Feb. 19, 1952 O. VON ZELEWSKY 2,586,127

TAILSTOCK FOR MACHINE TOOLS

Filed April 18, 1950 2 SHEETS—SHEET 1

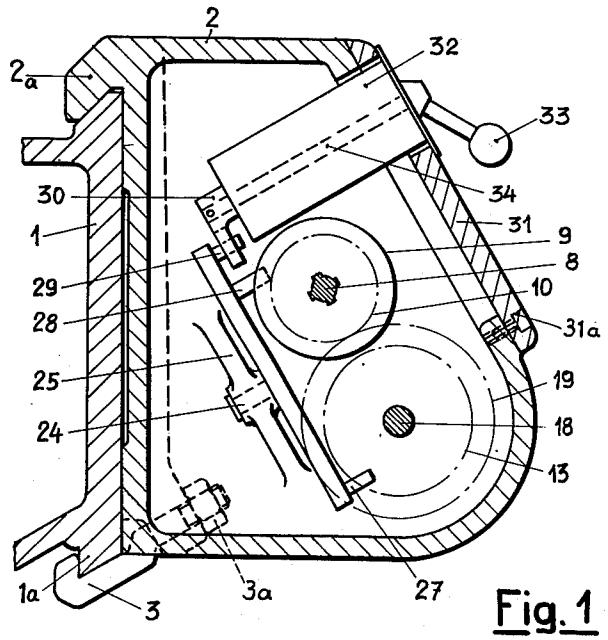



Fig. 1

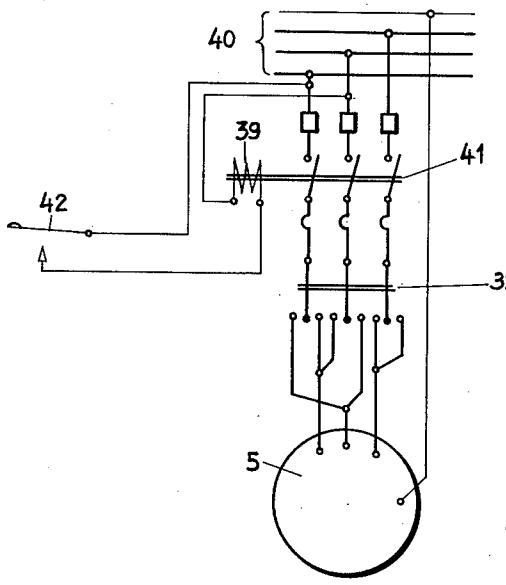



Fig. 2

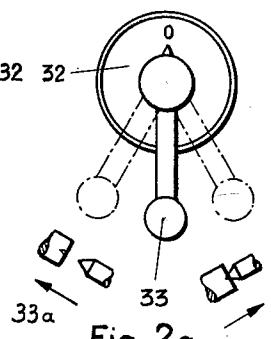



Fig. 2a

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Fig.3

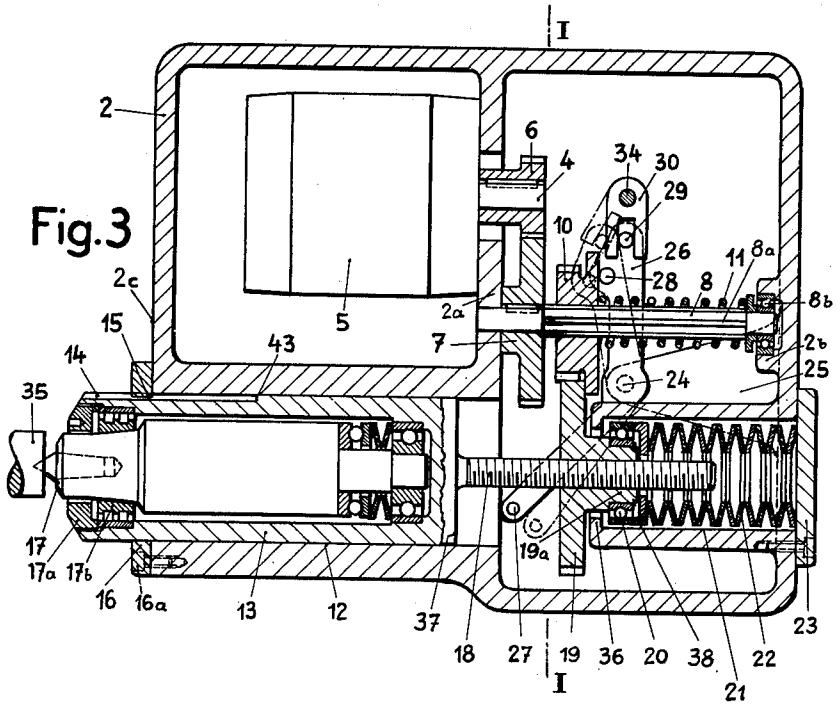
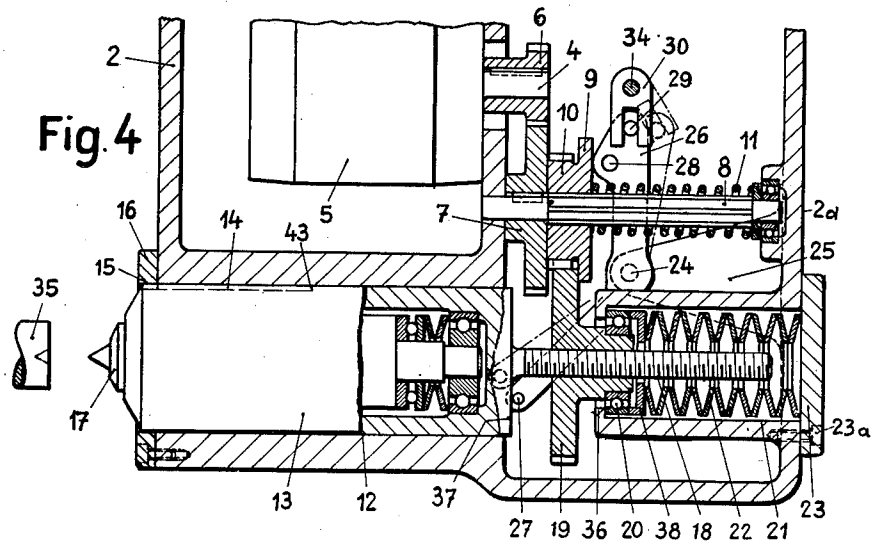



Fig.4




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Patented Feb. 19, 1952

2,586,127

# UNITED STATES PATENT OFFICE

2,586,127

## TAILSTOCK FOR MACHINE TOOLS

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Application April 18, 1950, Serial No. 156,539
In Switzerland November 30, 1949

3 Claims. (Cl. 82—31)

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This invention relates to lathes and similar machine tools, and refers more particularly to tailstocks of these machines which may be set in a variety of positions by means of an electrical motor drive.

An object of the present invention is to improve the construction and operation of prior art means holding and clamping a work piece while the machine tool is being operated.

Other objects of the present invention will become apparent in the course of the following specification.

The objects of the present invention may be realized through the provision of a tailstock, the positions of which may be set manually by operating a current-reversing switch, said switch being moved automatically and mechanically to its zero position after the clamping of the work piece when a predetermined pressure has been reached and during the procedure of removing the work piece after the device is moved to its rearward position; the work piece is held by resilient pressure while it is being turned.

The invention will appear more clearly from the following detailed description, when taken in connection with the accompanying drawings showing, by way of example, a preferred embodiment of the inventive idea.

In the drawings:

Figure 1 is a transverse section through a tailstock constructed in accordance with the principles of the present invention, along the line I—I of Figure 3;

Figure 2 is an electrical wiring diagram;

Figure 2*a* is a partial front view illustrating various positions of the switch-operating handle;

Figure 3 is a longitudinal, vertical section through the tailstock, and illustrates the tailstock in its forward, work-engaging position;

Figure 4 is similar to Figure 3, and shows the tailstock in its rearward, inoperative position.

