July 4, 1950 F. TURRETTINI 2,513,694

THREAD GRINDING MACHINE

Filed Dec. 18, 1947 4 Sheets-Sheet 1

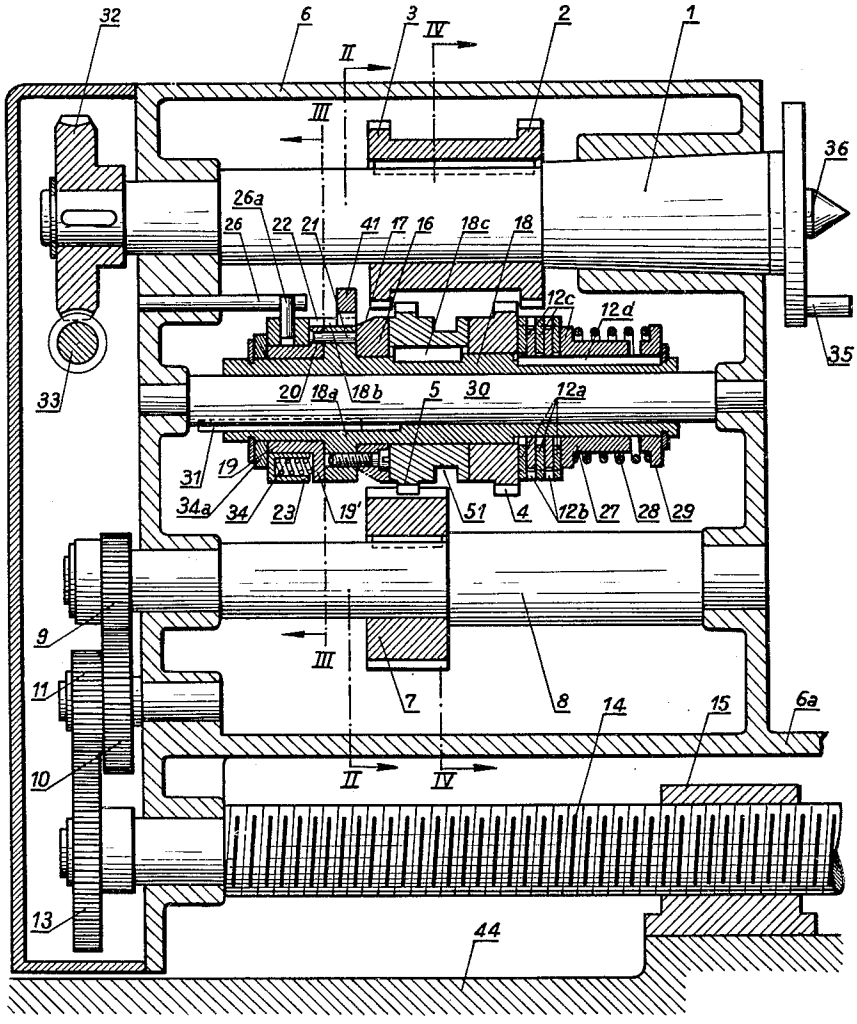


Fig. 1

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Fig. 2

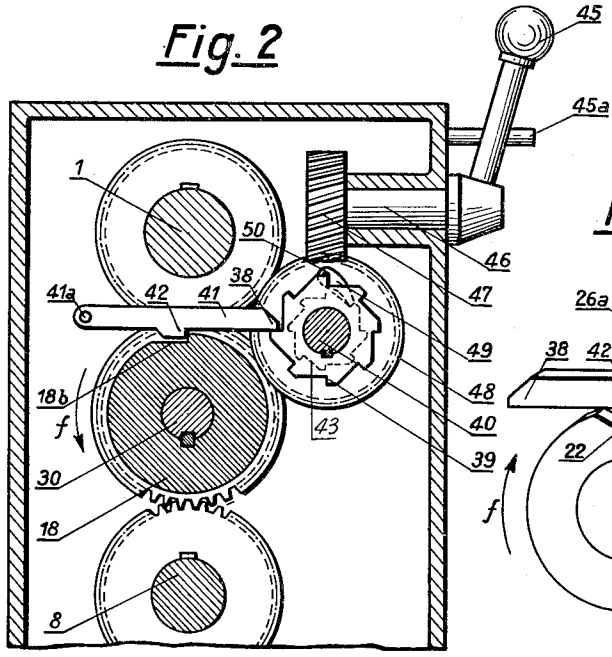
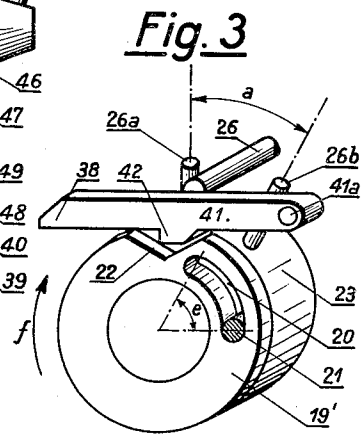


