stock pusher rides backwardly over the stock without moving it.

The stock pusher 16 extends outwardly beyond the end of the spindle where it is provided with a head 20 shown best in Figures 3 and 4. This head may be engaged in a peripheral groove 21 of a spool-shaped member 22 rotatably mounted on a bushing 23 carried by a pin shaft 24 which extends through a yoke 25. It is secured in this yoke by a transverse pin 26, passed through a slot therethrough opposite to the head end 27 of the pin shaft. The yoke 25 is fixed between a pair of lugs 28 and 29 on a block 30 which is secured to the outer end of a tube 31 as by screws 31. Extending through the tube 32 is a rod 33, which, as shown best in Figure 4, is anchored at its inner end by being threaded into the machine frame at 34. A spring 35 is enclosed within the tube 32 and reacts at one end between the closed end 350 of this tube and at its opposite end against an abutment 36 secured to the outer end of the rod 33 and held in position thereon as by a nut 37 threaded onto the outer end of this rod. This spring 35 thus tends to move the tube 32, and through its connections with the pusher of the spindle which happens to be in the proper index position, to move the pusher, also, inwardly in feeding direction.

The retracting motion of the feed tube is produced by the action of a cam 38 carried by a drum 39 secured to the cam shaft 7. This cam 38 has a sloping cam face 40 which is in angular position relative to the timing of the clamping and unclamping of the stock by the stock clamp 10 to cause the stock pusher to be retracted during the time that the collet 10 is in engagement with the stock. This cam 38 also has a depression 41 which is a second low point of the cam, the first low point being formed at the furthest left hand portion of the cam face 40 which permits the spring 35 to advance the stock pusher at a time in the cycle when the collet 10 is still closed, but when stock is in position and in engagement with the stock pusher and in the clamp as shown in Figure 4, this forward or feeding motion of the stock pusher is prevented by the presence of the clamped stock which normally

offers such large frictional resistance to the motion of the stock pusher therealong that the stock pusher is not moved therealong by pressure of the spring 35. However, should no stock be in position to be engaged by the pusher at this time during the cycle, the stock pusher may move forwardly, as shown, for example, in Figure 8, the cam follower 52 falling into the cam depression 41 and should such motion occur, provision is made in accordance with this invention for responding to the "out of stock" condition. The particular response to this condition as shown in the present embodiment acts to stop the machine.

In Figure 4 there is shown at M diagrammatically the driving motor for the machine which normally derives its power from the lines 45 and 46. In one of these lines, as 45, are positioned in multiple a pair of switches 47 and 48. Thus when either of these switches is closed the motor M is energized, but when both are open at the same time the motor is deenergized so that the machine stops. The switch 48 is normally closed but is opened whenever the lug 50 fixed to the cam 51 of the cam shaft 7 is in the angular position of Fig. 5 such that a cam follower roll 52 on the lever 53 is opposite to the cam depression 41. This lever 53 has an end 54 connected through a link 55 to a swivel head 56 carried by the block 30, a spring 57 being interposed between this head 56 and a pair of nuts 59 threaded on the outer end of the link 55. This spring 57 is additionally compressed by further rocking of the lever 53 by a suitable cam (not shown) on the drum 39 after the spring 35 has fed the stock against the stock stop, in order to prevent any rebound of the stock away from contact with the stop before the collet has had time to close. The switch 47 may be opened by impingement on an arm 60 thereof of a cam element 61 on the hub 62 of the lever 53. Whenever the lever is in the angular position shown in Figures 4 and 7, the switch 47 remains closed, but should no stock be in position to prevent forward motion of the stock pusher when the follower 52 is opposite to the depression 41, which allows the lever 53 to be pulled in counterclockwise direction by the action of the feeding spring 35, the cam lug 61 acts to open the switch 47. Thus whenever the shaft 7 is in angular position to permit actuation of the stock feed in feed direction while the stock clamp is closed, such action only being permitted by the absence of stock in the spindle, both the switches 48 and 47 are opened simultaneously so that the machine stops.

At other times when the cam 38 would permit forward feed of the stock pusher if no stock were in position and this motion is prevented by the presence of stock being held by the stock clamp 10, only the switch 48 opens so that the motor M is still energized and continues its rotation. It will be understood that the opening and closing of the stock clamp 10 is controlled by the angular position of the cam shaft 7 in a well understood manner. The provision of the roll 22 permits the spindle to come into operative relation to the head 20 on the stock pusher sequentially as the spindle carrier 1 is indexed from one to another of its angular positions, there being a stock pusher for each spindle, actuated by a single spool 22 positioned at that index station where feeding of the stock is desired.

From the foregoing description of an embodiment of this invention, it should be evident to

those skilled in the art that various changes and modifications may be made without departing from its spirit or scope.

I claim:

1. A mechanism of the class described, comprising a hollow rotary spindle through which stock may be fed, a stock clamp carried by said spindle, means for intermittently closing and opening said clamp, a rotary cam shaft, cams on said shaft for controlling operative functions of the machine including a cam for actuating said closing and opening means, a stock pusher mounted for reciprocation in said spindle and engageable with stock in said spindle, yielding means operatively connected to said pusher and tending to hold said pusher in stock-advanced position, said cams including a stock pusher cam, mechanism actuatable by said stock pusher cam for retracting said pusher while said stock clamp is closed and for releasing said stock pusher to be moved by said yielding means to feed the stock while said clamp is open, said pusher-actuating cam having a second portion recessed to permit said yielding means to move said pusher in stock-advancing direction while said clamp is closed when this is not prevented by stock engaged thereby being held against feed by the closed clamp, an electric motor for rotating said cam shaft, a pair of controlling switches for said motor arranged in parallel, means actuatable by said cam shaft only when said shaft is in angular position to present said pusher cam recessed portion in operative position to open one of said switches, and means actuated by advancing motion of said stock pusher for opening the other of said switches, whereby when said pusher advances while said clamp is closed both of said switches are opened to stop said motor.

2. A mechanism of the class described, comprising a hollow rotary spindle through which stock may be fed, a stock clamp carried by said spindle, means for intermittently closing and opening said clamp, a rotary cam shaft, cams

on said shaft for controlling operative functions of the machine including a cam for actuating said closing and opening means, a stock pusher mounted for reciprocation in said spindle and engageable with stock in said spindle, yielding means operatively connected to said pusher and tending to hold said pusher in stock-advanced position, said cams including a stock pusher cam, mechanism actuatable by said stock pusher cam for retracting said pusher while said stock clamp is closed and for releasing said stock pusher to be moved by said yielding means to feed the stock while said clamp is open, said pusher-actuating cam having a second portion recessed to permit said yielding means to move said pusher in stock-advancing direction while said clamp is closed when this is not prevented by stock engaged thereby being held against feed by the closed clamp, means for rotating said cam shaft, a circuit, a pair of controlling switches arranged in parallel in said circuit, means actuatable by said cam shaft only when said shaft is in angular position to present said pusher cam recessed portion in operative position to open one of said switches, and means actuated by advancing motion of said stock pusher for opening the other of said switches, whereby when said pusher advances while said clamp is closed both of said switches are opened to open said circuit.

ROGER W. BROWN.

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