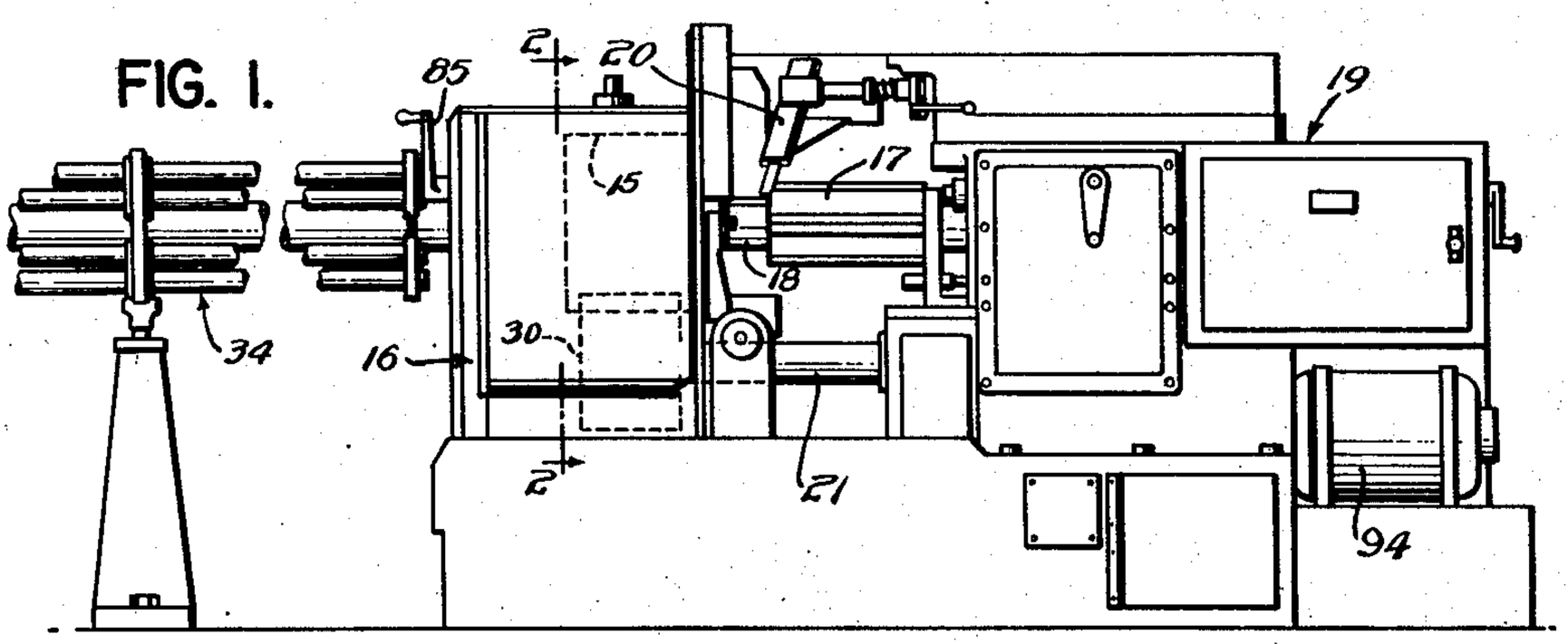
Nov. 17, 1953 A. H. JOBERT 2,659,127

STOCK FEED MECHANISM FOR BAR MACHINES

Filed April 22, 1948 4 Sheets-Sheet 1

FIG. 1.



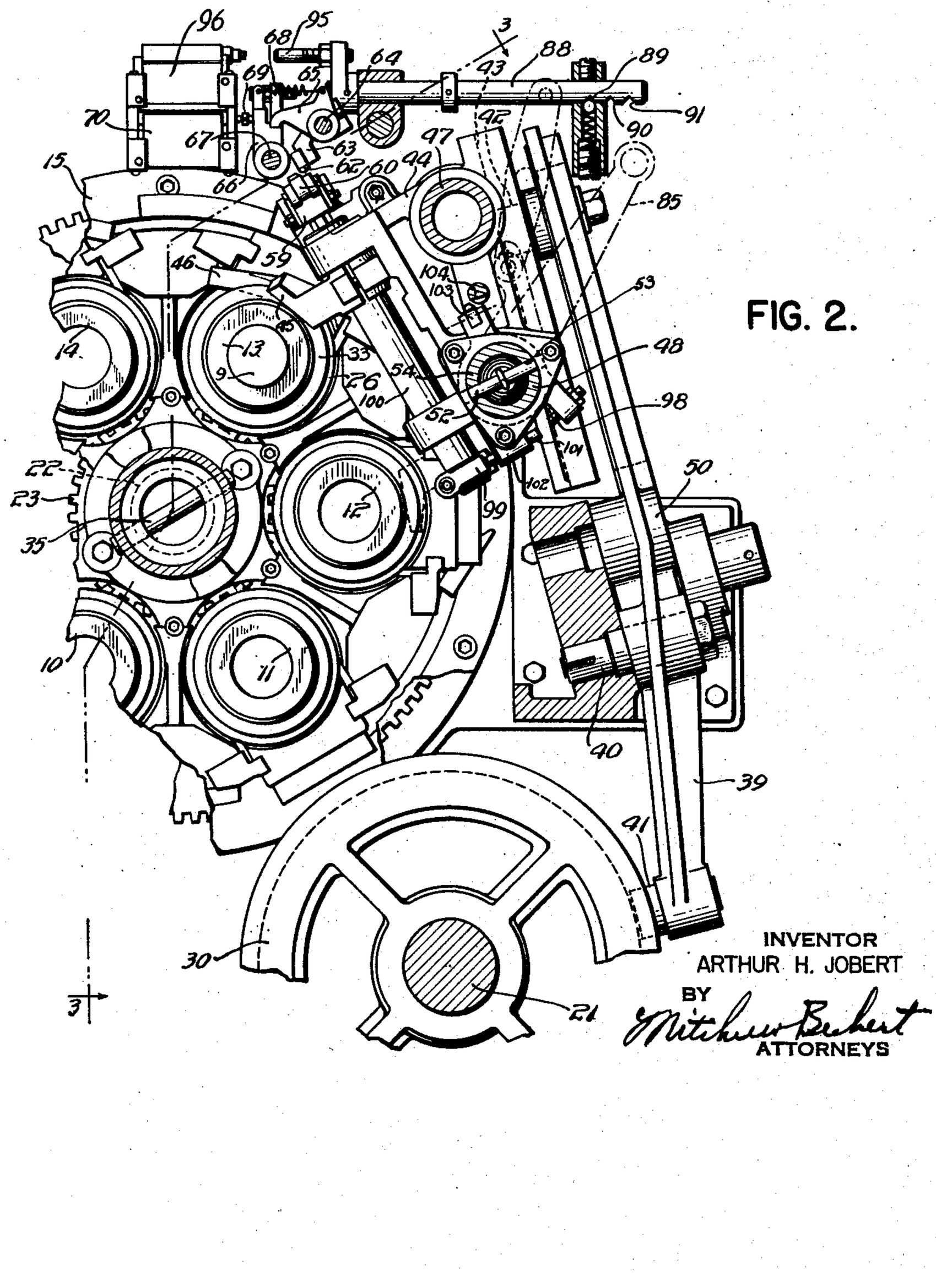


FIG. 2.

