Nov. 1, 1955 D. A. LAYTON ET AL 2,722,151

ATTACHMENTS FOR USE IN CONTOUR AND TAPER TURNING ON LATHES

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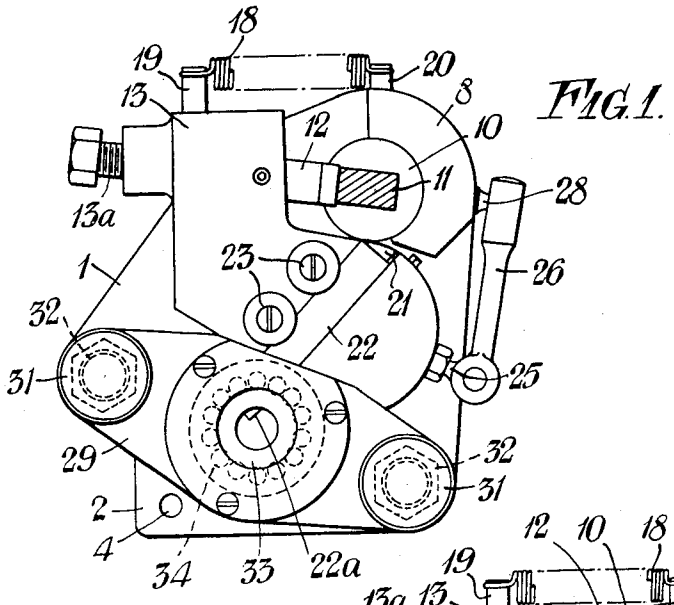

FIG. 1.

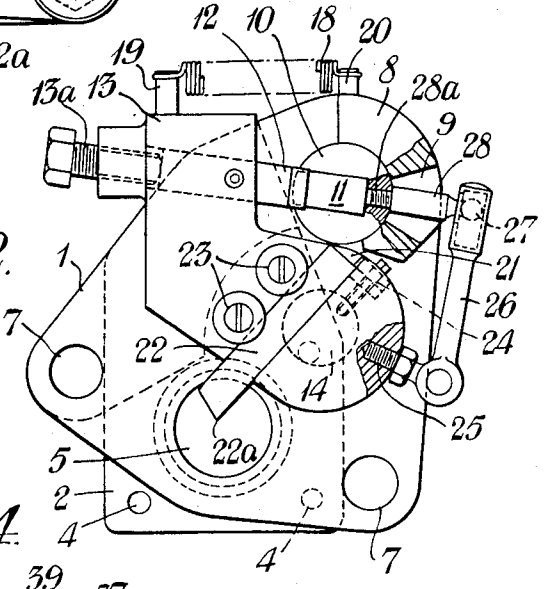

FIG. 2.

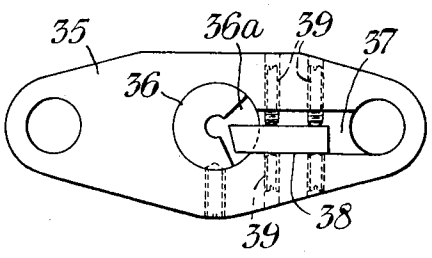

FIG. 4.

INVENTORS
DUDLEY AUSTIC LAYTON
AND
WILLIAM EDWARD ROGERS
BY
Haseltine, Lake & Co.
AGENTS

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FIG. 3.

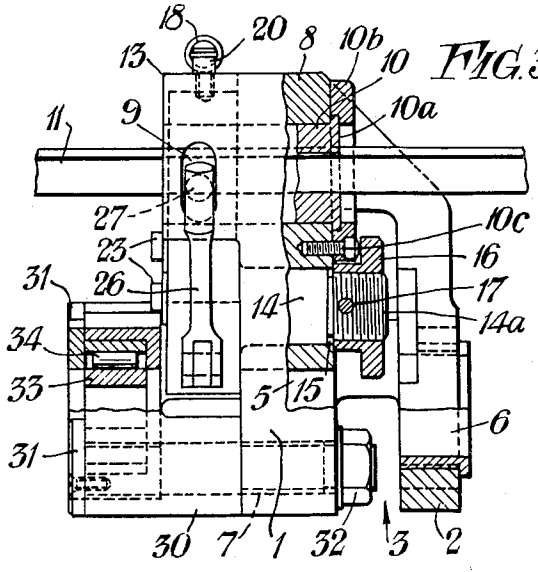


FIG. 5.