Fig. 3



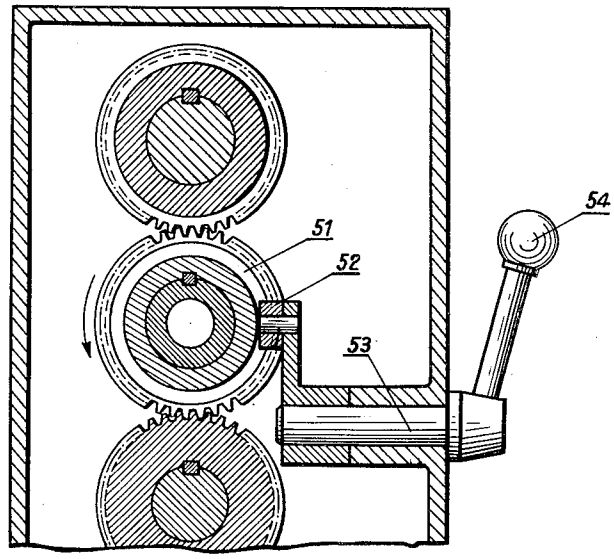


Fig. 4

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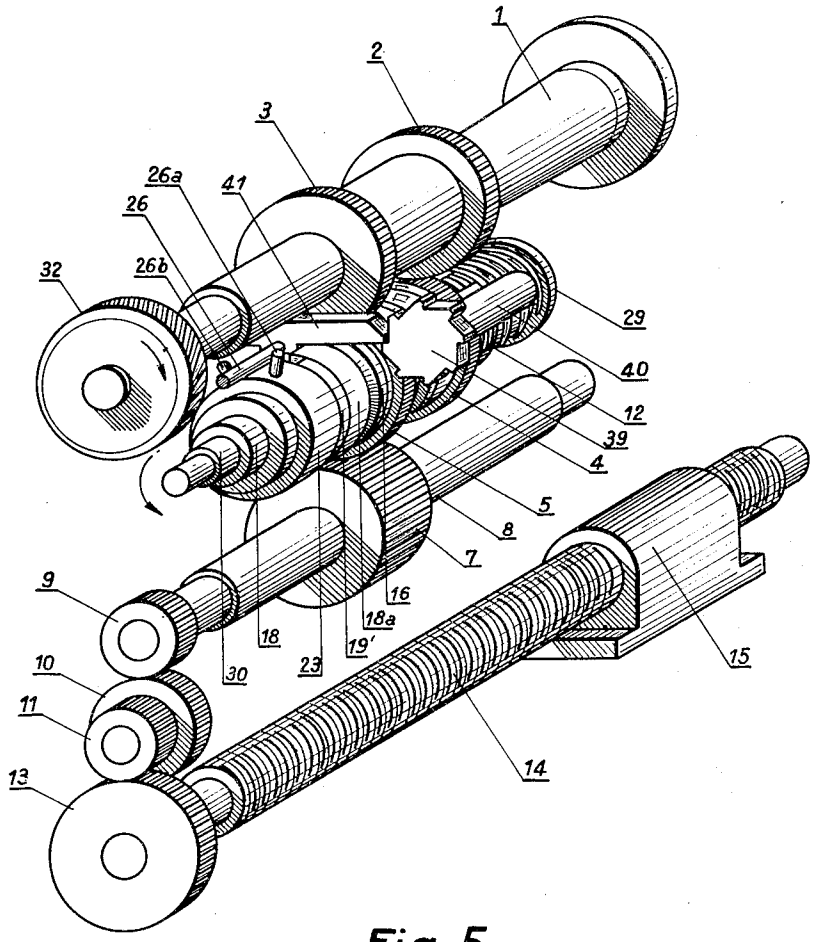


Fig. 5

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Fig.6.