INVENTOR
ARTHUR H. JOBERT
BY
Mitchell Bechert
ATTORNEYS

Nov. 17, 1953 A. H. JOBERT 2,659,127

STOCK FEED MECHANISM FOR BAR MACHINES

Filed April 22, 1948 4 Sheets-Sheet 2

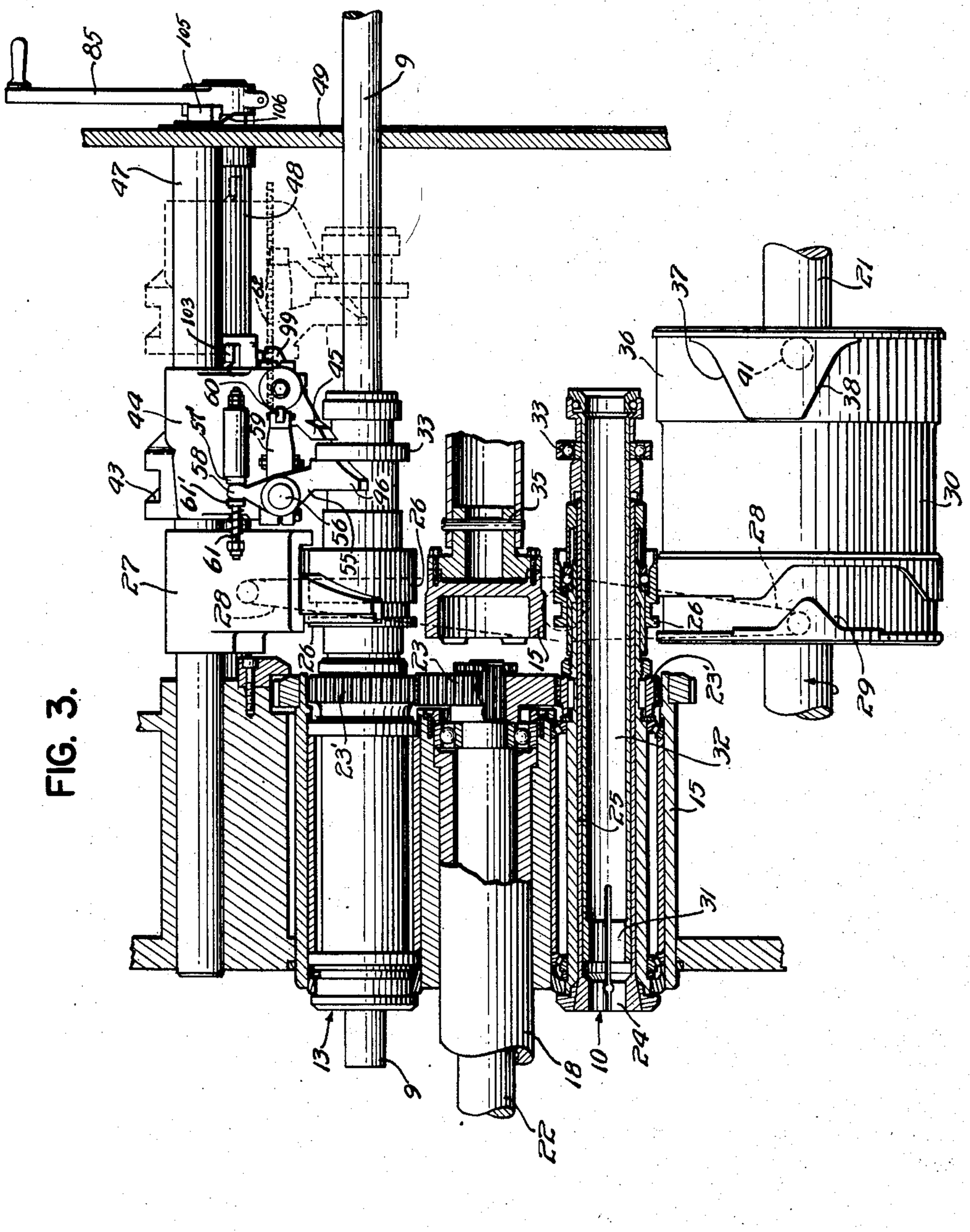


FIG. 3.

INVENTOR
ARTHUR H. JOBERT
BY Mitchell Bechert
ATTORNEYS

Nov. 17, 1953 A. H. JOBERT 2,659,127

STOCK FEED MECHANISM FOR BAR MACHINES

Filed April 22, 1948 4 Sheets-Sheet 3

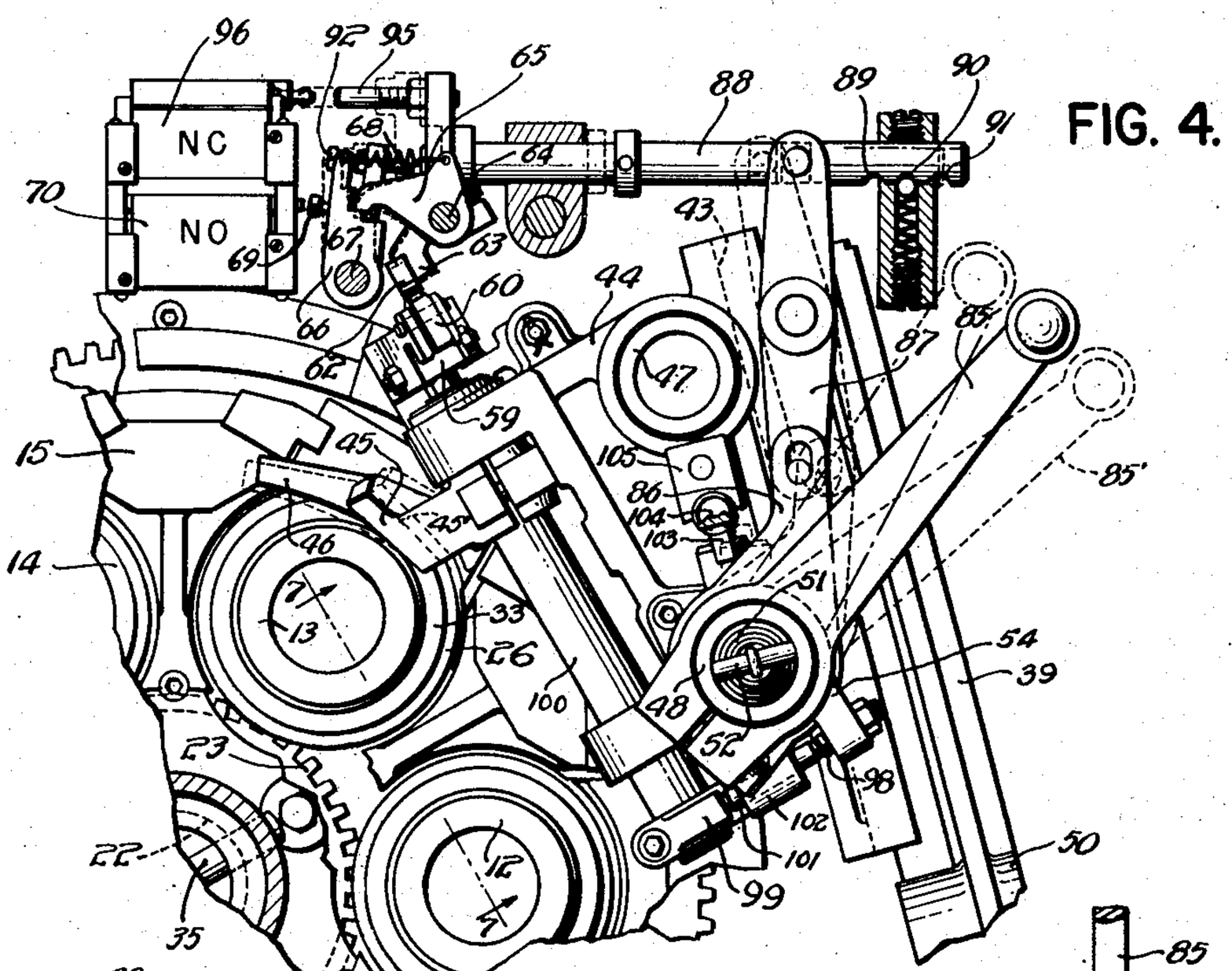


FIG. 4.