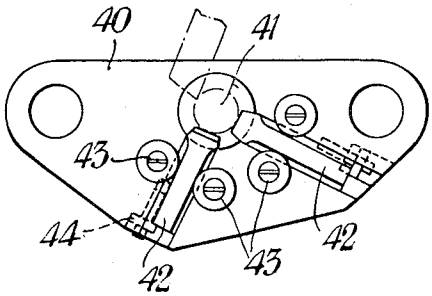


FIG. 6.

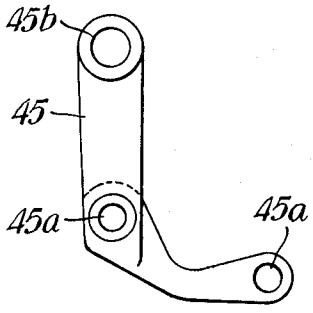
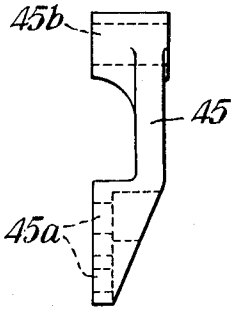


FIG. 7.



INVENTORS
DUDLEY AUSTIC LAYTON
AND
WILLIAM EDWARD ROGERS
BY
Haseltine, Lake & Co.
AGENTS

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ATTACHMENTS FOR USE IN CONTOUR AND TAPER TURNING ON LATHES

Dudley A. Layton and William E. Rogers, Norwich, England

Application September 30, 1952, Serial No. 312,388

Claims priority, application Great Britain October 4, 1951

6 Claims. (Cl. 82—14)

This invention relates to attachments for use in contour and taper turning on capstan, turret, automatic and other lathes and is concerned with the provision of a generally improved article of this nature which is readily adaptable to a wide variety of work whilst being accurate and reliable in operation.

According to the invention there is provided a contour and taper attachment for lathes comprising a main bracket adapted for attachment to the lathe carriage or equivalent member, a block pivotally carried on said bracket and provided with tool holding means, a tracer pin secured on said block, a tracer bar which can be turned about a longitudinal axis and is mounted for co-operation with said tracer pin to determine the angular position of said block on its pivot and link means adapted to turn the tracer bar about said longitudinal axis during a machining operation for the purpose of automatically maintaining the operative edge of the bar in predetermined angular relationship with the tracer pin, the arrangement being such that, on displacement of the attachment along a lathe bed, a tool carried in the block can be caused to produce, on a work-piece carried in the lathe, a profile which is determined by the contour of the operative edge of the tracer bar.

In order that the invention may be clearly understood and readily carried into effect one embodiment thereof will now be described in detail with reference to the accompanying drawings, wherein:

Figure 1 is a side elevation of the attachment showing one form of work-supporting means in position thereon,

Figure 2 is a side elevational view similar to Figure 1 showing the main bracket and pivoted block partially broken away and with the work-supporting means omitted,

Figure 3 is a part-sectional elevation of the attachment taken at right-angles to Figures 1 and 2,

Figures 4 and 5 are side elevational views of two modified forms of work-supporting means for use with the attachment,

Figure 6 is a side elevational view, to a reduced scale, of a further modified form of work-supporting means, and

Figure 7 is an end elevation of the means shown in Figure 6.

The contour and taper attachment illustrated by way of example in the accompanying drawings is intended to be bolted on to a turret face of a capstan lathe. To this end there is provided a main bracket having a face plate 1 and an integral rear plate 2 which is separated from the face plate by an undercut recess 3 as shown in Figure 3 of the drawings. The rear plate 2 is provided with three bolt holes 4 through which bolts can be inserted for securing the bracket to the turret face as aforesaid. Coaxial apertures 5 and 6 are provided respectively in the face plate 1 and rear plate 2 to permit the machined work to pass through the bracket as will be later explained. At diametrically opposed points on each side

of the aperture 5 in the plate 1 there are provided further bolt holes 7 as shown.

