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CENTER FOR COPYING LATHES

Filed April 6, 1944

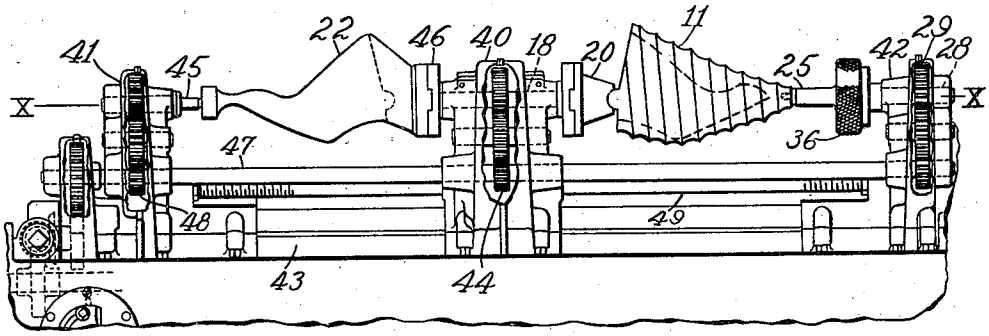


Fig. 1

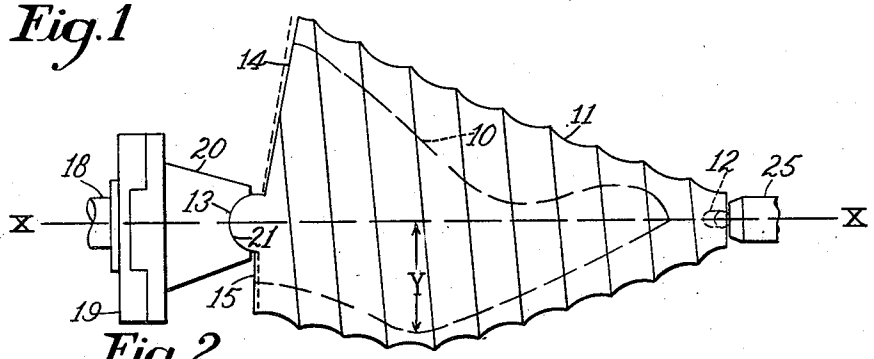


Fig. 2

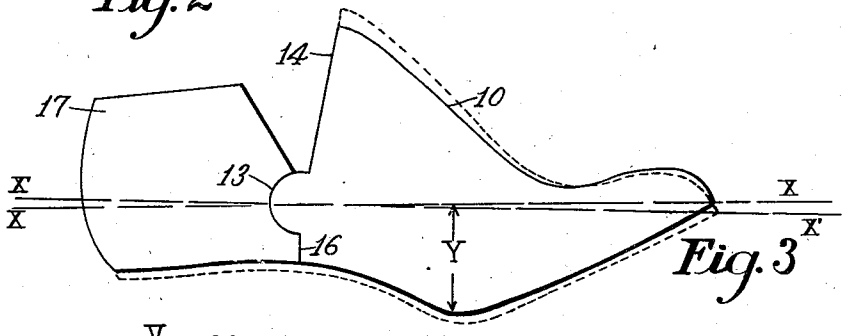


Fig. 3

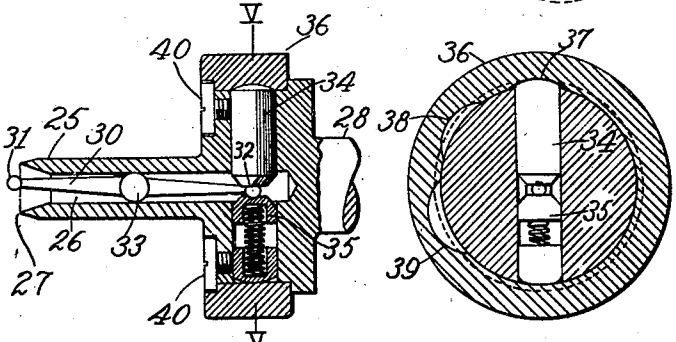


Fig. 4

Fig. 5

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CENTER FOR COPYING LATHES

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7 Claims. (Cl. 142—53)

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This invention is concerned with a problem involved in the manufacture of two-part lasts. The problem arises in consequence of girth grading in a copying lathe, regardless of whether the generated product is an individual forepart of a two-part last or a last in which the forepart and heel part are integral, but the present invention is not concerned with lasts of the latter type.