FIG. 5.

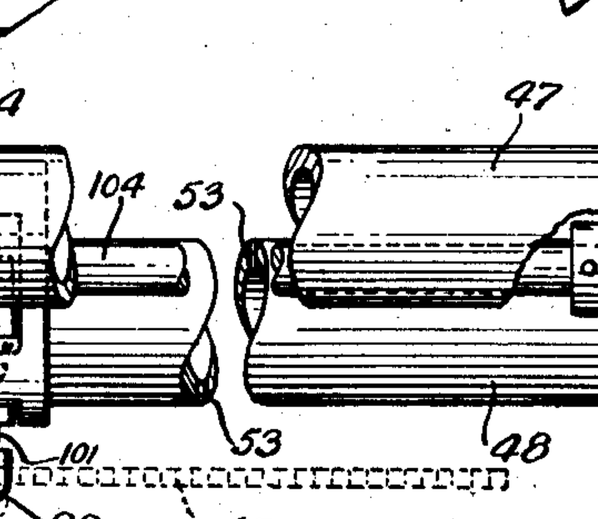


FIG. 6.

INVENTOR
ARTHUR H. JOBERT
BY
Mitchell Beckert
ATTORNEYS

Nov. 17, 1953 A. H. JOBERT 2,659,127

STOCK FEED MECHANISM FOR BAR MACHINES

Filed April 22, 1948 4 Sheets-Sheet 4

FIG. 7.

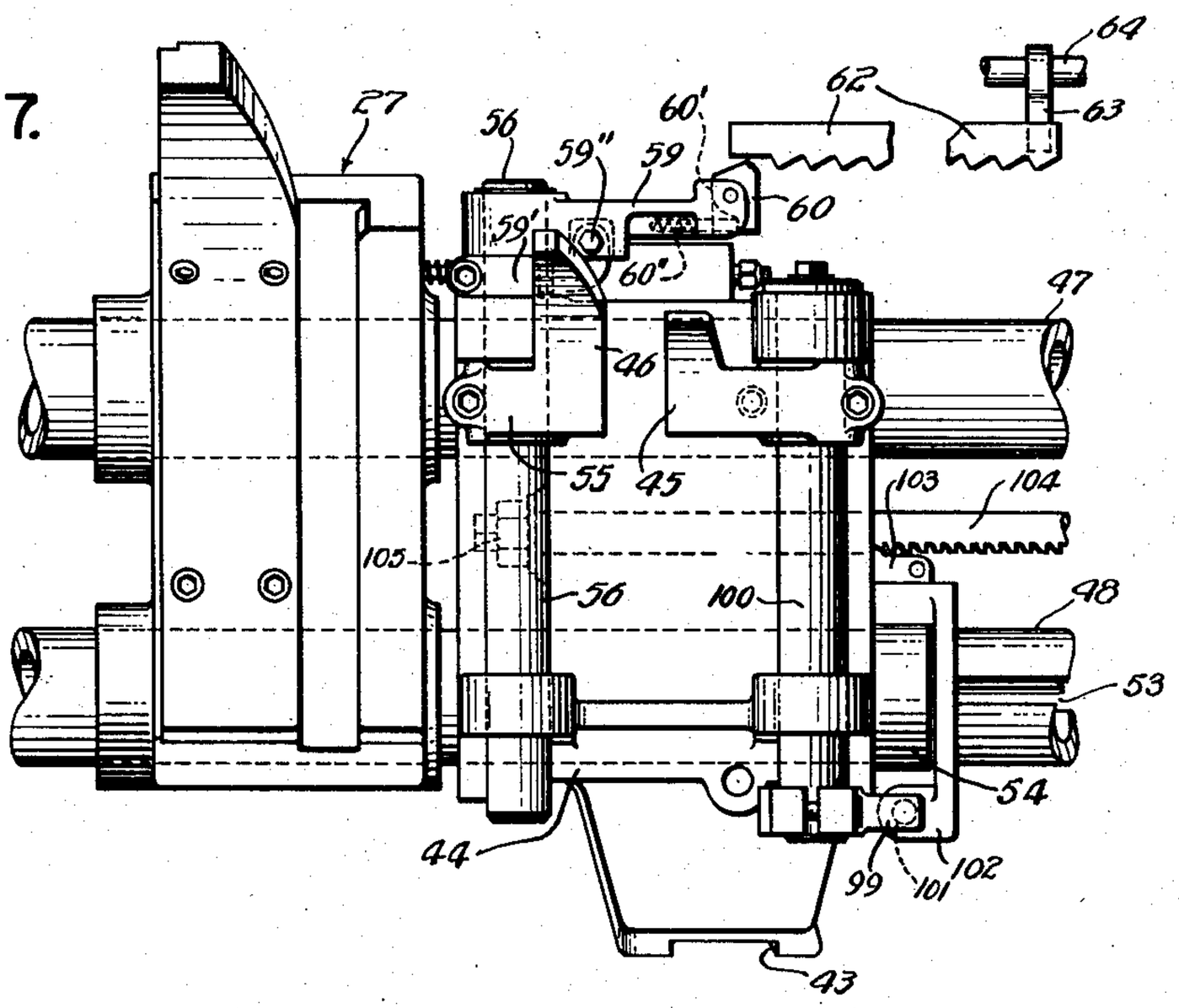
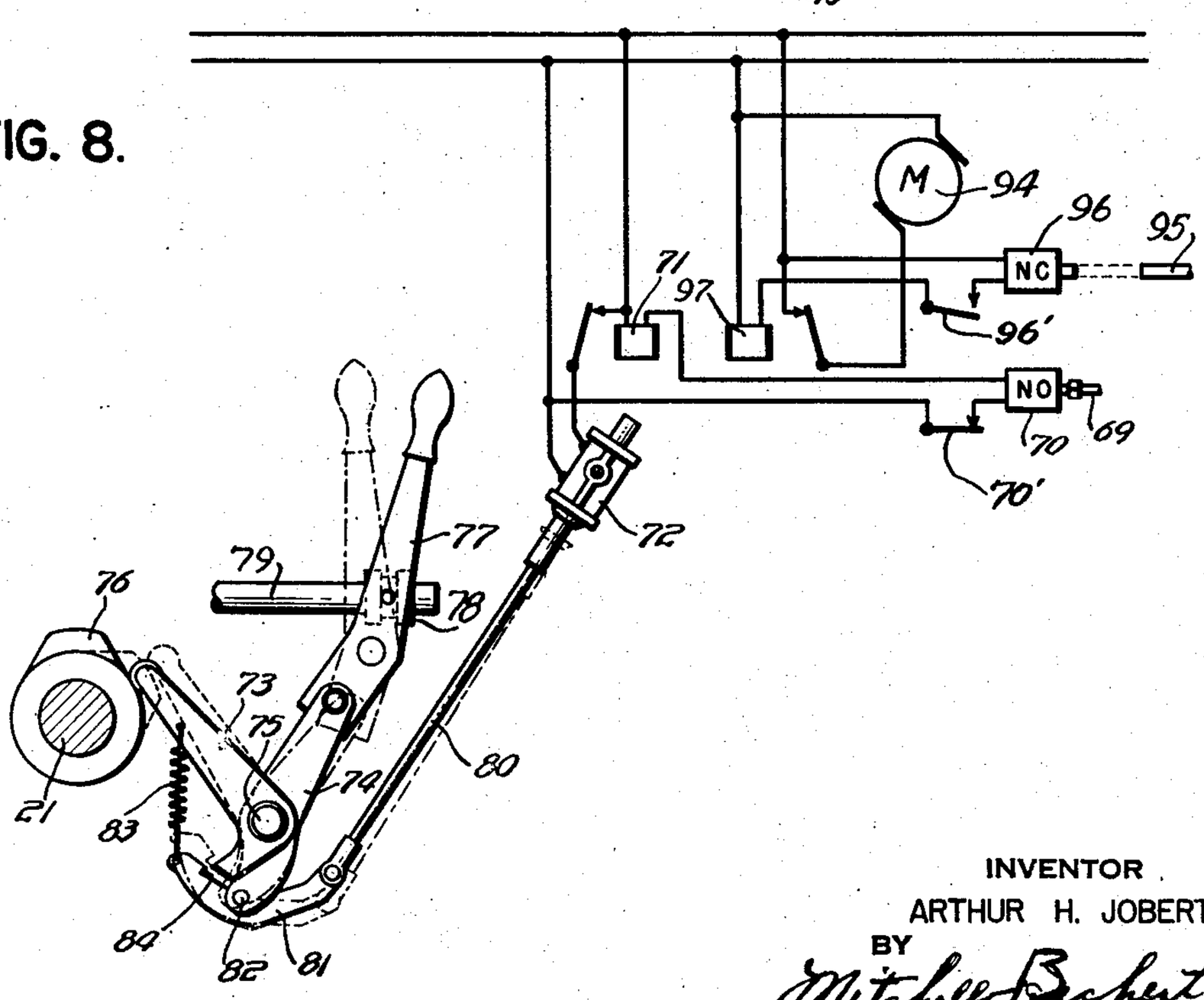


