April 4, 1961 A. M. LELAN 2,977,833

COPYING DEVICE FOR LATHES

Original Filed Sept. 8, 1954 5 Sheets-Sheet 1

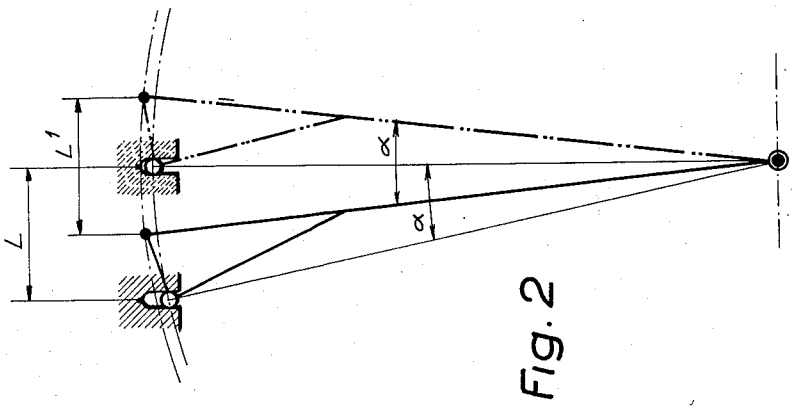


Fig. 2

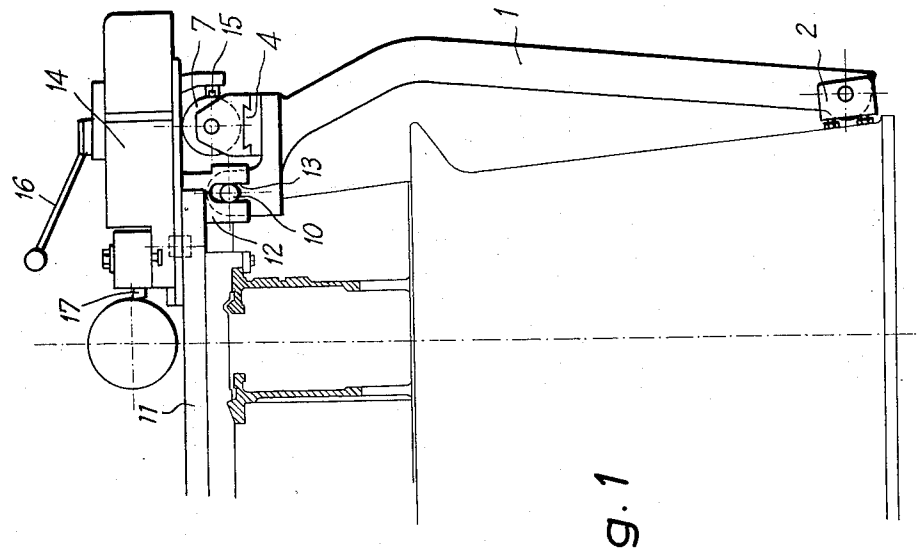


Fig. 1

April 4, 1961 A. M. LELAN 2,977,833