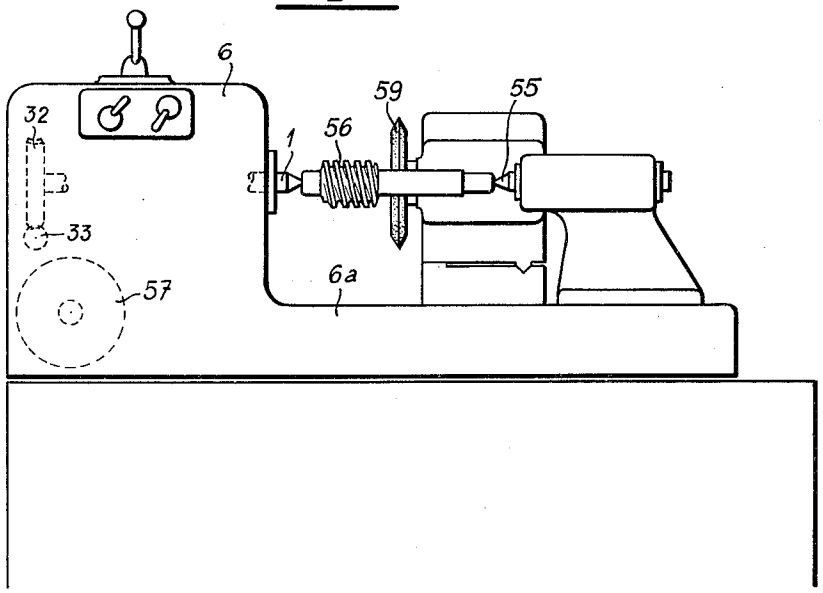
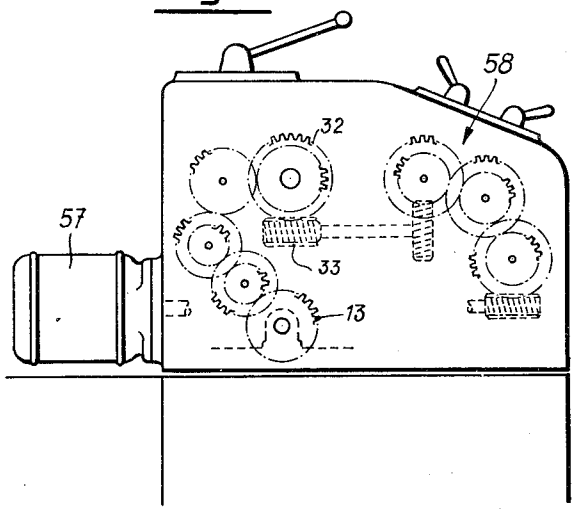


Fig.7.



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THREAD GRINDING MACHINE

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Application December 18, 1947, Serial No. 792,436
In Switzerland November 22, 1943

Section 1, Public Law 690, August 8, 1946
Patent expires November 22, 1963

4 Claims. (Cl. 51—232)

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Thread grinding machines for grinding circular grooves located within equidistant parallel planes are already known.

This kind of work is currently carried out when tools such as screw thread cutting tools or milling cutters for milling screw threads and gears, or profiled cutting tools with which the jaws of snap gauges intended for checking up screw threads are provided, are to be manufactured.

Up to now, for carrying out this work, the lead-screw was disengaged from the work spindle and it was revolved in a discontinuous way by hand; or, a slight displacement was transmitted to the nut of the lead-screw, by means of a hand operated element, and said displacement was then transmitted both to the lead screw and to the table.