FIG. 8.



INVENTOR
ARTHUR H. JOBERT
BY
Mitchell Bachert
ATTORNEYS

Patented Nov. 17, 1953 2,659,127

UNITED STATES PATENT OFFICE

2,659,127

STOCK FEED MECHANISM FOR BAR MACHINES

Arthur H. Jobert, New Britain, Conn., assignor to The New Britain Machine Company, New Britain, Conn., a corporation of Connecticut

Application April 22, 1948, Serial No. 22,655

9 Claims. (Cl. 29—62)

1

My invention relates to automatic rotating machines, such as automatic screw machines, and in particular to a stock-feeding mechanism therefor.

It is an object of the invention to provide an improved machine of the character indicated.

It is another object to provide an improved feed mechanism for a machine of the character indicated.

It is a further object to provide an improved means for automatically shutting down a part of the machine when automatically fed stock has been consumed to a point beyond which no further use may be made of the piece being fed.

It is an additional object to provide an improved automatic stop mechanism for a machine with an adjustable feed, wherein feed adjustments may be made without in any way touching or affecting the stop mechanism.

It is also an object to provide an improved feed shut-off mechanism in an indexing machine of the character indicated, wherein the feed will not be shut off until the last usable section of a piece of stock has been fully worked and until the station which need stock replenishment has been indexed into a stock-feed position.

It is a still further object to provide an improved stock-feeding and restocking mechanism that may reduce the number of pieces rejectable for having been insufficiently fed.

It is a general object to meet the above objects with a mechanism that is completely automatic, that requires a minimum of manual adjustments and which with certain additional elements may provide for a simplified setting up and restocking of the machine.

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 side elevation of a machine incorporating features of the invention;

Fig. 2 is an enlarged fragmentary sectional view taken substantially in the plane 2—2 of Fig. 1;

Fig. 3 is a sectional view taken more or less along the line 3—3 of Fig. 2;

Fig. 4 is an enlarged fragmentary view in elevation, taken from the rear end of the machine of Fig. 1, looking forward, and omitting certain frame parts;

Fig. 5 is an enlarged fragmentary detail of a

2

portion of Fig. 3, with the parts shown in a different relationship;

Fig. 6 is a right-end view of parts of Fig. 5;

Fig. 7 is a view of the underside of the feed-slide means of Fig. 4, as seen from the plane 7—7 of Fig. 4; and

Fig. 8 is a schematic showing illustrating certain features of the automatic operation of my machine.

Briefly stated, my invention contemplates an improved stock-feed mechanism for a machine of the character indicated. The feed mechanism may employ conventional feed-cam and feed-finger means, but I interpose novel means responsive to failure of the feed-finger means to maintain grasping contact with the stock which is being fed; upon disengagement of the feed-finger means from the stock, the feed means may be effectively disabled. In the indexing machine in connection with which a preferred form is to be disclosed, this disabling is arranged to occur after the last usable piece of stock has been completely worked (i. e. after cut-off) and when the collet or chuck containing the useless piece of stock is positioned for stock feeding. In addition to such automatic operation, the stock-feed mechanism may also be disabled at will, if desired.

Referring to the drawings, my invention is shown in application to a multiple-station indexing machine which may be an automatic bar machine. The machine is shown to include a plurality of spindles 10—11—12—13—14 revolubly supported in an indexible spindle carrier 15 within the case 16 at the rear end of the machine. The machine may include a number of forming slides (not shown) for forming and cut-off operations when the spindles 10 through 14 are at the various indexed stations of the machine. For end-working operations tools may be mounted at various positions on a slide 17 reciprocable on an arbor 18 carried by the spindle carrier 15 and case 19. A stock stop 20 may be located opposite one of the index stations for arresting the feed of stock at that station; in the form shown, the stock feed-out station is that occupied by spindle 13. Driving power for the spindles and for a main camshaft 21 may be provided within the power case 19 at the right end of the machine; in the form shown, a drive shaft 22 passing through the arbor 18 transmits power to a center gear 23 meshing with a plurality of spindle-drive gears 23′ at the rear end of the spindles.

Each spindle may include a collet 24 of the so-called draw-back type wherein clamping forces are exerted on stock 9 by drawing back a

collet-actuating tube 25. The collets 24 may be conventionally actuated by means of grooved spools 26 which at the stock-feeding station may be engaged by a chucking or collet-actuating slide 27 having a rocker-arm follower 28 to ride in the chucking slot 29 of a main cam drum 30 on the camshaft 21. The camshaft 21 may be rotated once for each indexed position of the spindle carrier, so that a chucking operation may take place for each indexed operation of the spindle carrier.

For stock-feeding purposes, I employ feed-finger means 31 at the forward end of a feed tube 32 within each collet, and the finger portion 31 thereof is preferably as far forward as practicable. Feeding and withdrawing thrusts may be applied to the feed tube 32 at the outer ring 33 of an anti-friction thrust bearing carried at the rear end of the feed tube. In the form shown, stock 9 is supplied to the various feed tubes 32 for all the spindles from a stock-reel mechanism 34 which is indexible with the spindle carrier, as by connection to the spindle carrier by means of a pin 35 (Fig. 3). The stock reel and various automatic features thereof may be as disclosed in my Patent No. 2,320,039, issued May 25, 1943.