COPYING DEVICE FOR LATHES

Original Filed Sept. 8, 1954 5 Sheets-Sheet 2

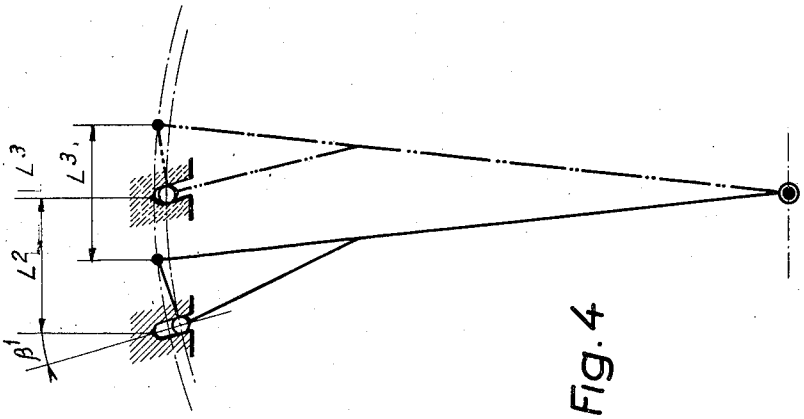


Fig. 4

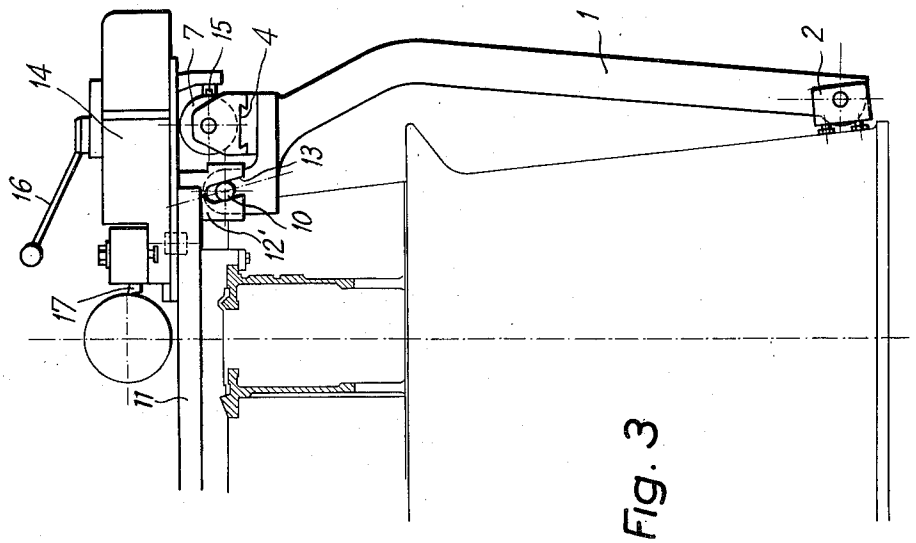


Fig. 3

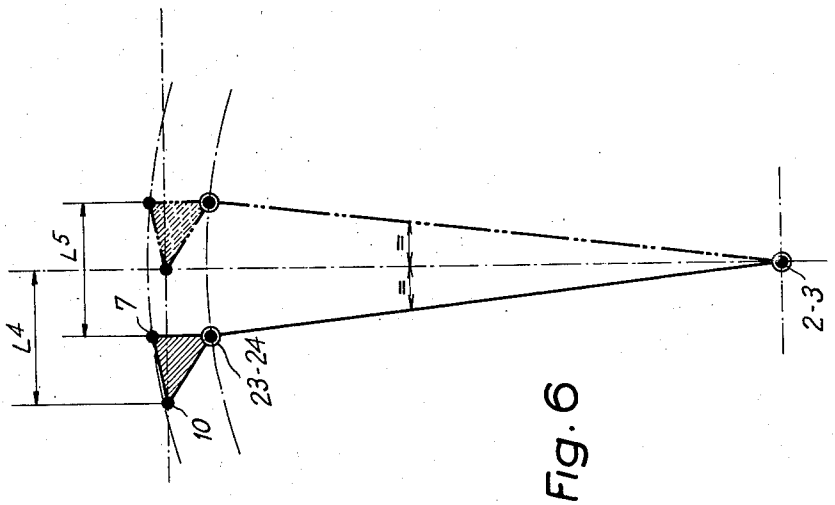


Fig. 6