There is, however, an inconvenience in the now mentioned methods, which is the lack of accuracy. In fact, the operator can make a slight error in the successive settings of the position of the table with respect to the position of the grinding wheel. Moreover, the materially unavoidable play of the control elements must, at all events, be taken up before the table starts its setting motion.

An object of the present invention is to provide novel and simple means for eliminating the above mentioned drawback. According to an important feature of the invention, the work spindle causing the rotation of the work-piece, drives a lead screw which, in turn, produces the displacement of the table carrying both the work spindle and the work piece.

One of the several possible forms of execution which can be given to the present invention and which merely intends to give a more substantial idea of the features embodied in it, comprises a double motion transmission device from the work spindle to the lead-screw, the one of which shows an intermittent action and includes a friction clutch depending from a stop member, whereas the other one comprises a permanent gearing connection.

Moreover, a control device is provided allowing the friction clutch to enter into action intermittingly, for moving the table forward by a length corresponding to one revolution of the work spindle and by a control member, allowing either of the transmission devices to be used, with a view to grind either grooves located in parallel planes or screw threads, as the case may be.

The accompanying drawing represents by way of example, and partially, a practical embodiment of the invention.

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In the attached drawing:

Fig. 1 is a sectional partial longitudinal sectional lay-out.

The Figs. 2, 3 and 4 are cross sections through II—II, III—III and IV—IV of Fig. 1, respectively.

Fig. 5 shows certain details in perspective.

Fig. 6 is a general view in elevation.

Fig. 7 is a view in profile.

The thread grinding machine represented comprises a sliding table 6*a* carrying a steady headstock 6, in which the spindle 1 revolves, and, in front thereof, a centre 55 (see Fig. 6). The workpiece to be ground 56 is located between the spindle and the centre, and is set into rotation by the driving plate 35 of spindle 1, the latter being itself driven by a motor 57, by the intermediary of the pinions 32 and 33 and of a change-speed 58 (see Fig. 7). The table displaces itself in front of the grinding wheel 59 (see Fig. 6), mounted on the bed 44, owing to the lead screw 14 revolving within a nut 15 fixed onto this bed. The rotation of the lead-screw 14 is brought about by the spindle 1 which is connected to that screw by means of a mechanism inserted between the spindle and a shaft 8 and, starting from this latter, by means of a usual gear train 9, 10, 11 and 13, which train is changed when one wishes to modify the travel which the table performs for one revolution of the spindle.

The hereabove mentioned mechanism comprises a shaft 30 parallel to the spindle 1 as well as to the shaft 8 and inserted between both these members. This shaft revolves in the head-stock 6 and is provided with a sleeve 18 slidingly mounted and dependent in rotation thereon owing to a key 31. On this sliding sleeve is fixed, by means of a key 18*c*, a pinion 5 provided with a circular groove 51 (see Fig. 4), in which engages a finger 52 secured to a shaft 53 rotatably supported in the casing and manually operable by a handle 54. Upon operation of this latter, the sliding sleeve 18, which is shown in its neutral position in Fig. 1, will be displaced, either towards the right or towards the left. Pinion 5 is constantly in mesh with a pinion 7 fixed on the shaft 8, and, when the sliding sleeve is shifted towards the left, this pinion 5 comes in mesh with a pinion 3 secured to the work spindle 1. By the side of pinion 5 is mounted loose on the sliding sleeve 18 a pinion 4 which, when shifting the sleeve towards the right, comes in mesh with a pinion 2 made integral with the above mentioned pinion 3. In this position the pinion 4 acts on a friction clutch 12 comprising friction discs 12*a* fastened by studs 12*b* to the pinion 4 and co-oper-

ating with friction discs 12c dependent in rotation upon sliding sleeve 18. A sleeve 27, keyed at 12d on the sliding sleeve 18, is submitted to the action of a spring 28 which, resting against a part 29 fixed to the sliding sleeve, presses the discs against each other. The pinions 2, 3, 4, 5 and 7 show the same diameter.