Stock-feeding forces may be derived from the cam drum 30, as by a second profile 36 having a rise 37 timed to cause retracting displacement of the feed fingers 31 just prior to an opening of the collet 13; the cam profile 36 may also include a feeding surface 38 timed for effectiveness while the collet jaws 24 are open. This feed motion may be translated from cam drum 30 by the rocking of a feed lever 39 pivoted, as at 40, on the frame of the machine and including a follower roll 41 to engage the said profile 36. The upper part of the arm 39 may carry a second roll 42 for engagement with a slot 43 in feed-slide means 44, and shoe means 45—46 carried by the feed-slide means 44 may engage opposite sides of the thrust ring 33.

The feed-slide means 44 is shown guided by twin arbors 47—48 which may be anchored at both ends in the frame of the machine and which in the form shown extend to the back plate 49 of the machine; the arbors 47—48 are also shown slidably supporting the chucking or collet-actuating slide 27. A tension spring 51 may constantly urge the feed-slide means 44 in a feeding direction so as to force the follower roll 41 always to ride against the profile 36 of the cam 30; in the form shown, spring 51 is encased within arbor 48, anchored at the forward end to a fixed part (not shown) of the machine, and held at the other end to a pin 52 carried by a part 54 of the feed-slide means 44. Pin 52, and with it the feed-slide means 44, may be permitted longitudinal movement by means of longitudinal slot openings 53 in arbor 48.

The roll 42 is preferably adjustably securable along the length of the upper part of lever 39, as in a slot 39', so that the same feed profile 36 may provide adjustable feeding displacements for the slide and, hence, for the stock. For further adjustment, the lever 39 may incorporate a second fulcrum boss 50 to receive the pin 40. To assure that the feed fingers 31 may always be as far forward as possible at the end of a feed stroke, no matter what the adjusted position of the roll 42 or of pin 40, the slots 39'—43 may be designed for alignment with each other in the fully fed position, as will be clear.

In accordance with the invention, I provide a

means for automatically shutting down certain parts of the machine including the stock-feed mechanism, and preferably such other functions as spindle-carrier indexing, collet operation, and the like as may be controlled from the main camshaft 21, whenever the stock 9 within any particular spindle has been consumed to a point beyond which it is no longer considered useful; the shut-down means may be effective wholly at the feed-out station—that is, while a given spindle is at the feed-out station, my mechanism may not only detect a shortage of stock in the said spindle but also shut down the camshaft soon enough so that new stock may be loaded into the said spindle without the need to wait for a succession of indexing operations, as has previously been the case. As an indication of this exhausted-stock condition, I employ means responsive to a disengagment of the feed-finger means 31 from a piece of stock 9 that is too short; such means may include a resiliently opposed lost-motion connection between the feed-slide means 44 and the feed-finger means 31, the connection being stressed for one of the strokes (feed or drawback) of the feed-slide means 44. If there is sufficient stock 9 at the feed-out station, the frictional engagement of feed-finger means 31 with the stock may be as great as to compel a take-up of the lost motion before said one stroke can be effective, but if there is insufficient stock, the lost-motion may not take place during said one stroke, and means responsive to the placement of the lost-motion connection during said one stroke may initiate the shut-down functions.

In the form shown, the lost-motion connection is arranged to be effective during the drawback stroke, and the shutdown functions may be initiated when or after the feed fingers 31 have slipped off the back end of a piece of stock 9 that is too short for further use. The lost-motion connection may include the drawback shoe 46, which may be formed at the end of an arm 55 pivotally supported on a rod or shaft 56 journalled in the feed slide 44. The arm 55 represents a lost-motion element between the feed slide 44 and the feed fingers 31, the lost motion being shown as an angular lost motion, as illustrated in Fig. 5 in the displacement between the solid-line and dot-dash-line shapes shown. Resilient means may be employed to urge the arm 55 to a given limit of the lost motion, and in the form shown a spring 57, which surrounds a shouldered rod 57' mounted within a part of the housing of the feed slide 44, normally urges a part 58 on arm 55 counterclockwise (in the sense of Fig. 5). For each feed of stock, the feed shoe 45 is solidly backed by abutment at 45'' with the feed slide 44, so that upon abutment of shoe 45 with the thrust ring 33, there may be positive engagement between the feed slide 44 and the feed fingers 31. For each drawback stroke, and as long as a sufficient length of usable stock remains, the feed fingers 31 will be in tight dragging relation with the stock so as to rock the arm 55 clockwise in a compression of spring 57 and into a firm abutment, as by contact of abutment surfaces 55' (on arm 55) and 44' (on feed slide 44), with the shoe 46 assuming the dot-dash position of Fig. 5. If during the drawback stroke the feed fingers 31 of a particular feed tube 32 should slip off the end of the stock, the force of spring 57 is preferably sufficient to displace the shoe 46 through its lost-motion travel to take up the solid-line po-

sition of Fig. 5, there being relatively little resistance then offered by the thrust ring 33.

To initiate the shut-down functions in the form shown, a second arm 59 is clamped to the pivot shaft 56 for lost-motion rotation with the arm 55, and a pawl 60 at the end of arm 59 is poised to trip a declutching mechanism for the main camshaft 21 whenever the arms 55—59 are in the solid-line positions of Fig. 5 during a drawback stroke. If there is usable stock 9 still to be fed, the drawback stroke may cause the pawl 60 of arm 59 to assume a displaced position out of possible engagement with the tripping mechanism, so that no declutching of the main camshaft need then result, as will be understood.

In the form shown, the tripping mechanism to be actuated by the pawl 60 on the arm 59 includes a longitudinally extending rack 62 supported by transverse arms, such as the arm 63, for pivoting about a longitudinal shaft 64. A latch-trip arm 65 may also be carried by the shaft 64, for dogging engagement with a latch member 66, which may be pivotally mounted on a longitudinally extending pivot axis 67. A tension spring 68 between latch members 65—66 may serve to hold the latched position. When latched, as shown in Fig. 2, an abutment 69 on the latch member 66 may press the actuating button of a normally open electric switch 70 so as to hold the contacts thereof closed and to complete a circuit for closing a relay 71, which in turn may control the actuation of a solenoid 72 (Fig. 8). The pawl 60 is preferably resiliently urged against an abutment 60′ for assumption of a normal position (Fig. 7), so that positive coaction between pawl 60 and the disabling rack or bar 62 is possible only during a drawback stroke; to prevent possible actuation of rack 62 during a feeding stroke, the spring 68 holding latch members 65—66 together is preferably stronger than spring 60′′ for pawl 60, so that pawl 60 may merely ratchet or ride on rack 62 during a feed stroke, as will be understood. It will be clear that, as long as there remains sufficient stock to be fed, the trip arm with its pawl 60 will be thrust aside (to the extent of the lost motion in the mounting of arm 55) with each drawback actuation of the feed slide 44. This action will mean that the pawl 60 may fail to engage the rack 62 and that the solenoid 72 may remain energized as long as there is usable stock 9 in the spindle at the stock feed-out station.