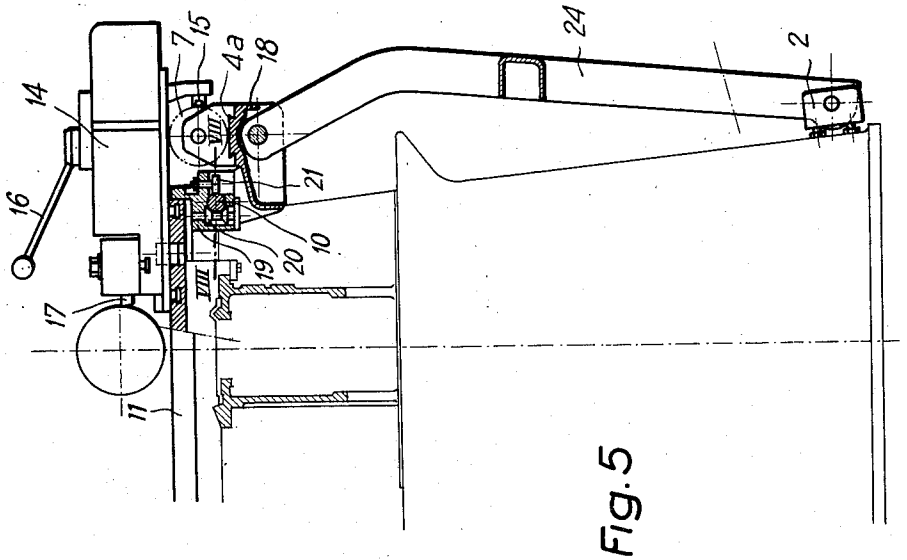


Fig. 5

April 4, 1961 A. M. LELAN 2,977,833

COPYING DEVICE FOR LATHES

Original Filed Sept. 8, 1954 5 Sheets-Sheet 4

Fig. 8

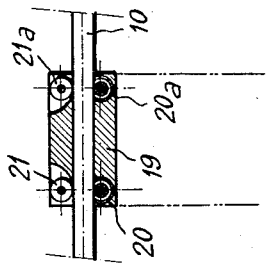
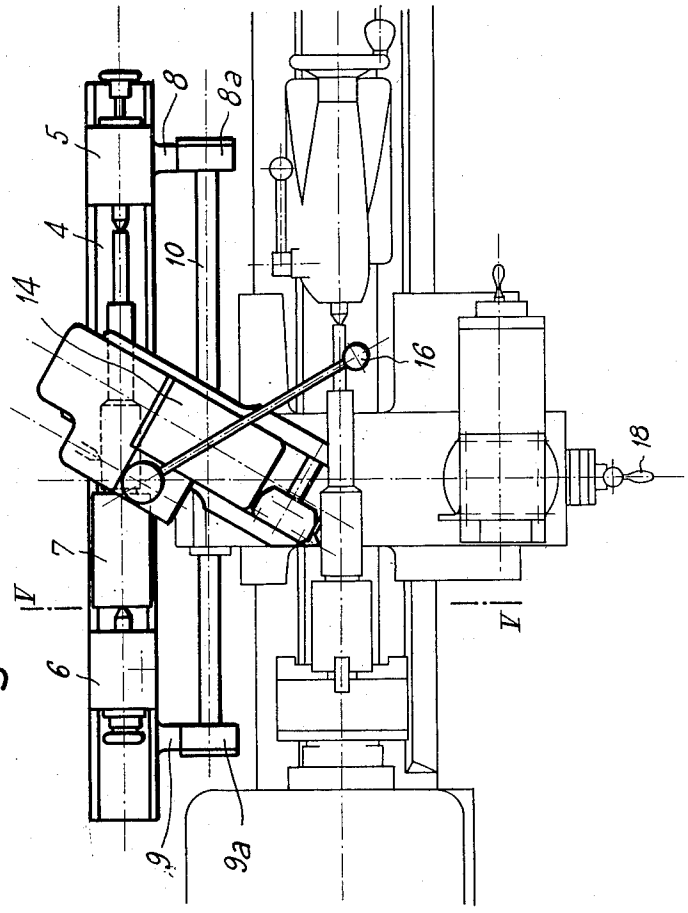


