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AUTOMATIC STOCK BAR FEED MECHANISM FOR AUTOMATIC METALWORKING MACHINES

Eugene S. Marlott, North Syracuse, N. Y., assignor to W. C. Lipe, Inc., Syracuse, N. Y., a corporation of New York

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15 Claims.

(CL. 140—120)

This invention relates to stock bar feeding mechanism for automatic machine tools or metal working machines, as lathes and automatic screw machines.

It has for its object a feed mechanism embodying a pressure operated plunger working in a cylinder or tube to push the stock bar through the passage of an automatic lathe to the tools thereof with means for momentarily dampening the starting impulse of the plunger, after it has been started or for overcoming the static inertia thereof, in order to prevent hammering of the bar against the stop of the metal working machine.

It also has for its object means for absorbing the shock of the bar against the stop, and thereby preventing rebound and hence displacement of the stock bar relatively to the tools of the screw machine.

It further has for its object a mounting for the tube by which, when the tube is shifted out of alignment with the passage of the metal working machine, the fluid pressure or air passing to the tube to actuate the plunger under the force of the air out of the tube, and also the remnant of the bar which may be left in the tube, and also for preventing the flow of air to the tube unless the tube is aligned with the stock bar passage of the machine.

The invention consists in the novel features and in the combination and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

Figure 1 is an elevation, partly in section, of a feed mechanism embodying this invention an automatic lathe, with parts omitted, being shown.

Figure 2 is an end elevation looking to the right in Figure 1.

Figure 3 is an enlarged sectional view on line 3—3, Figure 2.

Figure 4 is an enlarged view taken on line 4—4, Figure 1.

Figure 5 is a sectional view on line 5—5, Figure 4.

Figure 6 is an enlarged longitudinal sectional view through the feed tube and the plunger therein.

Figure 7 is an enlarged fragmentary sectional view through the stop of the screw machine.

Figure 8 is a sectional detail view illustrating the two-way valve in the conduit through which the air is supplied to the tube to actuate the plunger therein.

1 designates generally the machine tool as a lathe having a head 2 formed with a passage 4 through which the stock bar is fed to the tools, not shown, of the machine. 5 designates a table on which the tools or tool posts or holders are mounted.

6 designates the stop against which the stock bar is fed after each operation, it being understood that the bar is fed against the stop, and a portion thereof operated on by the tools, the machine or finished article cut off, and the bar again fed up against the stop, and that this operation is repeated until the stock bar is used up or too short to be used for an additional article.

The feed mechanism includes a tube 7 for receiving the stock bar and normally mounted in alignment with the passage 4, and a feed plunger 8 movable in the tube, the tube being closed or having a head 9 at its end remote from the end through which the stock bar 5 is fed, forming a cylinder for a pressure fluid, as compressed air.

The tube is mounted to swing or swivel into two radial positions for a purpose hereinafter described. The swivelling movement is preferably in a horizontal plane. The tube is carried by a collar or bracket 10 mounted to rotate or swivel about a stem 11 threading into the top of a housing 12. The stem 11 is threaded for the purpose of effecting a vertical adjustment of the tube, in order to align the tube in the horizontal plane of the passage 4, that is, in order to adjust the height of the tube 7.

13 designates a pressure chamber located within the housing or base 12, and connected, as through a pipe 14, to a suitable source of compressed air. The pressure chamber communicates through a valve controlled conduit 15 with a flexible pipe or hose 16 which communicates with the tube 7 through the head 9. 17 is a pressure gage communicating through a pipe 18 with the conduit 15 between the valve therein and the conduit 16, in order to indicate the pressure in the tube 7. The pressure chamber embodies a valve to regulate the pressure delivered to the conduit 15 and hence to the tube 7. The valve is operable to adjust the pressure by means, as a screw 13. The construction of the chamber 15 and its regulating valve per se forms no part of this invention. The chamber 15, conduit 15, pressure gage and connections are all grouped together within the housing 12. The overhanging end or portion of the tube between
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the bracket 10 and the machine 1 is supported to have a vertical adjustment. The overhanging portion is here shown as carried by a standard 21 at the upper end of which is carried a bracket 22 provided with a laterally extending slot 23 through which the tube 7 extends, the slot permitting radial shifting of the tube into and out of allignment with the passage 4. The bracket 22 is adjustable vertically to the standard, in order to adjust the height of the tube 7 by a nut 25. The tube is normally aligned with the passage 4 and is preferably locked in this position by a lock or latch 24 (see Figure 4). When it is desired to put a new stock bar in the tube, the latch 24 is released and the tube 7 swung out of the position shown in Figure 4 along the slot 23 into the broken line position (Figure 4). In order to prevent unlocking operation and the swinging of the tube 7 out of its normal position, when the valve in the pipe 15 is open, means is provided by which the lock 24 cannot be unlocked until the air behind the plunger 8 has been released, that is, until the valve in the conduit 16 is closed.