If desired, accurate alignment of the pawl 60 with rack 62 may be assured for the stated eventuality by providing for angular adjustment of the arm 59 on its pivot shaft 56. In the form shown (see Fig. 7), a collar 59′ is anchored to shaft 56, and an offset portion or lug on collar 59′ is adjustably engaged by screws 59′′ carried by arm 59, thus angularly orienting the arm 59 with respect to collar 59′ and with respect to the drawback shoe 56, as will be clear.

When deenergized, the solenoid 72 may form part of a shut-down mechanism described in the above-mentioned patent for disengaging the main-camshaft clutch (not shown) and also, if desired, for applying braking means (not shown) to stop the main camshaft when the collet is open and ready to receive a new bar of stock. This shut-down mechanism is shown to include two arms 73—74 pivoted at 75 and effectively disconnected as long as the solenoid 72 is energized. The arm 73 may follow a tripping cam 76 on the main camshaft 21, and the arm 74 may

be in actuating relation with a rocker arm 77 in engagement with a spool 78 for shifting a clutch throw-out rod 79 for the main-camshaft clutch. In the form shown, the armature of solenoid 72 is linked by a rod 80 and by a latch rocker arm 81 to an extended part of the arm 73, as at the pivot 82; and, as indicated, as long as solenoid 72 remains energized, the motion of arm 73 in following the cam 76 may be purely wasted motion However, should the feed fingers 31 slip off the end of a piece of stock during a drawback operation, spring 57 may cause a quick shift in the position of the pawl 60 from its neutral position (shown in Figs. 2 and 3) to its tripping position (shown in Figs. 4 and 5) and, therefore, into tripping alignment with the rack 62. Continued drawback of the feed slide 44 may force the rack to ride upon the pawl 60 and thus to raise the trip arm 65 to the position of Fig. 4, for a release of the latch 66 and thus for an opening of the normally open switch 70. The relay 71 will be immediately deenergized so as to permit spring 83 to draw rocker arms 81—73 into latching engagement, as against the notch 84 on lever 81. Upon the next rise of the cam-follower arm 73 on the cam 76, the members 73—74—81 will be effectively a solid body so as to enforce a clutch-disengaging shift of the rocker arm 77 to the left (in the sense of Fig. 8).

It will be clear that by a proper setting of the timing cam 76 on the main camshaft 21 with relation to the collet-actuating profile 29 of the main cam 30, the feed mechanism (and for that matter all operations timed by the main camshaft 21) may be shut down while the collet (of the spindle at the feed-out station) is open, thus facilitating manual removal of the unusable stock and reloading with a new bar. It will further be seen that since the drawback surface 37 of the feed cam 36 occurs immediately prior to the collet-actuating function, the feed fingers 31 cannot slip off a piece of stock until the last usable part thereof has been completely worked at all spindle stations, including the cut-off station. No indexing need, therefore, be performed (manually or otherwise) for a reloading operation, and a minimum of time is consumed in reloading.

Before fully automatic operation of the machine is again possible, the latching members 65—66 must be reset, into a position to hold the switch 70 closed so as to disable the connection between trip arms 73—74. In the form shown, I provide for this resetting by means of a multipurpose manual-control arm or hand crank 85, which is shown accessible behind the rear plate 49 of the machine frame. The normal positioning of the control arm or hand crank 85 (i. e. for automatic operation) may be that shown in dot-dash outlines in Fig. 2, and to condition the machine for restocking an empty spindle, such as the spindle 13, the arm 85 may be shifted to the dotted position 85′ of Fig. 4. When shifted to the position 85′ the arm 85 may, through a crank 86 and rocker arm 87, shift a control rod 88 to the third (91) of three detents 89—90—91, so as to engage and carry an adjustable abutment screw 92 on an upwardly projecting portion of lever 66, thus shifting the latch arm 66 counterclockwise to permit arm 65 resiliently to reset the latch. It will be understood that when relatched in this manner, the abutment 69 on latch arm 66 may operably engage the electric switch 70 to reenergize the solenoid 72 and thus to make

possible reengagement (as by manual means 77) of the clutch for the main camshaft 21.

It has been noted that the arrangement of the tripping bar or rack 62 may be such that the feed means may be effectively disabled should the feed fingers become disengaged from the stock during any part of the drawback stroke. The bar 62 is preferably at least as long as the maximum feed stroke that may be called for by adjustment of lever 39 and roll 42. The bar 62 may thus be considered as a disabling means poised to operate whenever the feed fingers run off the stock, regardless of the adjusted feed stroke. Moreover, the fact of adjusting the length of the feed stroke need have no effect upon the readiness of the disabling means to operate when there is no longer a feeding engagement with the stock.

It has been indicated that the control crank 85 may perform a number of functions and that, in the form shown, it may have three positions (see Fig. 4), each of which may be retained by one of the detents 89—90—91. One of these positions, namely, that shown in Fig. 2, may be termed the normal position, in which fully automatic operation of the machine may proceed. A second position is shown in solid lines in Fig. 4 and may be termed the set-up or intermediate position, to be used when checking the setting of tools or for running the machine with a semi-automatic operation, as when feeding stock in one spindle only and stopping the machine after each index to check sizes, when setting up a new job or resetting tools after a smash up or other tool disturbance. The third and other extreme position 85′ of the hand crank 85 may be termed the restocking position (see Figs. 4 and 6).

When restocking, and particularly when manually feeding a new piece of stock into the feed fingers 31 for a particular spindle, it may be desirable that the drive to the spindles be disengaged. In the form shown, this function may be accomplished by deenergizing the main motor 94 for the machine whenever the hand control crank 85 is in the restocking position 85′ (Fig. 4). For this purpose, the latch-resetting slide rod 88 may carry an adjustable abutment screw 95 operatively to engage a second electric switch 96, which may be of the normally closed variety. Thus, for the hand-crank position 85′, switch 96 may be open so as to drop out the relay 97 for the main motor 94 and thus to shut down the drive to the spindles. After the new piece of stock has been loaded and the machine is again ready to run, it will be understood that by cranking the handle 85 into the normal position (Fig. 2), switch 96 may return to its normally closed position. A manually operated switch 96′ in series with switch 96 may be used to start the motor 94 and the spindles, while the latch means 65—66, having been reset, is left ready to initiate another shut-down operation when the stock 9 in some other spindle may become exhausted.

In bumping stock, as during a manual restocking operation, the feed tube 32 should be bodily displaceable for a substantial part of the length of a spindle, so that the new piece of stock and the feed tube 32 may be rammed forward against a forward abutment in the spindle. In the form shown, this forward abutment occurs upon thrust ring 33 striking the drawback shoe 46, and upon take-up of the lost-motion in rocker arm 55. This sudden abutment may open the feed fingers 31 to permit the stock to extend forward thereof, and the bumping out may have to be repeated several times over and until the stock

extends to the stock stop 20. The way may be cleared for such extended travel of the feed tube 30, as for bumping-out operations, by a lifting of the feed shoe 45 into the dotted position 45′ of Fig. 4. This lifting of the shoe 45 may be accomplished as the handle 85 is shifted into the restocking position 85′ by positioning an abutment 98 on the feed-slide part 54 to operate a crank 99 on a shaft 100, the feed shoe 45 being clamped to the shaft 100. In the form shown, the crank 99 is actuated by the abutment 98 through a slide pin 101 which may move in a guide boss 102 formed in or carried by the frame of the feed-slide means 44. The part 54 will be recalled as the collar to which the pin 52 is secured; and, since the pin 52 is guided by the longitudinal slots 53 in the arbor 48, a rotation of arbor 48 will be understood to effect rotation of the collar or slide part 54, whenever the handle 85 is actuated.