Fig. 7



April 4, 1961 A. M. LELAN 2,977,833

COPYING DEVICE FOR LATHES

Original Filed Sept. 8, 1954 5 Sheets-Sheet 5

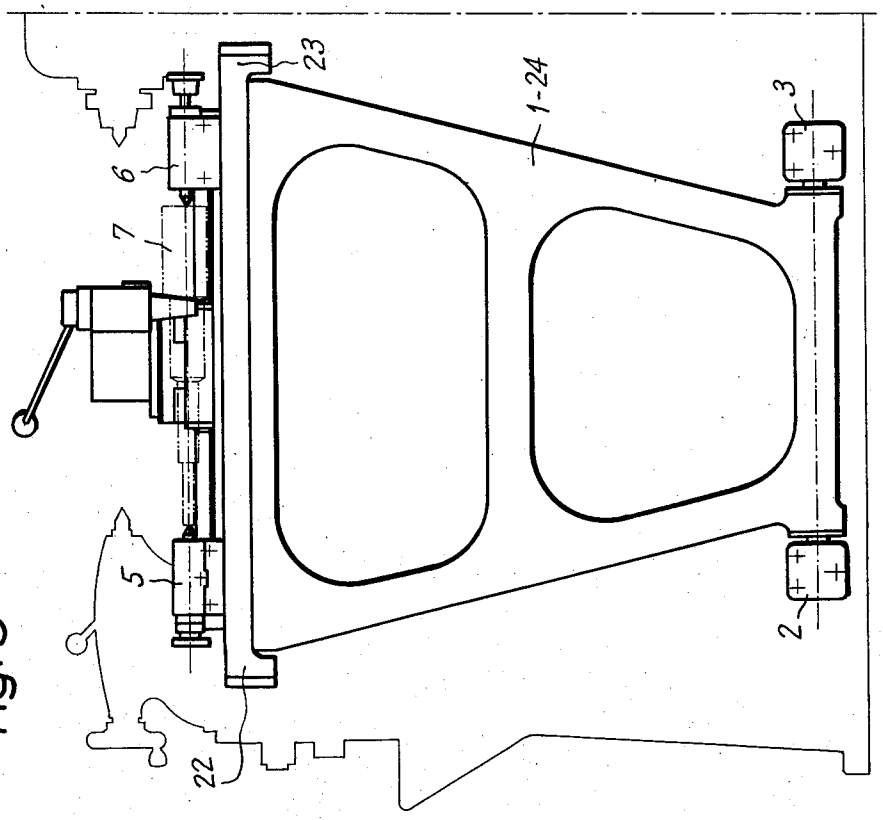


Fig. 9

United States Patent Office 2,977,833 Patented Apr. 4, 1961

2,977,833

COPYING DEVICE FOR LATHES

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Continuation of application Ser. No. 454,677, Sept. 8, 1954. This application Aug. 15, 1958, Ser. No. 755,849

Claims priority, application France Sept. 11, 1953

9 Claims. (Cl. 82—14)

This invention relates to a copying device for machine tools such as lathes, as described in my prior application Serial No. 454,677 filed September 8, 1954, now abandoned, of which this application is a continuation.

It has already been proposed to provide a lathe with a copying device which is mounted on the transverse slide of the lathe and in which a templet is mounted transversely to the slide and longitudinally relative to the support of the lathe. This known type of copying device has the advantage of not requiring any functional modification of the slide. Moreover with this arrangement the adjustments of the diameter of the work piece are carried out in the usual way by operating the transverse threaded spindle controlling the displacements of the slide by means of the usual hand operated crank.

This known arrangement, which is very convenient to the operative, has however the disadvantage of having a rather complicated construction of templet carrier, which is movable transversely with respect to the axis of the machine. In practice however, these known arrangements require, in addition to very accurate mounting of the slide etc., an additional means for ensuring true parallelism between the axis of the templet and the axis of the machine during the transverse displacements of the templet. Furthermore, it is difficult, in practice, to protect the slide from dust and chips falling on it which has the effect of causing rapid wear, renders the operation of the frequent displacement of the templet difficult and results in rapid reduction in precision.

The object of the present invention is to provide a copying device for machine tools which overcomes these disadvantages and which provides a transverse movable support device for the templet which ensures high precision in the control of the displacements of the templet.

The invention thus provides in a copying device for machine tools, such as lathes, having a work spindle and including a longitudinally movable carriage, a transverse slide, a templet carrier for supporting a templet parallel to said spindle and coupled to the slide for transverse movement in unison therewith, a pivoted support for the carrier defining swinging movement thereof with a radius substantially equal to the maximum vertical dimension of the machine about a first axis parallel to the spindle, means locking the carrier on the support against movement longitudinally of the machine, and means pivotally coupling the carrier to the slide about a second axis constantly parallel to said spindle and first axis and permitting longitudinal movement of said slide relative to said carrier, whereby said carrier templet is held parallel to said two axes irrespective of the positions of said slide and carrier.