The upper end of the face plate 1 is shaped to provide an annular bearing 8 one end of which projects from the front face of the plate 1. In the wall of the projecting portion of the bearing 8 there is provided an elongated slot 9 and a bar supporting bush 10 is mounted in the bearing for oscillation in relation to the latter. This bush 10 supports a tracer bar 11 and has an axially extending slot in the wall thereof through which a tracer pin 12 can contact the operative edge of this bar. The bar 11 is free to slide in relation to the bush 10 and is held against longitudinal displacement in relation to the bed of the lathe either by a stop on the lathe headstock or in any other convenient manner. The bush 10 is held against axial displacement in relation to the bearing 8 by means of a head 10*a* on the bush and a retaining ring 10*b* which is secured to the rear face of the plate 1 by means of screws 10*c* so as to overlie the marginal rim of the head 10*a* of the bush.

The tracer pin 12 is arranged to follow the operative edge of the tracer bar 11 and is carried in an aperture formed to receive it in a block 13. A screw 13*a* enters the outer end of the aperture in the block 13 carrying the tracer pin 12 for the purpose of axially adjusting the pin. The block 13 is pivotally mounted on the front face of the face plate 1 by means of a stub axle 14 which projects rearwardly from the block 13 and enters an aperture 15 formed through the plate 1. The stub axle 14 may be formed integrally with the block 13 as shown and has a screw-threaded outer end 14*a* over which a retaining nut 16 is engaged, a split pin 17 being provided to lock the nut 16 on the screw-threaded end 14*a* of the stub axle. The stub axle 14 is free to rotate in the aperture 15 so that the block 13 can swing about the central longitudinal axis through the stub axle.

The tracer pin 12 is normally spring-urged against the operative edge of the tracer bar 11 by means of a coil spring 18 which connects a post 19 on the block 13 with a post 20 on the projecting wall portion of the bearing 8 and thus tends normally to rotate the block 13 about its pivot in a clockwise direction as viewed in Figures 1 and 2.

The front or outer face of the block 13 is recessed transversely as at 21 to provide a seating for a tool 22, the latter being held down in its seating by retaining screws 23 and being held against longitudinal displacement in its seating by an end screw and washer assembly 24. As shown in Figures 1 and 2, the cutting end 22*a* of the tool overlies the rims of the apertures 5 and 6 in the face and rear plates.

Pivotally secured to the T-head of a screw 25 attached to the pivotable block 13 is one end of an arm 26 the opposite end of which is ball jointed as at 27 to the outer end of a connector rod 28. This connector rod 28 extends through the slot 9 in the wall of the projecting end of the bearing 8 and has a screw-threaded inner end 28*a* which is engaged in a screw-threaded aperture formed to receive it in the bush 10.

A support or steady bracket 29, as shown in Figures 1 and 3, having a rearwardly projecting boss 30 at each end, is secured to the face plate 1 by means of bolts 31 which extend respectively through concentric apertures in the bracket 29 and bosses 30 and through the apertures 7 in the face plate 1, there being nuts 32 screwed on to the projecting ends of the bolts 31 behind the face plate 1. The centre part of the bracket 29, which lies in front of the aperture 5 in the face plate 1 when the bracket is secured in position on the face plate, has an aperture therethrough which is located coaxially with the apertures 5 and 6 in the face and rear plates respectively. Within the aperture in the bracket 29 there is mounted a bush 33

carried in an antifriction bearing assembly **34** whereby the bush **33** is free to revolve in relation to the bracket **29** together with the end of the stock to be machined, which end is entered into the bush **33** and supported thereby. Use of the bracket **29** serves greatly to reduce bush wear and is particularly suitable for the profile turning of precision ground round stock. The bracket **29** can, however, also readily be adapted for use with rectangular, hexagon or other irregular shaped stock by the use of a suitably modified bush.