Under certain circumstances, as in the event of a breakage of the stock-feed spring 51, the forward or feed motion of slide 44 may cease before the full-forward position is reached. The ring 33 of the feed tube 32 might then catch and ride under the drawback shoe 46 of the arm 55, so as to cause a counterclockwise rotation of arm 55 (in the sense of Figs. 3 and 5). To anticipate this relatively remote contingency, means may be provided normally to urge arm 55 clockwise, with its part 56 against the shouldered part of rod 57′. In the form shown, this function is accomplished by means of another spring 61 on rod 57′, the spring 61 being compressed between a stop nut and a slidable washer 61′. Should there then be an obstruction, it will be understood that spring 61 may serve to return the shoe 46 to its normal position when the obstruction has been cleared. The spring 61 may also serve usefully during a bumping-out operation, when it will be appreciated that the impact of ring 33 against the drawback shoe 46 might (in the absence of spring 61) cause the shoe 46 to rebound in a counterclockwise direction and, possibly, to ride over ring 33; clearly, spring 61 may assure avoidance of this contingency.

In checking the setting of tools, as when setting up the machine or as after a crack-up in which some tools may have been damaged or dislocated, it may be desirable to operate the machine semi-automatically and to render the stock-feed function inoperative in all spindle positions but one. For such eventualities, I provide the intermediate position (solid outlines of Fig. 4) of the control handle 85. In this intermediate position, I employ a one-way engaging clutch mechanism whereby the feed-slide means 44 may be held in a substantially drawn back position. The one-way clutching function may be effected by a pawl 103 and ratchet 104, the pawl being carried by the collar member at 54, and the ratch being in the form of a rack extending longitudinally to the back frame plate 49. The rack 104 may be secured to the back plate 49 or, as in the form shown, it may pass through the plate 49 and carry an enlarged head 105 for resiliently urged abutment with plate 49.

It will be seen that in the intermediate position of control handle 85, the collar member 54 may be shifted to align pawl 103 with the ratchet rack 104 (see Fig. 4), and it will be further appreciated that if the slide means 44 is pulled back against the tension of spring 51, the ratchet mechanism may hold this retracted position. If desired, the forward end of the ratchet bar 104

may carry a further abutment such as a washer held by a nut 105, and the ratchet bar 104 may thus serve to provide a forward limiting abutment means for limiting the forward travel of the feed slide 44. If the feed slide 44 is being held retracted by the ratchet mechanism, it will be clear that a mere shifting of the control handle 85 to either of its extreme positions may release the ratchet and allow spring 51 to carry the slide 44 forward either to the limiting abutment afforded by the nut 105 or to some position determined by the position of cam-follower roll 41 on the feed cam 36.

In a semi-automatic operation, it may be desirable to have the machine shut down the camshaft 21 (and, hence, all operations timed thereby) for each rotation of the camshaft 21. Such semi-automatic operation may be effected by a manual opening of a switch 70' in series with the normally-open switch 70 and with the solenoid 72. Thus, with switch 70' closed and with hand crank 85 in its intermediate position, the stock-feed functions may be disabled (slide 44 held in drawn-back position by pawl 103) while waiting for the spindle carrier 15 to index around to the desired position, whereupon switch 70' may be opened to shut down camshaft 21 (at the effective position of cam 76). In such case, the spindles will continue to rotate, and by throwing in the camshaft-clutch lever 77 the camshaft may again be started; however, as long as switch 70' is open, the camshaft will operate only one revolution for each clutching operation of lever 77. After adjustments are made, the operator may move lever 85 to its normal or upper position, and the feed tubes 32 which had been effectively disabled will be automatically picked up again by the drawback shoe 55 and by the feed shoe 45 as the tubes are automatically indexed to the feeding station.

If new stock has just been loaded into the machine or if there has been a semi-automatic operation of the machine, it may be that the spindles will have been rotating while the collet jaws have been open at the feed-out station. In such event, the stock 9 will have been loosely held in the collet for a short period of time, and the stock may "walk" backward a small amount from the desired fed-out position. If the collet jaws should then be clamped, and if the machine should proceed through a full cycle of indexed automatic operation, at least one piece of stock may have been so short as to require rejection.

In order to avoid this sort of difficulty, I incorporate into the functions controlled by handle 85 means for assuring the application of a final incremental holding thrust as the handle 85 is returned into its normal position (Fig. 2). In the form shown, this additional movement is derived from a small cam surface 106 in the form of a wedge formed on an offset part of the boss 107 for the handle crank 85, and the cam or wedge 106 is positioned for operative engagement with the head 105 at the back end of the rack bar 104. In Fig. 6, it will be seen that for the normal position (solid lines) of control handle 85 the cam or wedge surface 106 is out of engagement with the head member 105. However, for the restocking position 85' of handle 85, the cam surface 106 will have so engaged the head 105 as to retract the rack 104 by an amount equal to the rise of the cam surface 106. This rise preferably takes effect prior to disengagement of feed shoe 45 from the ring 33 of the feed tube, in a movement of handle 85 from the normal position toward the restocking position. It will

be seen that the first function to occur as the control lever 85 is moved from the restocking position 85' is the movement of the feed shoe 45 from the dotted-line position 45' to reengage the ring 33 of the feed tube; continued motion of lever 85 causes cam surface 106 to release its coacting member 105, thus permitting stock-feed spring 51 to hold a newly fed bar against the stock stop 20 (against which the new bar has been bumped) through the feed shoe 45. This holding operation may take place after the spindles have been restarted and just before the collet jaws are closed, and the holding may be sufficient positively to urge the stock 9 against the stock stop 20, thus assuring good initial use of the newly loaded stock.

For purposes of simplifying the drawings and the description, I have shown and described my invention in application to a single-index type of machine wherein each spindle is indexed a single station for each operation. It will be understood, however, that the presently described form may be readily applied to multiple-index machines, such as those which perform duplicate operations simultaneously on two or more spindles and in which each index operation involves a spindle displacement of two or more stations. In the latter type of machine (i. e. a double-index machine), stock-feeding operations would take place simultaneously for two spindles, and in the form shown, the attachment of another feed shoe, such as the shoe 45, on the shaft 100 and in feeding alignment with the thrust ring 33 on spindle 12 would suffice. Similar simple modifications in the drawback and tripping mechanisms could be employed for application of the single feed-slide means 44 to a double-index machine, as will be clear.

It will be seen that I have described an ingenious mechanism for improving the efficiency of bar machines, particularly automatically indexed multiple-spindle bar machines. With the features provided by my invention there need be a minimum of time consumed in setting up the machine and in restocking a spindle in which the stock has been exhausted. My invention also provides assurance that stock will be consumed to the maximum extent possible. Simplicity of operation is assured by the employment of a multi-purpose single control means, with an incremental hold feature that may materially reduce the number of rejects due to insufficient feeding, following any interruption of automatic operation of the machine.

While I have described my invention in detail for the preferred form shown, it will be understood that modifications may be made within the scope of the invention as defined in the appended claims.