In order that the invention may be more clearly understood, reference will now be made to the accompanying drawings, wherein:

Figure 1 is a part sectional view of a lathe showing the profile of the support of the templet according to one embodiment of the invention;

Figure 2 illustrates diagrammatically the operation of the support according to Figure 1;

Figure 3 is a view similar to Figure 1 of another embodiment of the invention;

Figure 4 illustrates diagrammatically the operation of the support according to Figure 3;

Figure 5 is a part sectional view of a still further embodiment of the support of the templet, corresponding to a section on the line V—V of Figure 7;

Figure 6 illustrates diagrammatically the operation of the embodiment according to Figure 5;

Figure 7 is a part plan view of a conventional parallel lathe fitted with an additional copying device according to Figures 5 and 6;

Figure 8 is a horizontal part sectional view through the coupling between the templet and the transverse slide on the line VIII—VIII of Figure 5;

Figure 9 is a rear elevational view showing the general arrangement and the mounting of the support of the templet.

Referring now to Figure 1 of these drawings, the templet 7 is supported on a support 1 pivoted, without play, at its lower end on two bearings 2 and 3 (see Figure 9) fixed to the base of a lathe. The upper part of the pivoted support comprises a dovetail portion 4 parallel to the axis of the device and serving for longitudinal adjustment and for the fixing of the tail stocks 5 and 6 of the templet 7.

At the two upper ends of the pivoted support 1 are fixed two arms 8 and 9 (see Figure 7) which serve for fixing an attachment bar 10 which is parallel to the axis of the device. The bar 10 is coupled to a transverse slide 11 of the lathe by means of a block 12 which is fixed thereto and provided with vertical slots 13 in which the attachment bar may slide in such a manner as to permit the templet to follow the transverse movements of the slide 11 without hampering the longitudinal movement of said slide.

The copying device 14, which is provided with a feeler 15 which contacts the templet 7, is mounted on the slide 11 in the usual manner and is provided with a lever 16 for the working positioning and rapid withdrawal of the copying device.

In operation, an operative, by means of the lever 16, moves the device into working position, that is in the position in which the feeler 15 is in contact with the templet 7. The means for effecting longitudinal feeder movement of the lathe is then actuated whereupon a transverse movement is imparted to the feeler 15 and consequently the tool 17, this movement corresponding in magnitude to the deviations of the profile of the templet. Adjustment of the diameters is effected in the usual way by rotation of a hand operated crank. As will be understood any transverse movement of the slide 11 will be transmitted to the templet by the above described attachment device comprising the block 12 and attachment bar 10 integral with templet support.

As will be seen from Figure 2 the magnitude of the displacement L of the slide 11 is not always equal to the magnitude of the displacement L' of the templet, either in its partial values or as a whole, although the angular displacements α are equal for the reason that it is not possible in practice to make the axis of the attachment bar coincide with the axis of the templet.

In the embodiment according to Figure 3, the attachment block 12' is provided with a slot 13 inclined at an angle β' to the vertical, instead providing a vertical slot as in Figure 1. By this means it is possible to correct in part this difference between the respective values of displacement of the slide and the templet as is illustrated in Figure 4 by the values L^2 and L^3 respectively. For a given value β', and in a sense appropriate to the positions

of the support 1 with respect to the vertical, the unavoidable differences of displacement L^2 and L^3 are satisfactorily compensated.

In the embodiment according to Figures 5 to 9, the templet support, which in the preceding embodiments consists of a one-piece support, consists of two parts articulated to one another. The support proper 18 comprises a dovetail portion 4*a* (Figure 5) for the attachment of the tail stocks 5 and 6 and an attachment bar 10 fixed to the support 18 by the arms 8 and 9 which are provided at their ends with bearings 8*a* and 9*a* in which the ends of the bar 10 are mounted, thus permitting pivotal movement of the support. The attachment of the said bar 10 to the slide is different from that according to the previously described embodiments. As will be seen from Figures 5 and 8, a block 19, corresponding to the block 12 or 12' in the previous embodiments, carries four rollers 20, 20*a*, 21 and 21*a*. The rollers 20, 20*a* are provided with a circumferential V-groove and serve for guiding the bar 10. The rollers 21, 21*a* are cylindrical and serve to hold the bar 10 against the rollers 20, 20*a* in such a manner that said bar 10 slides, without radial play, in the block 19. The support 18 rests on the other hand at its two lower ends on two bearings 22 and 23 serving for the articulation of the pivotal support 24 in the same manner as the support 1 above described. By a symmetrical disposition on both sides of the vertical plane passing through the bearings 2 and 3 (see Figure 6) it will be understood that the displacements L^4 of the slide are equal to the displacements L^5 of the templet, disregarding the infinitesimal differences between the lengths of the arcs and the chords which is permissible by choosing the position of the pivotal axis 2 of the support 24 as low as possible.