At its opposite end, in Fig. 1, the sliding sleeve 18 shows a collar 18a on the periphery of which a single notch 18b is provided. At the left hand of this collar, there is a sleeve 19 provided with another collar 19' (see also Fig. 3) mounted loose on the sliding sleeve 18 and a disc 23 mounted loose on the sleeve 19. An elastic device 34, pushing the disc 23 against the stop piece 34a, fastened up to the sliding sleeve, presses against the collar 18a, the sleeve 19 which is also provided with a notch 22. This latter can align itself with the notch 18b; in the collar 18a a pin 21 is fixed, which engages in a groove 20 in the shape of an arc of circle of the sleeve 19, whereby said collar is allowed to drive this sleeve with an angular displacement which varies when the rotation direction is reversed. On the disc 23 are fixed two stops 26a and 26b between which passes a stem 26, fixed on the casing.

On this latter a retaining pawl 41, pivoted at 41a, is provided with a tooth 42 and a heel 38. The tooth 42 is intended to engage in the notch 18b when the notch 22 is in alignment therewith. When the tooth 42 is engaged into these notches, the heel 38 rests on either of the teeth of a cam 39. This latter is fixed on a shaft 40 to which is also fixed a ratchet wheel 43 with which cooperates a pawl 49 pivoted on a pin 50. This latter is fixed to a worm gear 48, in mesh with a helical pinion 47 fixed on a shaft 46. This shaft 46 is rotatably supported in the casing and is manually operable by a handle 45 which can be displaced between two stops 45a. The hereabove mentioned mechanism comprising all of the referenced parts starting from the collar 18b, constitutes the control device which allows operation of the friction clutch.

The sliding sleeve 18 being located in the neutral position shown in Fig. 1, suppose that one wishes to grind a screw thread. By means of handle 54, the sliding sleeve 18 is shifted towards the left until the pinion 5, constantly in mesh with pinion 7, comes in mesh with pinion 3. From that moment, the work spindle 1 is connected by the gear train 3, 5, 7, 9, 10, 11 and 13 to the lead screw 14 and drives this latter in the usual way. The cone 17 provided on the ring 16 fixed to the collar 18a, has placed itself underneath the pawl 41, which, thus, is inoperative.

Suppose, on the contrary, that one wishes to grind equidistant circular grooves. One will shift towards the right by means of the handle 54 the sliding sleeve 18. One sees that the notches 18b and 22, which are aligned for one rotation direction only, will place themselves under the tooth 42 of the pawl 41, the pinion 4 comes in mesh with the pinion 2. The friction clutch 12 is induced to only slide, the sliding sleeve 18 which it is intended to revolve in the direction of the arrow f (Fig. 2) being just prevented by pawl 42 from revolving; the lead-screw remains therefore idle whereas the work spindle 1 revolves, and consequently the grinding wheel grinds a circular groove. When one wants to grind the next groove, the handle 45 is displaced until it rests against the abutment 45a, opposite to the one against which it had rested just before, it being then returned to its

starting position. In its forward travel, this handle 45 causes the cam 39 to revolve one tooth which latter lifts up for an instant the pawl 41, the tooth 42 of which gets out of the notches 18b and 22. The friction clutch 12 causes immediately the sliding sleeve 18 to rotate a complete revolution until the pawl 41, which, in the meantime, has been released by the tooth which did lift it, takes again its initial position into the notch 18b; this revolution of the sliding sleeve 18 causes the table to advance the interval between two adjacent circular grooves. In the return motion of handle 45, this latter does not drive the cam 39, owing to the pawl 49.

