United States Patent

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[54] **TRUEING DEVICE FOR GRINDING WHEELS**

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[52] **U.S. Cl.** ..... **125/11 AT**

[51] **Int. Cl.** **B24b 53/06**

[58] **Field of Search** ..... 125/11 AT

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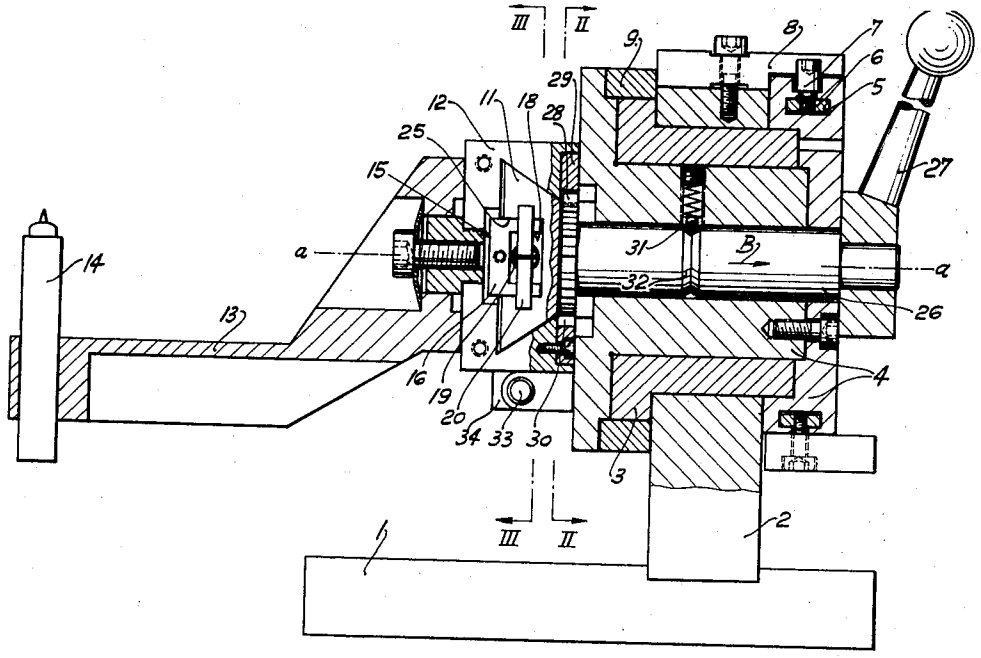
[57] **ABSTRACT**

A trueing device for grinding wheels, particularly for trueing concave or convex profiles with a rectilinear movement of the trueing tool. The trueing device has a carrier capable of limited rotary movement determined by adjustable stops and has a slide guide extending at right angles to its pivot axis. A slide is guided for movement on the slide guide and carries the trueing tool. A spring is provided which extends parallel to the slide guide and is located therein. Stop elements are secured to opposite ends of the spring and are engaged at each end with the abutment surfaces on the opposite ends of the slide. The spring normally maintains the abutment surfaces in an aligned condition in the mid position. A driving device is provided which includes a driving shaft which is coaxial with the axis of rotation of the carrier and operates the slide via members that convert its rotary action into rectilinear motion.