In Figure 4 there is shown an alternative form of support or steady bracket **35** which is provided with rearwardly projecting end bosses (not shown) in exactly the same manner as the bracket **29** and is also arranged for attachment to the face plate **1** in the same manner as bracket **29**. The bracket **35** has a central aperture containing a pilot bush **36** for directly supporting the stock immediately in front of the tool end **22***a*, the bush **36** being made, for example, of hard steel or tungsten carbide. In the face of the bracket **35** which will lie outermost when the bracket is attached to the face plate **1**, there is provided a recess or seating **37** for the reception of an auxiliary tool **38**, the latter being secured in the seating by set screws **39**. There is thus provided a tool station in front of the bracket **35** which can be utilised for sizing the stock before it enters the bush **36**. The tool station can also be employed for turning black bar to size prior to entering the bush **36**. To allow for chip clearance and the rear portion of the tool **38**, a segment **36***a* of the bush **36** is cut away.

Yet another alternative form of steady or support bracket **40** is shown in Figure 5. This bracket again has rearwardly projecting bosses (not shown) at each end and is arranged for attachment to the face plate **1** in exactly the same manner as brackets **29** and **35**. The bracket **40** has an aperture **41** therethrough which is again coaxial with the apertures **5** and **6** in the face and rear plates of the main bracket when the support bracket **40** is secured thereon. Projecting into the aperture **41** are adjustable steadies **42** which are retained in position by holding down bolts and co-operating washers **43** and by end screws **44**. The steady or support bracket **40** can be used for supporting any type of round stock. If desired the steadies **42** could be replaced by rollers arranged in the conventional manner for roller steady turning tools.

In Figures 6 and 7 there is shown yet another form of steady bracket **45** for use with castings, hot pressings, forgings and the like which cannot be supported in bushes. The bracket **45** has a substantially horizontal arm provided with an aperture **45***a* at each end as shown, whereby the bracket can be bolted across the face plate **1** in a manner similar to the earlier described support or steady brackets. The upright arm of the bracket **45** has an aperture **45***b* therethrough at its upper end which is arranged to engage an overhead pilot bar of the lathe to hold the whole attachment steady during machining.

In operation, the taper and contour attachment as described is provided with the appropriate support or steady bracket and is bolted to a lathe turret face so that the attachment can be fed along the lathe bed on the turret towards or away from the lathe headstock which carries the stock or work-piece. The location of the tracer bar **11** on the attachment permits the turret to pass under this bar as required during such feeding operation. The stock or work-piece, which is supported by a steady bracket where applicable, is rotated by the headstock in the normal manner and the tool **22** is fed axially along the stock for carrying out the machining operation. The machined end of the stock passes through the apertures **5** and **6** in the attachment bracket as the latter is fed forward. In cases where the bracket **35** is employed, the stock can be sized before entering the supporting bush **36** in the bracket by means of the auxiliary tool **38**. The forward feed of the attachment causes the tracer pin **12** to travel along the working edge of the tracer bar **11** and the block **13** is thereby swung backwards and forwards about its pivot to move the tool end **22***a* nearer or further away from the stock and thereby to produce a profile on the stock which is determined by the contour or configuration of the working edge of the tracer bar **11**. To reduce errors to a minimum, the tracer pin **12** and the tool **22** are positioned relatively close together on the block **13**, both being located, in the example illustrated, between the pivotal axis of the block and the upper end of the latter. During the forward feed of the attachment, the tracer bar is held against longitudinal displacement in relation to the lathe bed by means of a suitable stop as aforesaid.

The link arrangement constituted by the screw **25**, arm **26** and connecting rod **28** ensures that any oscillation of the block **13** is also imparted to the bush **10** which in turn rotates the tracer bar about its longitudinal axis or an axis parallel thereto and ensures that the working edge of the bar is always maintained substantially perpendicular to the tracer pin.