In the illustrated embodiment of my invention, the lock 24 is pivoted at 25 to the bracket 22 and swings it in its pivot from the full line position to the broken line position, but is held from being unlocked while the valve in the pipe 16 is open.

26 (Figure 5) designates the movable member of a two-way valve mounted in a casing 27, which casing is connected in the pipe 16. The valve member 28 is normally operated by a handle 29 mounted on the bracket 22 and connected through a flexible shaft 30 to the movable valve member. The handle 28 and the lock 24 are so formed that the handle prevents pivotal movement of the lock 24, when the handle is in its position occupied when the valve 28 is open, and permits shifting of the lock 24 out of locking position, when the handle 28 is operated to close the valve 28, the position of the handle 28, when the valve is open, being indicated in full lines (Figure 4), and when closed, in broken lines. As here shown, the hub 30 of the lock is provided with an arcuate cut-out 31, which receives the hub 32 of the handle 28 when the valve is in its closed position and also when the lock 24 is in its locking position, and the hub 32 of the handle 28 is provided with a similar cut-out 33 arranged to be brought into juxtaposition to the hub 28 when the handle 28 is turned to close the valve 28. Thus, the tube 7 is held locked in its normal position by reason of the cut-out 31 of its hub interlocking with the periphery of the hub of the handle 28. Upon turning of the handle 28 to close the valve 28, the cut-out 33 of the handle registers with the cut-out 31 so that the lock 24 can be then swung on its pivot out of locking position, and the tube shifted laterally out of allignment with the passage 4. When in this position, the handle is locked from being turned to open the valve until the latch 24 is returned to its locking position. It can not be turned to its locking position, until the tube 7 has also been returned to its normal position, because, as seen in Figure 4, the shifting of the lock 24 from the dotted line position to full line position can not be accomplished unless the tube 7 is returned to its normal position, because the tube when in its shifted position blocks the return movement of the lock 24.

The means for momentarily releasing the pressure against the plunger 8, after the plunger has been given a starting impulse or for dampening the movement of the plunger, after the static inertia has been overcome, is embodied in the plunger itself and comprises an inert weighted member 35 mounted on the plunger to have a forward and rearward movement, said member normally closing a by-pass from the pressure side of the plunger to the non-pressure side, and momentarily operating to open said by-pass.

As seen in Figure 6, the plunger 8 is shown as provided with a head 39 having an axial stem 31 along which the inert weighted member 35 is shiftable against the action of a light return spring 36. When the automatic machine has completed the one operation and cut off one article from the stock bar, the air pressure in the tube 7 behind the plunger 8 acts to push the plunger 8 forwardly and feed the stock bar. This sudden starting impulse causes the inert member 35 to shift to the left (Figure 6) and uncover the port 39 of the by-pass 40, which port opens through the periphery of the stem 37 so that momentarily the air is released from the pressure side of the plunger through the by-pass 40 and branches 41 therefrom into a clearance 42 between the periphery of the body of the plunger and the bore of the tube 7. The plunger at the head thereof is provided with a suitable packing 43 between it and the bore of the tube 7. Thus, immediately after the starting impulse is given to the plunger 8, the pressure is momentarily released or exhausted, and the feeding movement of the plunger damped. This greatly opposes the momentum of the plunger 8 and reduces the force with which the end of the stock bar strikes the stop 6. The plunger 8 also includes a rotating head 44 which thrusts against the end of the bar stock 5, this having a stem 45 suitably journalled in anti-friction bearings 46 in the body of the plunger 8.

Preferably, means is provided preventing re-binding of the stock bar, and this means is illustrated as embodied in the stop 6, or as applied to the stop 8. It consists of a yieldingly retrac-tile or spring-cushioned spindle 47 slidably mounted in a body or tube 48 which is applied to the opening in the stop 6 of the screw machine, the spindle 47 being in effect a plunger working in a bore in the body 48 against the action of an air dash pot formed in the body 48 and having a restricted outlet 49 which can be regulated by means of a valve, as a needle valve 51. This dash pot also has a comparatively large air inlet at 52 provided with a check valve 53 for preventing the outlet of the air through the inlet.

In operation, the spindle or plunger 47 is forced rearwardly by the stock bar when being fed by the plunger 8 and cushioned both by the spring 47 and by air escaping through the restricted outlet 50, and the retracting movement of the spindle 47 is limited by the end of the stock bar coming against the surface 46 at the end of the body or tube 48. The dash pot action not only cushions the blow of the stock bar but also prevents re-binding or re-action. During the machining operation, the end of the stock bar is against the stop 54, and when the machining operation is completed, and the finished end of the stock bar cut off, the spring returns the plunger 47 to its normal projecting position, shown in Figure 7, the check valve 53 opening and permitting a quick inlet of air to effect a quick return.
What I claim is:

1. In an automatic stock bar feed for automatic metal working machines, a feed tube closed at one end forming a cylinder, a push plunger movable in the tube, means for supplying a pressure fluid to the closed end of the tube behind the plunger to actuate the plunger to feed the bar, and means for momentarily exhausting the pressure from the pressure side of the plunger after the plunger has been given a starting impulse.