10 Claims, 4 Drawing Figures



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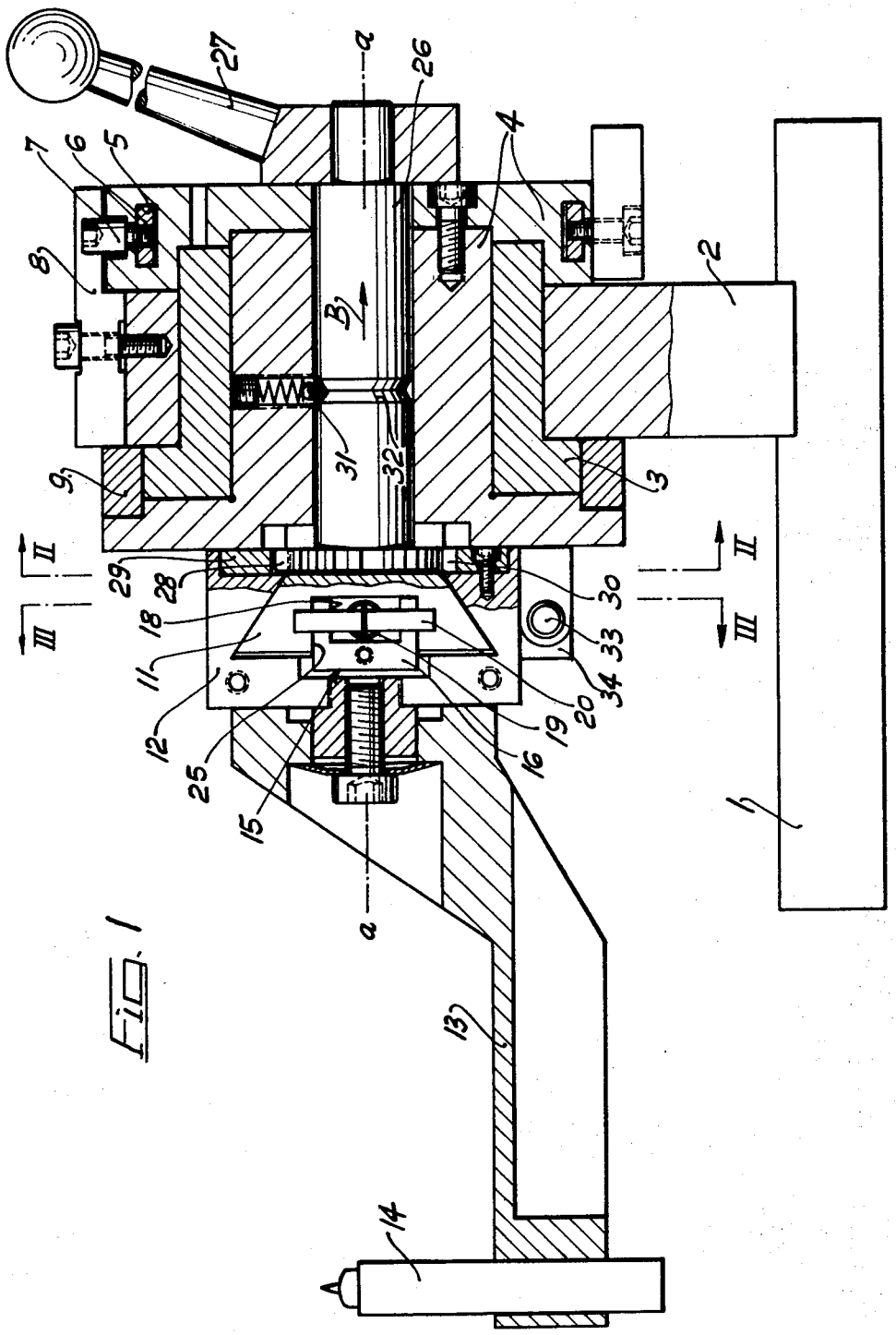