When castings, hot pressings, forgings and the like are to be machined, the steady bracket **45** is employed as aforesaid, this bracket then serving to steady the entire attachment.

The attachment as described and illustrated can also be adapted for producing a profiled work-piece having an irregular diameter. For this purpose the arm **26** is disconnected from the block **13** and arranged for actuation by a cam motion controlled by the spindle of the lathe. The contacting face of the tracer pin **12** will then preferably be angled off so that it contacts only the corner of the tracer bar **11**. The cam motion will impart an oscillation to the bush **10** thus giving an extra movement to the piovted block **13**. This movement can be calculated in order to give desired irregularity on the diameter of the work-piece.

The attachment has been described as adapted for securing to a turret face of a capstan lathe but it will be appreciated that it can equally well be adapted for mounting on other types of lathe. The attachment can also be secured to a cylindrical turret by the provision of a rearwardly extending shank of the bracket which is secured in the turret hole.

We claim:

1. A contour and taper attachment for lathes comprising a main bracket adapted for mounting on the lathe carriage, a tracer bar, an operative side edge on said bar, an oscillatable tracer bar support on said main bracket whereby said bar is supported longitudinally with respect to the lathe bed for oscillation with said support about the longitudinal bar axis, a tool carrying block mounted on said main bracket to swing about an axis substantially parallel to the longitudinal axis of said bar, tool holding means on said block, a tracer pin secured on said block for co-operation with said operative edge of said tracer bar to determine the angular position of said block on its pivot, means for oscillating said tracer bar support and tracer bar to and fro during a machining operation in accordance with said tool block position to control the angular relationship between said operative bar edge and said pin and work-steadying means on said main bracket to steady the attachment in relation to a work-piece in the lathe.

2. A contour and taper attachment as claimed in claim 1, said tracer bar support comprising a bearing on said main bracket and a longitudinally slotted bush which is oscillatably mounted in said bearing and supports said bar so that the operative edge of the latter is contacted by the tracer pin through said longitudinal slot, said bar being arranged to slide longitudinally in relation to said bush and bearing and to oscillate with the bush in said bearing.

3. A contour and taper attachment as claimed in claim 2, in which said means for oscillating said tracer bar comprises link means coupling said bush wtih said pivoted block whereby said tracer bar is caused to follow the

oscillations of said pivoted block to maintain the operative edge of said bar substantially perpendicular to said tracer pin.

4. A contour and taper attachment as claimed in claim 3 wherein said link means comprises an arm pivotally connected at one end to said pivoted tool carrying block and connected at the other end, through a ball joint and connecting rod, to said bush whereby the said bush, and thus also the tracer bar supported therein, is caused to follow the oscillations of the pivoted block to maintain the operative edge of the said bar substantially perpendicular to said tracer pin.

5. A contour and taper attachment as claimed in claim 1 in which a tool supported in said tool holding means on said pivoted block and said tracer pin project from opposite sides of the block above the pivotal axis of the latter whereby pressure of the tool on the workpiece urges said tracer pin against the operative edge of said tracer bar, said pressure being further aided by spring means acting between the said block and main bracket.

6. In a lathe, a contour and taper attachment comprising a main bracket mounted to travel along the lathe bed with the lathe carriage, a tracer bar, an oscillatable tracer bar support on said bracket whereby said bar is slidably supported in substantially parallel relationship to the bed of said lathe for oscillation with said support about a

longitudinal axis of the bar, a tool carrying block mounted to swing on said main bracket about an axis substantially parallel to the axis of oscillation of said bar, a tracer pin secured on said block, above the pivotal axis of the latter, for co-operation with an operative edge of said tracer bar to determine the angular position of said block on its pivot, tool holding means provided on said block between said tracer pin and said pivotal block axis, means for holding said tracer pin against said operative edge of the tracer bar, link means coupling said block to said tracer bar support whereby said support and bar is caused to oscillate with said block and maintain said operative edge of the bar perpendicular to said tracer pin during a machining operation, and work-steadying means positioned on said main bracket in front of said tool holding means for steadying the attachment in relation to a workpiece in the lathe.

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