The problem under consideration is due to the fact that girth grading in a copying lathe unavoidably alters the toe spring of a last. Specifically, the toe spring is increased by grading up and decreased by grading down, but in the case of grading the forepart of a two-part last, it is possible to counteract the effect of grading on the toe spring by regulating the angular relation of the joint surface of the block and the turning axis thereof in the process of setting up the block in a copying lathe. This does not alter the shape of the generated forepart nor its position in space during the turning operation, but it does alter the length of the bottom of the forepart, and later, when the generated forepart is finally assembled with a heel part, the abutting portions of their joint surfaces below the hinge become effective to determine the quantity of toe spring.

As herein exemplified, the invention is embodied in a copying lathe of the type disclosed in United States Letters Patent No. 2,072,228, granted March 2, 1937, on application of Topham et al. modified by the substitution of improved means for holding a forepart block, the turning center for holding the toe end of the block being provided with adjustable means arranged to locate that end of the block in any one of a variety of positions differently related to the turning axis of the lathe.

The utility of a turning center such as that mentioned above is predicated upon a known practice of preparing a forepart block for turning by forming its joint surface at the butt end and boring a locating socket in its toe end with the aid of a jig to insure a standardized relation of one to the other. Examples of jigs designed for such use are disclosed in United States Letters Patent No. 1,969,739 and No. 2,030,141 both granted to J. Fitzpatrick. The locating socket bored in the toe end of the block is intended to establish the turning axis of the block and in some cases to receive a turning center of a lathe. Its utility in that respect is predicated upon placing it exactly in a standardized relation to the joint surface at the opposite end of the block to insure a correct set-up of the block with regard to the turning axis of the lathe. The expression "standardized relation" means that relation which is standard for a true copy generated at zero grade.

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The adjustable means of the present improved turning center includes a tongue the tip of which is formed and arranged to occupy the locating socket prior to forcing the center into the block. The tongue may be adjusted to place the socket in concentric relation to the turning axis or in various eccentric relations thereto, and if the adjustments be coordinated with the adjustments of the girth-grading mechanism the graded lasts will have approximately the same toe spring as a non-graded last.

The invention also provides a complemental feature in the head stock of the lathe, namely, a chuck designed to hold the butt end of a forepart block solely by engagement with a cylindrical surface of the hinge portion of the block. The entire block-engaging surface of the chuck herein illustrated is also cylindrical and conforms to the corresponding surface of the block except in angular extent, the concave surface of one of the elements having slightly less angular extent than the convex surface of the other element to provide clearance for relative angular adjustment commensurate with the adjusting requirements at the toe end of the block. A chuck embodying the feature above described will serve the purpose in view when grading up or down as well as when the girth-grading mechanism is set for zero grade.

Referring to the drawing,

Fig. 1 is a front elevation of a portion of a copying lathe embodying the present invention;

Fig. 2 is an enlargement of the forepart block, the head stock chuck, and a portion of the toe center as they appear in Fig. 1;

Fig. 3 represents the outlines of two lasts, one generated at zero grade in full lines and the other graded up girthwise;

Fig. 4 is a sectional view of the toe center included in Fig. 1 at the right thereof; and

Fig. 5 is a cross section indicated by line V—V of Fig. 4.

A discussion of Figs. 2 and 3 will reveal the problem under consideration and the manner in which it is solved by the present invention. The profile 10 superposed on the forepart block 11 represents a forepart to be generated at zero grade in a copying lathe. Prior to setting up the block in the lathe, its butt end is provided with a joint surface and thereafter its toe end is provided with a locating socket 12, usually bored with a drill while the block is secured in a jig

designed to insure a standardized relation between the socket and the joint surface.