Suppose that after having performed a first grinding run of the circular grooves one wants to return the table idle into its initial position, for performing a second run. It will then suffice to cause the work spindle 1 to rotate in the reverse direction, whereby the rotation direction of the lead-screw and, of course, of all intermediary members, will be changed over. During this return motion, if the sleeve fitted with the collar 19' and the disc 23 (see Fig. 3) should not exist, the pawl 41 would be lifted at each revolution of the sliding sleeve 18, and would then fall again, whereby a disagreeable noise and an unnecessary wear would be produced. The sleeve 19 and the disc 23 are provided to eliminate this inconvenience; to this end, the sleeve 19 is connected to the collar 18a by a coupling provided with a play, the coupling member being the pin 21 co-operating with the groove 20, and the play being limited by the travel this pin may make within the groove; the sleeve 19 is constantly braked in its rotation by the disc 23 which can only rotate through an angle limited by the stops 26b and 26a, thrusting against the stem 26; consequently, the sleeve 19 always lags, whatever the rotation direction may be, with respect to the collar 18a and it can thus take two determined positions according to the rotation direction with respect to 18a. In one of the rotation directions, the relative positions of sleeve 19 and of collar 18a is such that the notches 22 and 18b are located in alignment with one another and that, consequently, the tooth 42 of the pawl 41 can stop the rotation of notch 18b. In the opposite rotation direction, notch 22 is angularly displaced with respect to notch 18b which is thus closed and the tooth 42 of the pawl 41 cannot engage into notch 18b. When the work spindle 1 starts again to revolve in the grinding direction, the collar 19', which always tends to remain backwards in the rotation motion, will again present its notch 22 in alignment with the notch 18b and the retaining pawl 41 will again enter in operation.

What I claim is:

1. In a thread grinding machine, in combination, a frame, a table movably mounted on said frame, a work-spindle rotatably supported on said table, a lead-screw rotatably supported in said table and operatively engaging said frame to move said table thereon, means for rotating said work-spindle, first motion transmitting means for continuously driving said lead-screw from said work-spindle, second motion transmitting means for intermittingly driving said lead-screw from said work-spindle, said second motion transmitting means comprising a friction coupling dependent upon a stop member, control means acting on said friction coupling for rendering it operative intermittingly for shifting said table forward by a length corresponding to

the rotation of the lead-screw produced by one revolution of said work-spindle, and manually operable means determining operative action of either said first or second motion transmitting means.

2. In a thread grinding machine, in combination a frame, a table movably mounted on said frame, a work-spindle rotatably supported in said table, a lead-screw rotatably supported in said table and operatively engaging said frame to move said table thereon, means for rotating said work-spindle, first motion transmitting means for continuously driving said lead-screw from said work-spindle, second motion transmitting means for intermittingly driving said lead-screw from said work-spindle, said first and second motion transmitting means comprising a common gear train and a common intermediate rotatable shaft, manually operable means determining operative action of either said first or second motion transmitting means, said manually operable means comprising a sliding sleeve mounted on said common intermediate shaft and dependent in rotation thereupon, said second motion transmitting means comprising a friction coupling mounted on said sliding sleeve and dependent on a stop member, and control means acting on said friction coupling for rendering it operative intermittingly for shifting said table forward by a length corresponding to the rotation of the lead-screw produced by one revolution of said work-spindle.

3. In a thread grinding machine, in combination a frame, a table movably mounted on said frame, a work-spindle rotatably supported in said table, a lead-screw rotatably supported in said table and operatively engaging said frame to move said table thereon, means for rotating said work spindle, first motion transmitting means for continuously driving said lead-screw from said work-spindle, second motion transmitting means for intermittingly driving said lead-screw from said work-spindle, said first and second motion transmitting means comprising a common gear train and a common intermediate

rotatable shaft, manually operable means determining operative action of either said first or second motion transmitting means, said manually operable means comprising a sliding sleeve mounted on said common intermediate shaft and dependent in rotation thereupon, said second motion transmitting means comprising a friction coupling mounted on said sliding sleeve, said sliding sleeve having a notch in which engages a retaining pawl for rendering said friction coupling operative in the rotation direction of said sliding sleeve corresponding to the return motion of said table, and means for momentarily disengaging said retaining pawl from said notch to render intermittingly inoperative said friction coupling in the rotation direction corresponding to the forward motion of said table.

4. In a thread grinding machine, the combination as claimed in claim 3, wherein an auxiliary sleeve having a notch is mounted on the sliding sleeve adjacent the notched part thereof and connected therewith by a coupling provided with an angular play in such a way that said auxiliary sleeve always lags, whatever the rotation direction may be with respect to said sliding sleeve, and is thus adapted to occupy two positions with respect to said sliding sleeve, namely a position corresponding to the idle run of the table in which both notches are angularly displaced with respect to each other, and a position corresponding to the forward motion of the table, in which both notches are in alignment, thus allowing the retaining pawl to engage thereinto.

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