The tailstock shown in Figures 1, 3 and 4 of the drawings includes a casing 2 having a flange 2*a* which is mounted upon a corresponding flange of a tool frame 1. The tailstock is slidable longitudinally upon the frame 1, and may be firmly clamped thereon by means of clamping bolts 3 which engage a downward flange 1*a* of the frame 1, and which may be tightened by nuts 3*a*.

An electrical motor 5 is mounted within the casing 2 and has a motor shaft 4 upon which a pinion 6 is keyed. A shaft 8, which carries a plurality of locking projections 8*a* extends through the casing 2, and is mounted at one end in an inner wall 2*a* of the casing 2. The opposite end

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of the shaft B is carried in ball bearings 8*b* which are mounted in support 2*b* constituting a part of the casing 2. A gear wheel 7 is firmly keyed upon the shaft 8 and meshes with the pinion 6.

Another gear wheel 10 is movable longitudinally upon the shaft 8, but is rotatable along with the shaft. The gear wheel 10 is provided with a projecting portion 9 and is engaged by one end of a coiled spring 11 which encloses the shaft 8. The opposite end of the spring 11 engages the bearing 8*b*.

The casing 2 has inner walls enclosing a chamber 12. A sleeve 13 is located within the chamber 12 and is provided with a longitudinal groove 14. As best shown in Figure 3, a portion of the sleeve 13 may extend out of the casing 2. A ring 16 encloses the sleeve 13 and is held upon the outer front surface 2*c* of the casing 2 by a screw 16*a*. The ring 16 has a projection 15 fitting in the groove 14 of the sleeve 13. Thus, the sleeve 13 is prevented from turning around and may reciprocate in the direction of its axis within the casing 2.

A work-engaging member 17 is carried by a disk 17*a* and a supporting element 17*b* located in the front end of the sleeve 13.

The work-engaging member 17 may be of any suitable known construction, and may be eccentrically mounted in the sleeve 13. The sleeve 13 may be provided with a number of grooves 14 and/or the ring 15 may be provided with a plurality of groove-engaging portions whereby the position of the eccentrically located, work-supporting member 17 may be conveniently varied.

The sleeve 13 has a bottom 37 which is integral with a threaded rod or spindle 18. A gear wheel 19 is provided with inner threads and is mounted upon the threaded spindle 18. A ball bearing 20 encloses a sleeve 19*a* which is integral with the gear wheel 19. The gear wheel 19 meshes with the gear wheel 10.

The casing 2 has an inner sleeve 21 which is integral therewith, and which encloses the free end of the spindle 18. The sleeve 21 encloses a plurality of annular springs which form a spring aggregate 22. One end of the spring aggregate 22 engages a disk 38 which presses the ball bearing 20 against an inner flange 36 located upon the inner end of the sleeve 21, and integral therewith. The other end of the spring aggregate 22 presses against a cover 23 which is held upon the rear surface 2*d* of the casing 2 by one or more screws 23*a*.

The casing 2 is integral with an inner support

25 which carries a pivot 24. A two-armed lever 26 is mounted intermediate its ends upon the pivot 24. One arm of the lever 24 carries a pin 27 which may engage the bottom 37 of the sleeve 13. The other arm of the two-armed lever 24 carries pins 28 and 29.

The pin 28 may be brought into engagement with a portion 9 of the gear wheel 10. The pin 29 is enclosed by a fork 30 which is mounted upon a shaft 34.

As shown in Figure 1, the shaft 34 forms a part of a current-reversing switch 32. The opposite end of the shaft 34 extends through a cover 31 and is firmly connected with a hand-operated lever 33. The cover 31 is firmly attached to the casing 2 by one or more screws 31*a*.

As shown in Figure 3, the member 17 is adapted to engage the end 35 of a work piece, the opposite end of which is engaged by a headstock, not shown in the drawings. The work piece 35 is treated upon the machine by any suitable means, which do not form a part of the present invention and are not shown in the drawings.