I claim:

1. In an automatic bar machine or the like, a frame, stock-chucking means, stock-feeding means including longitudinally reciprocable feed-slide means for feeding stock to said chucking means, longitudinally acting resilient means urging said feed slide means in a stock-feeding direction, cam means in driving relation with said feed-slide means against the action of said resilient means for retracting the same, holding means including a part engaging said frame and including one-way-engaging clutch means effectively engaging said feed-slide means against the action of said resilient means and independently of the instantaneous position of said cam means, manually operable means controlling the opera-

tion of said clutch means, and means including a cam effective upon a displacement of said manually operable means and before engagement of said clutch means to effect an incremental withdrawal of said feed-slide means, whereby in a position of clutch-engagement said feed-slide means may be held in an incrementally withdrawn position so that upon a return of said manually operable means to a position disengaging said clutch means said feed-slide means may be resiliently fed said incremental distance.

2. A machine according to claim 1, in which said clutch means includes a longitudinally extending member with a part to be engaged by said second-mentioned cam and with a part to be clutched to said feed-slide means.

3. In an automatic bar machine or the like, a spindle, drive means for said spindle, stock-chucking means carried by said spindle, stock-feeding means including a feed tube in said spindle and longitudinally reciprocable feed-slide means for feeding said feed tube, feed means connected in feeding relation with said feed-slide means, said feed-slide means including a yieldable abutment in driving relation with said feed tube in a retracting displacement of the same, spring means carried by said feed-slide means and opposing yieldable displacement of said abutment with a force less than the frictional grip of said feed tube on the stock but sufficient to move the said tube in the absence of a grip upon stock, a latch and tripping means for said latch, said tripping means including a longitudinally extending member interceptable by said abutment member in an unyielded position thereof and clearing said abutment member when said abutment member has been yieldably displaced, whereby upon interception of said longitudinally extending member by said yieldable abutment member said latch may be tripped, first disabling means for said feed means and positioned to effectively disable said feed means upon a tripping of said latch, second disabling means for said drive means, and a single manually operable resetting means for said latch, said manually operable means being manually movable in a first movement from a normal position to an abnormal position and actuating said second disabling means in such first movement, whereby said spindle may be stopped in response to such first movement, said manually operable means being manually movable in a second movement from said abnormal position to said normal position and being connected to reset said latch means during said second movement, whereby upon said second movement of said manual means the functions disabled by both said disabling means may be enabled.

4. In an automatic bar machine or the like, a spindle including a collet therein, feed-finger means for said spindle for feeding bar stock therein, longitudinally movable feed-slide means for said feed-finger means, cam means in controlling relation with said feedslide means and with said collet for operating said feed-slide means and said collet in timed relation, retractable abutment means carried by said feed-slide means and drivingly engageable with said feed-finger means in an extended position thereof, externally accessible manual actuating means for said retractable abutment means and including a longitudinally extending member, a longitudinally slidably keyed connection between said longitudinally extending member and said retractable abutment means, whereby said abutment

means may be retracted by said manual actuating member for a plurality of possible longitudinal positions of said feed-slide means, disabling means for said cam means, said disabling means being connected to said manual actuating means to effectively disable said cam means upon an actuation of said manual means which also retracts said retractable abutment means, said disabling means and said abutment means being also so connected to said manual actuating means that said abutment means is extended and said disabling means is rendered ineffective upon another operation of said manual actuating means.

5. In an automatic bar machine or the like, a spindle including a collet, feed-finger means for feeding stock to said collet, cam means for operating said collet and said feed-finger means in timed relation, longitudinally movable feed-slide means including a follower for said cam means, movable abutment means carried by said slide means and said feed-finger means and in a driving abutment relation between said slide means and said feed-finger means in a retracting displacement of said slide, resilient means carried by said slide means and urging said abutment means toward a first position for abutment with said feed-finger means, whereby if said feed-finger means engages stock for a retracting stroke of said slide said resilient means may be stressed through a lost motion represented by a movement of said abutment means to a second position, and whereby if said feed-finger means becomes disengaged from the end of the stock said resilient means may either prevent such lost motion in a retracting displacement of said slide means or will cause return of said abutment means to said first position immediately upon disengagement of said feed-finger means from the stock end, and longitudinally extending means positioned for interception by said abutment means when said abutment means is in said first position during a retraction of said slide, said last-defined means being connected to disable said cam means when intercepted and being positioned for no interception when said abutment means is in said second position during a retraction of said slide.

6. In an automatic bar machine or the like, a spindle including a collet, feed-finger means for said spindle for feeding bar stock therein, longitudinally movable feed-slide means for said feed-finger means, and a camshaft including cam means in controlling relation with said feed-slide means and with said collet for operating said feed-slide means and said collet in timed relation, an abutment member carried by said feed-slide means and in lost-motion relation therewith for thrusting engagement with said feed-finger means, resilient means carried by said feed-slide means and urging said member into a first given relation with said feed-slide means, said abutment member being driven against the action of said resilient means to a second relation with said feed-slide means upon thrusting against said feed-finger means when said feed-finger means is engaging a piece of stock, said resilient means being sufficiently strong to move said abutment means to said first relation when said feed-finger means becomes disengaged from a piece of stock, and longitudinally extending camshaft-disabling means responsive to the positioning of said abutment member in said second relation for disabling said camshaft when the position of said member reflects a disengagement

of said feed-finger means from the stock being fed, said longitudinally extending disabling means being poised for actuation upon a movement of said abutment member through such lost motion, whereby immediately upon feed-finger disengagement from the stock there may be an actuation of said disabling means.

7. A machine according to claim 6, in which said member includes a shoe to abut said feed-finger means and a crank positioned in accordance with the position of said shoe, and in which said last-defined means includes latch means positioned to be tripped upon assumption of a given angular position of said crank and upon a given displacement of said feed-slide means.

8. In an automatic bar machine or the like, an indexible spindle carrier, a plurality of spindles in said spindle carrier, collet means and a feed tube for each of said spindles for chucking and feeding bar stock therein, feed-slide means engageable with feed tubes successively indexed into a feed-out station for feeding the same at said station, cam means for actuating said collet means and said feed-slide means in timed relation at said station, a first abutment shoe carried by said feed-slide means for feeding abutment with a feed-tube at said station, a second abutment shoe carried by said feed-slide means for withdrawing abutment with said feed tube at said station, a lost-motion connection between one of said abutment shoes and said feed-slide means, means carried by said feed-slide means and urging said one shoe in the direction in which said one shoe is to be used for thrusting and with a force less than the frictional force of engagement of said feed-finger means with a

piece of stock, whereby said one shoe may be forcibly displaced through said lost motion for every movement of said feed-finger means in said direction as long as there is sufficient stock to be fed so that said shoe may be in one of two positions relatively to said feed-slide means depending upon whether said feed-finger means engages the stock, and longitudinally extending means poised for actuation immediately upon a movement of said shoe to the position representing no stock engagement, said last-defined means being connected to disable said cam means, whereby said cam means may be disabled while the empty spindle is at the feed-out station so as to permit restocking without delay at the feed-out station.

9. A machine according to claim 8, in which said lost-motion connection is between said second abutment shoe and said feed-slide means, whereby said cam means may be disabled after a withdrawal of said feed-finger means should said feed-finger means become disengaged from a piece of stock during such withdrawal.

ARTHUR H. JOBERT.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
580,539	Woodruff	Apr. 13, 1897
622,760	Davenport	Apr. 11, 1899
925,041	Seward	June 15, 1909
1,591,818	Hayden	July 6, 1926
1,779,529	Brophy	Oct. 28, 1930
2,055,435	Gridley et al.	Sept. 22, 1936
2,159,398	Montgomery et al.	May 23, 1939