What is claimed is:

1. In a copying device for machine tools, such as lathes, having a work spindle and including a longitudinally movable carriage, a transverse slide on the carriage, a templet carrier for supporting a templet parallel to said spindle and coupled to the slide for transverse movement in unison therewith, a pivoted support for the carrier the length of which is such that at its point of coupling with said carrier there is an infinitesimal difference between the arc described and its chord when the support is pivoted about a first axis parallel to said spindle, means locking the carrier on the support against movement longitudinally of the machine, and means pivotally coupling the carrier to the slide about a second axis constantly parallel to said spindle and first axis and permitting longitudinal movement of said slide relative to said carrier, whereby said carrier templet is held parallel to said two axes irrespective of the positions of said slide and carrier.

2. A copying device as in claim 1 wherein the coupling means comprise a bar on said carrier extending parallel to said two axes and a slot on said slide embracing said bar.

3. A copying device as in claim 2 wherein the slot is substantially vertical.

4. A copying device as in claim 2 wherein the slot is at an angle to the vertical.

5. In a copying device for machine tools, such as lathes, having a work spindle and including a transverse slide, a templet carrier, for supporting a templet parallel to said spindle, a machining tool and a templet feeler both mounted, on said slide in mutually fixed relationship during machining of a workpiece, said feeler having an active surface transverse to the direction of movement of said slide with said feeler in tangential contact with said templet, a pivoted support for the carrier, the length of which is such that, at its point of contact between said templet and said feeler, there is an infinitesimal difference between the arc described and its chord when the support is pivoted about an axis parallel to said spindle, means locking the carrier on the support against movement longitudinally of the machine, and means to position said pivoted support during said machining in respect to said work spindle.

6. A copying device for machine tools comprising in combination: support means for a workpiece defining a copying axis, a carriage movable longitudinally parallel to said copying axis, a slide mounted on said carriage for movement transversely to the copying axis, a machining tool and a templet feeler both mounted on said slide in mutually fixed relationship during machining of a workpiece, a support for a copying templet mounted for swinging motion about an axis parallel and fixed with respect to said copying axis, a copying templet mounted on said support with its peripheral surface positioned to contact said feeler, said feeler having an active surface transverse to the direction of movement of said slide with said feeler in tangential contact with said templet, and an abutment in fixed relationship with respect to said workpiece supporting means engaging a portion of said templet support to maintain said templet in predetermined position relative to said copying axis.

7. A pendulous templet-holder for controlling the position of a tool with respect to the bed of a copying-machine-tool, comprising a templet-holding member, mounted on said bed to freely oscillate about an axis, a stopping member associated with said templet-holding member, a reference abutment secured on said machine-tool bed, means to accurately adjust the relative position of said stopping member with respect to said templet-holding member so as to make said reference abutment capable of limiting, through said stopping member, the freedom of angular displacement of said templet-holding member to a desired precise angular position, and means to make said members rigid with each other in any desired position relationship, independently of said accurate adjusting means.

8. A copying device as in claim 2 comprising a pair of grooved rollers in the slot on one side of the bar and a pair of cylindrical rollers in the slot on the other side of the bar, maintaining strict alignment of the slide with respect to the longitudinal axis of the bar.

9. A copying device as in claim 1 further comprising a pivotal connection between the templet carrier and the pivoted support for the carrier, thereby to define straight line movement of the templet concurrently with arcuate movement of the pivotal connection between the carrier and support.

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