The joint surface illustrated herein includes a cylindrical hinge surface 13 and two stop faces 14 and 15 located respectively above and below the hinge surface. The stop face 15 is the one to be particularly considered, since its coaction with a corresponding stop face 16 of a heel part 17 determines the amount of toe spring of a last when the parts are assembled as represented in Fig. 3.

The head stock represented in Figs. 1 and 2 includes a live spindle 18, a face plate 19 carried thereby, and a chuck 20 affixed to the face plate. The chuck is provided with a cylindrical surface 21 of the same radius as the hinge surface 13 of the block and of sufficient circumferential extent to rotate the block about the turning axis X—X. In some circumstances the forepart will be provided with a concave hinge surface and its mated heel part will be provided with a convex hinge surface. In such circumstances the chuck 20 will be replaced by one having a convex cylindrical surface instead of a concave surface 21. In either case, the chuck will be designed to provide clearance gaps between itself and the faces 14 and 15 of the block.

Assuming that a block 11 is set up in a lathe with its socket 12 in concentric relation with the turning axis, and assuming also that a forepart of the style indicated is to be generated at zero grade, the distance Y from its turning axis to the ball surface will be equal to the corresponding distance in the model 22 (Fig. 1). If the forepart were graded up girthwise, this distance would be greater, but if graded down, it would be less, and the amount of toe spring would be altered accordingly because the relation of the toe end to the turning axis would not be affected by the grading factor.

One possible expedient by which the toe spring of an up-graded forepart could be reduced to counteract the effect of the grading factor would be to trim a thin layer of stock from the stop face 15, thereby permitting the turning axis of the forepart to take the position indicated by line X'—X' (Fig. 3) instead of its true position indicated by line X—X. On the other hand, if the toe spring were reduced by grading down, it could be increased by attaching a thin layer of wood to the face 15, but these expedients would be unsatisfactory for obvious reasons. Nevertheless, almost the same results can be obtained without trimming or patching by setting the socket 12 above the turning axis when grading up, and below that axis when grading down. Such procedure does not change the shape or the position in space of the turned surface of the forepart during the turning operation, but it does change the position of the stop face 15 which later coacts with the stop face 16 of the heel part to determine the amount of toe spring of an assembled last.

Referring to Fig. 2, dotted lines adjacent to the joint faces 14 and 15 indicate the planes in which these faces would lie during the turning operation if the socket 12 were placed above the turning axis. As to the face 15, its change of location would have the ultimate effect of lowering the toe end of the forepart with respect to an assembled heel part and thereby reducing the amount of toe spring. Thus, a forepart graded up (dotted lines in Fig. 3) can be turned in a way to counteract an increase in toe spring due to the grading factor. On the other hand, a

reduced toe spring produced by grading down may be corrected during the turning operation by placing the socket 12 below the turning axis. This would shift the stop face 15 slightly away from the toe end of the forepart and result in raising the toe end with respect to the heel part when the stop faces 15 and 16 abut each other.

The lathe represented in the drawing is provided with means for obtaining the results above described. A tail stock center 25 in concentric relation to the turning axis of the spindle 18 is arranged to cooperate with the chuck 20 to support a block 11. A tubular portion of the center is provided with a chamber 26 having an open mouth defined by a sharp work-indenting edge 27. The shank 28 of the center is affixed to a driven gear 29. An adjustable tongue 30 is nested in the chamber 26, but its tip 31 projects through and beyond the mouth of the latter to enter a socket 12 in the toe end of a block 11. The tip 31 is spherical and its diameter is the same as that of the drill used to bore the socket. The inner end 32 of the tongue is also spherical, likewise an intermediate portion 33 which serves as a fulcrum and has a bearing in a cylindrical internal surface that forms the chamber 26.

An adjustable thrust member 34, cylindrical in form, is installed in a bore intersecting the chamber 26 and lying on an axis at right angles to the turning axis. The inner end of the member 34 engages the ball end 32 of the tongue, their contact being maintained by a spring follower 35 also engaging the ball end. The members 34 and 35 are encircled and confined by a collar 36 capable of being rotated manually with respect to the center 25. The internal surface of this collar is a cam surface including concentric segments and a series of three depressions 37, 38 and 39 of graduated depths. The center is provided with screws 40 for retaining the collar without binding it.