The electrical connections illustrated in Figure 2 include main lines 40 adapted to supply electrical current to the motor 5. In the example illustrated the motor 5 is a three-phase A. C. motor which is connected with the lines 40 by a current-reversing switch 32 and a safety switch 41. As indicated in Figures 2 and 2*a*, the switch 32 may be operated manually by means of the lever 33, or may be actuated by a magnetic coil 39. It is advantageous to employ a foot-operated switch 42 for the purpose of operating the coil 39 used to actuate the switch 41.

The described tailstock is operated as follows:

The tailstock is placed in the required position upon the frame 1, which depends upon the length of the work piece to be treated. Then the tailstock casing 2*a* is clamped upon the frame 1 by the clamps 3 and the nuts 3*a*. At that time the sleeve 13 is in its rearward, inoperative position, shown in Figure 4.

The fork 30 occupies the vertical position shown in full lines in Figure 4, and the current-reversing switch 32 is located in its middle or zero position with the manual lever 33 extending vertically downward, as shown in full lines in Figure 2*a*.

If it is now desired to clamp the work piece by causing the work-piece holder 17 to engage the end 35 thereof, the lever 33 is moved manually to the left in the direction of the arrow 33*a* (looking in the direction of Figure 2*a*). The motor 5 is then switched on so that its shaft 4 will rotate and will transmit its rotation to the pinion 6 and the gear wheel 7 meshing therewith. The shaft 8 will also be rotated so that its rotation will be transmitted to the gear wheel 10 and the gear wheel 19, meshing with the gear wheel 10. The rotation of the gear wheel 19 will cause the spindle 18, with the sleeve 13 connected therewith, to move outwardly until the work holder 17 is moved from the position shown in Figure 4 to the position shown in Figure 3 wherein it engages the end 35 of the work piece. In the course of this forward movement of the sleeve 13 the fork 30 and the two-armed lever 26 are located in the positions shown by broken lines in Figure 3.

The work holder 17 moves into engagement with the end 35 of the work so that force is exerted upon it. In the meantime the gear wheel 19, which is screwed upon the spindle 18, moves somewhat to the right and the bearing 20 is



moved out of engagement with the flange 36, thereby compressing the spring system 22. This is shown in Figure 3 of the drawings. This movement of the gear wheel 19 causes it to engage the flange 9 of the gear wheel 10, and to move the gear wheel 10 to the right upon the shaft 8, thereby compressing the spring 11.

The flange 9 engages the pin 28 upon the lever 26 and pushes the pin 28 to the right until the latter moves along with the lever 26 to its central zero position. It is apparent that the pin 29, the fork 30 and the shaft 34 are moved along with the arm 26 so that the current-reversing switch 32 is moved automatically to its intermediate zero position. The motor 5 is then switched off and the work piece 35 is held in place by the pressure exerted by the spring system 22 against the work holder 17. The parts of the device have assumed the position shown in Figure 3.

In order to remove the work piece from its clamped position it is necessary to withdraw the work holder 17 from engagement with the end 35 of the work piece. This is accomplished by manually moving to the right the handle 33 of the current-reversing switch 32. The motor 5 is then energized and its shaft 4 will rotate in the opposite direction. This rotation is transmitted through the pinion 6 and the gear wheel 7 mounted upon the shaft 8 to the gear wheel 10 mounted upon the same shaft and the gear wheel 19 which meshes with the gear wheel 10. The rotation of the gear wheel 19 will be transmitted to the spindle 18 so that the spindle 18, the sleeve 13 and the work holder 17 will move to the right from the position shown in Figure 3 to the position shown in Figure 4. At that time the fork 30 and the two-armed lever 26 are located in the position shown by broken lines in Figure 4.

At the beginning of this return movement the pressure exerted by the spring system 22 is relieved and the gear wheel 19 is moved to the left while the bearing 20 is pressed against the inner surfaces of the flange 36. Then the gear wheel 10 is moved by the pressure of the spring 11 to the position shown in Figure 4 wherein it is pressed against the gear wheel 7.

The described return movement of the work holder 17 is interrupted when the rear end 37 of the sleeve 13 engages the pin 27 of the lever 26 and moves the lever 26 counterclockwise until it is brought into its middle position shown in full lines. This movement of the lever 26 will bring the pin 29, the fork 30, the shaft 34 and the handle 33 of the switch 32 back to their zero positions so that the motor 5 is switched off.