2. In an automatic stock bar feed for automatic metal working machines, a feed tube closed at one end forming a cylinder, a push plunger movable in the tube, means for supplying a pressure fluid to the closed end of the tube behind the plunger to actuate the plunger to feed the bar, and means for momentarily exhausting the pressure from the pressure side of the plunger after the plunger has been given a starting impulse, said means being embodied in the plunger.

3. In an automatic stock bar feed for automatic metal working machines, a feed tube, a push plunger movable in the tube, means for supplying a pressure fluid to the tube behind the plunger to actuate the same to feed the bar, the plunger being provided with a by-pass from the pressure side thereof to the other side, which pushes against the stock bar, an inert member carried by the plunger and normally closing said by-pass, said member having a shifting movement lengthwise of the plunger to open said by-pass under the starting impulse of the plunger by the air, and means for returning the inert member to its normal position, after the plunger is started.

4. In an automatic stock bar feed for automatic metal working machines, a feed tube, a push plunger movable in the tube, means for supplying a pressure fluid to the tube behind the plunger to actuate the same to feed the bar, the plunger having a stem on the pressure side thereof and a by-pass opening through the periphery of the stem and into the tube on the side of the plunger pushing against the bar, an inert member slidably mounted on the stem and normally closing said passage and being movable axially away from the plunger to uncover said passage under the starting impulse of the plunger by the pressure fluid, and means for returning the inert member to its normal position after the plunger is started.

5. The combination with an automatic metal working machine having a passage through which the stock bar is fed to the tools, and a stop for limiting the feeding movement; of an automatic stock bar feed mechanism including a tube normally alined with said passage and closed at one end providing a cylinder, a plunger movable in the tube, means for supplying a pressure fluid to the closed end of the tube for actuating the plunger to feed the bar against said stop, and means for preventing rebound of the bar away from the stop.

6. The combination with an automatic metal working machine having a passage through which the stock bar is fed to the tools, and a stop for limiting the feeding movement; of an automatic stock bar feed mechanism including a tube normally alined with said passage and closed at one end providing a cylinder, a plunger movable in the tube, means for supplying a pressure fluid to the closed end of the tube for actuating the plunger to feed the bar against said stop, means for momentarily exhausting the pressure from the
stop comprising a spring-retumed plunger for coacting with the stock bar, and an air dash pot in which the plunger works, the dash pot having an adjustable outlet valve, and being provided with a comparatively large inlet, and a check valve therein for preventing outlet of the air through the inlet.

12. In an automatic stock bar feed mechanism for automatic metal working machines having a passage for the stock bar, a feed tube normally 10 aligned with said passage, the tube being closed at its end remote from the end through which the stock bar is fed providing a cylinder, a plunger movable in the tube, and means for supplying a pressure fluid to the closed end of the tube for actuating the plunger, said tube being mounted to shift radially out of alinement with said passage for the insertion of the stock bar.

13. In an automatic stock bar feed mechanism for automatic metal working machines having a passage for the stock bar, a feed tube normally aligned with said passage, the tube being closed at its end remote from the end through which the stock bar is fed, providing a cylinder, a plunger movable in the tube, and means for supplying a pressure fluid to the closed end of the tube for actuating the plunger, said tube being mounted to shift radially out of alinement with said passage for permitting the insertion of the stock bar, a valve for controlling the flow of pressure fluid to the tube, means for opening and closing the valve and means controlled thereby for preventing shifting of the tube laterally out of normal position when the valve is open, and preventing opening of the valve when the tube is shifted out of its normal position.

14. In an automatic stock bar feed for automatic metal working machines having a passage for the stock bar, a feed tube normally aligned with said passage, the tube being closed at its end remote from the end through which the stock bar is fed, providing a cylinder, a plunger in the tube, means for supplying a pressure fluid to the closed end of the tube for actuating the plunger, said tube being mounted to shift radially out of alinement with said passage, a valve for controlling the flow of pressure fluid to the tube, manual means for opening and closing the valve, a lock for holding the tube in its normal position, the lock and the valve operated means having coacting parts operating to permit movement of the lock only when the valve is closed and to permit opening of the valve only when the lock is in locking position relative to the tube.

15. In an automatic stock bar feed for automatic metal working machines having a passage for the stock bar, a feed tube normally aligned with said passage, the tube being closed at its end remote from the end through which the stock bar is fed, providing a cylinder, a plunger in the tube, means for supplying a pressure fluid to the closed end of the tube for actuating the plunger, said tube being mounted to shift radially out of alinement with said passage, a valve for controlling the flow of pressure fluid to the tube, manual means for opening and closing the valve, a lock for holding the tube in its normal position, the lock and the valve operated means having coacting parts operating to permit movement of the lock only when the valve is closed and to permit opening of the valve only when the lock is in locking position relative to the tube, the tube and the lock coacting when the tube is shifted out of normal position to prevent shifting of the lock into locking position.

EUGENE S. MARIOTTE.