When the depression 38 of intermediate depth is in register with the thrust member 34, it will maintain the tip end 31 of the tongue in concentric relation to the turning axis, and this is the adjustment that would normally be made when a forepart is to be turned at zero grade. The shallower depression 37 will locate the tip end 31 at one side of the turning axis (Fig. 4), but the deeper depression 39 will locate it at the opposite side. As a matter of convenience, the depressions 37 and 39 may be made to correspond to one width-grade above or below zero grade, as the case may be.

In accordance with the lathe organization more fully shown and described in the aforesaid Letters Patent No. 2,072,228, the elements hereinbefore described are all carried by a swing frame comprising arms 40, 41 and 42 and a pivot shaft 43 of square section between its ends. The arm 40 provides bearings for the live spindle 18 and carries gearing 44 for driving it. The arms 41 and 42 are both adjustable toward and from the arm 40, one having bearings for a tail stock center 45 for supporting the toe end of the model and the other having bearings for the center 25 which carries the toe end of the block 11. These bearings all remain on a common turning axis X—X. A face plate 46 affixed to the spindle 18 supports and drives the butt end of the model 22. A transmission shaft 47 journaled in the arms 40, 41 and 42 drives the spindle 18 and both tail stock centers in synchronism, the gear train 48 serving the

center 45 as another train including the gear 29 serves the center 25.

When setting up a block 11 in the lathe, the operator will first adjust the collar 36, if need be, according to whether a forepart is to be graded up or down or turned at zero grade. The arm 42 and the center 25 may be shifted toward the chuck 20 by turning the screw rod 49 the thread of which engages an internal thread in the arm 42. Once the socket 12 in the block has been placed in register with the tip 31 of the locating tongue the arm 42 may be advanced to drive the indenting end 27 of the center into the block, the tongue then being effective to maintain the socket in the desired relation to the turning axis during the indenting stage.

Having described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a lathe of the copying type in which bearings for a live spindle and a tail stock center are maintained in coaxial relation, a rotatable tail stock center having work-indenting means, a radially adjustable work-locating tongue carried thereby, the tip of said tongue projecting beyond said indenting means to occupy a socket in a work piece, and means carried by the center and associated with said tongue for shifting said tip radially to and from the axis of the center.

2. A lathe comprising a rotary turning center and means for driving it, the center having a work-supporting portion at one end and a chamber forming an open mouth in said end and surrounding its turning axis, a work-locating tongue carried by the center and nested in said chamber, the tip of said tongue projecting through said mouth and beyond said work-supporting portion, and means associated with the tongue for shifting its tip radially toward and from the turning axis of the center.

3. A rotatable lathe center having a work-supporting portion at one end and a chamber forming an open mouth in said end, a work-locating tongue nested in said chamber, the tip of said tongue projecting through said mouth and beyond said work-supporting portion, and means associated with said tongue to maintain its work-locating tip in various positions of adjustment radially of the turning axis of the center.

4. A tubular rotatable lathe center having a sharp work-indenting edge for supporting one

end of a work piece, an angularly adjustable tongue nested in the center and having a bearing therein, the tongue having a work-locating tip projecting beyond said edge, and adjusting means associated with said tongue for shifting its work-locating tip to and from the turning axis of the center.

5. A tubular rotatable lathe center having an internal cylindrical surface and an open mouth defined by a sharp work-indenting edge, an angularly adjustable tongue nested in the center and having a spherical fulcrum portion engaging said cylindrical surface, the tongue also having a work-locating tip projecting beyond said edge, and adjusting means associated with said tongue for shifting said tip to and from the turning axis of the center.

6. A lathe center as defined in claim 4 in which the adjusting means comprises a manually rotatable collar surrounding the center and having a bearing thereon, said collar having an internal cam surface, a thrust member between said cam surface and the tongue, and resilient means acting on the tongue in opposition to said thrust member.

7. A lathe center as defined in claim 4 in which the adjusting means comprises a manually rotatable collar surrounding the center and having a bearing thereon, the collar having a series of depressions of different depths in its internal surface, a thrust member between said surface and the tongue, and resilient means acting on the tongue in opposition to said thrust member.

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