Should, as a result of an error, the switch 35 be switched on to provide forward movement of the work holder 17 when there is no work to be clamped, the gear wheel 19 will continue to move the spindle 18 with the sleeve 13 and the work holder 17 outwardly until the bottom 43 of the longitudinal groove 14 will strike the projection 15 of the ring 16. This will effectively stop the forward movement of the work holder with the same result as if it had been brought into engagement with the work.

It is apparent that by means of the described mechanism the current-reversing switch is automatically moved to its zero or middle position at the completion of a longitudinal movement of the work holder. The mechanical means constitute a lock which prevents manual operation of the current-reversing switch in the direction of the same

movement which has just been executed by the work holder. Thus, by way of example, upon the execution of a forward movement of the work holder the switch can be operated only to provide the return movement thereof, and vice versa.

It is also apparent that in the event the supply of electrical current is interrupted during the treatment of the work piece the latter will be held by spring pressure, and there is no danger that it will be thrown off.

Another advantage of the use of resilient pressure is that in the event of a heat expansion of the work piece during treatment the work holder will follow such expansion without changing substantially the amount of pressure exerted upon the work piece being treated.

It is apparent that the example shown above has been given solely by way of illustration and not by way of limitation, and that it is subject to many variations and modifications without departing from the scope of the present invention. All such variations and modifications are to be included within the scope of the present invention.

What is claimed is:

1. In machine tools, a tailstock comprising, in combination, a work holder, a sleeve enclosing said work holder, a threaded rod firmly connected with said sleeve, a gear wheel axially movable upon said rod and rotatable therewith, a bearing enclosing a portion of said gear wheel, a spring aggregate supporting said bearing, a motor, means connecting said motor with said gear wheel for moving said work holder toward and away from said motor, means connected with said motor, means connected with said device and automatically operable to switch off said motor when said work holder is brought in engagement with a work piece and said spring aggregate is compressed to a predetermined extent, and means connected with said device and automatically operable to switch off said motor when said work holder is moved a selected distance away from the work piece.

2. In machine tools, a tailstock comprising, in combination, work-engaging means, a threaded rod firmly connected with said means, a gear wheel axially movable upon said rod and rotatable therewith, a motor, a shaft, a gear wheel axially movable upon said shaft and rotatable therewith, the first-mentioned gear wheel meshing with the second-mentioned gear wheel, means operatively connecting said motor with the second-



mentioned gear wheel, motor-switching means connected with said motor, a pin operatively connected with said motor-switching means, the second-mentioned gear wheel having a flange engaged by the first-mentioned gear wheel, and resilient means adapted to support the first-mentioned gear wheel, said pin being located adjacent to said flange, whereby the first-mentioned gear wheel shifts axially the second-mentioned gear wheel to move said pin and thereby switch off said motor when a work piece is engaged by said work-engaging means and said resilient means are compressed to a predetermined extent.

3. In machine tools, a tailstock comprising, in combination, a work holder, a sleeve enclosing said workholder, a threaded rod firmly connected with said sleeve, a gear wheel axially movable upon said rod and rotatable therewith, resilient means adapted to support said gear wheel, a motor, a shaft, a gear wheel axially movable upon said shaft and rotatable therewith, the first-mentioned gear wheel meshing with the second-mentioned gear wheel, means operatively connecting said motor with the second-mentioned gear wheel, a two-armed lever, separate pins upon the arms of said lever, motor-switching means operatively connecting said two-armed lever with said motor, the second-mentioned gear wheel having a flange engaged by the first-mentioned gear wheel, one of said pins being located adjacent to said flange, whereby the first-mentioned gear wheel shifts axially the second-mentioned gear wheel to move said pin and thereby switch off said motor when a work piece is engaged by said work-engaging means, and said resilient means are compressed to a predetermined extent, the other one of said pins being located adjacent to said sleeve and being engaged by said sleeve to switch off said motor when said holder is moved away from the work piece.

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