FIG. 1

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Fig. 2

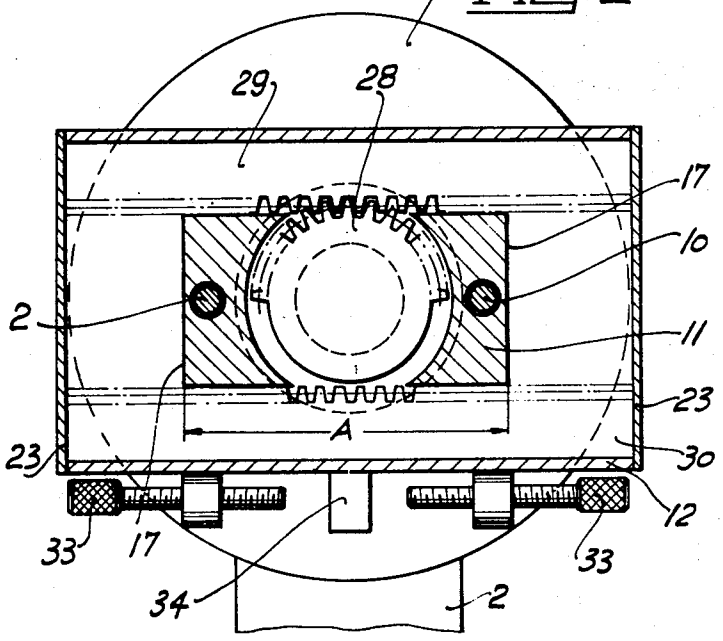

Fig. 3

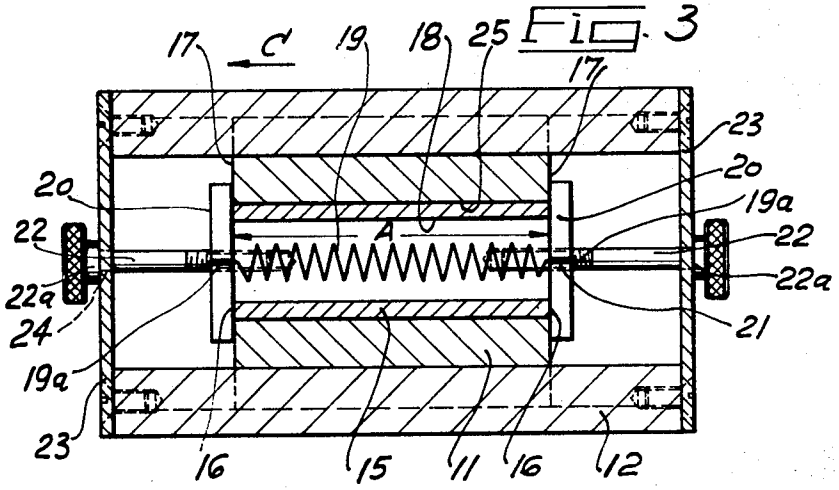

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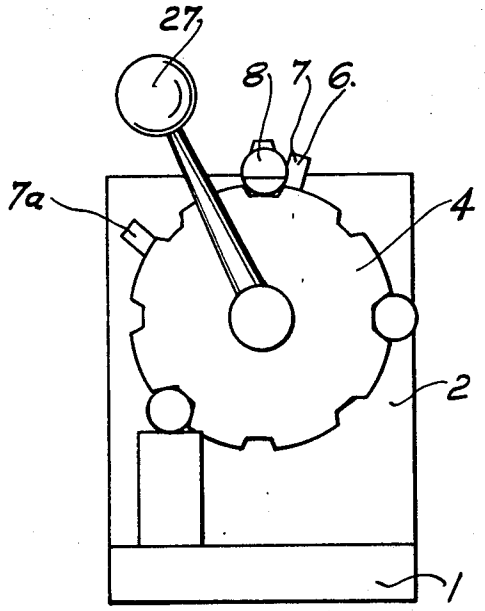
FIG. 4



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TRUEING DEVICE FOR GRINDING WHEELS

This invention relates to a trueing device for grinding wheels, for trueing concave or convex profiles with rectilinear movement of the trueing tool, the device comprising a carrier capable of limited rotary movement determined by adjustable stops, and having a slide guide extending at right angles to its pivot axis, a slide guided for movement on this guide and carrying the trueing tool, a spring parallel to the slide guide and located therein and engaging at each end with abutment surfaces on the carrier and also with abutment surfaces on the slide via stop elements which engage over the abutment surfaces of the slide and the abutment surfaces of the carrier, which in the mid-position are aligned with those of the slide, and which elements by abutment against all four abutment surfaces hold the slide resiliently in a mid-position, and a driving device which includes a driving shaft which is coaxial with the axis of rotation of the carrier and operates the slide via members that convert its rotary action into rectilinear motion.

In a known trueing device of this type the spring is a compression spring which is arranged in a bore extending in the longitudinal direction of the slide. At both ends of the bore are provided hollow screws on which the spring bears through the intermediary of washers. Concentric with and within the compression spring is provided a rod which is guided through the hollow screws and projects beyond both ends of the bore. The ends of the rod are secured in a forked holder which is connected to the carrier. The ends of the rod are surrounded by spacing bushings which in the mid-position of the slide project into the hollow screws. The inner ends of the hollow screws form abutment surfaces on which the said washers abut in the mid-position of the slide and hence hold the slide resiliently in the mid-position.

This arrangement has various disadvantages. In order that the slide may be held in its mid-position without any play, it is necessary for the distance between the abutment surfaces of the two spacing bushings and the distance between the abutment surfaces of the two distance bushings to be exactly equal. However, this can be achieved only with difficulty, since this distance depends on the one hand on the length of the two hollow screws and the length of the slide member into which the hollow screws are screwed, and on the other hand on the width of the forked part of the carrier and the actual length of the spacing bushings. In many such machine parts it is extremely difficult to machine them so exactly that the distances between the abutment surfaces are in fact equal. Even very slight manufacturing tolerances can add up. If it is in fact desired to manufacture a trueing device that operates without play, then the lengths of the spacing bushings must in practice be adjusted by grinding and testing, complete dismantling of part of the device being necessary each time. The multiplicity of individual parts that have to be very accurately manufactured also makes the manufacture of the known trueing device expensive. Should it in fact be possible to machine these individual parts so accurately that the spacing of the respective abutment surfaces is exactly the same, this does not ensure that in the mid-position of the slide relative to the carrier the trueing diamond is also in fact in its mid-position. For accurate trueing it is however necessary for the trueing diamond to be capable of such adjustment that in the mid-position of the slide it is located exactly in the plane passing through the pivot axis of the carrier. Such adjustment is impossible with the known trueing device, and additional expenditure would be necessary in providing for such adjustment.

The invention is based on the problem of providing a trueing device of the type referred to initially, which is of simpler construction and is cheaper to manufacture, and wherein the slide is held in its mid-position in spite of large manufacturing tolerances and which also permits subsequent adjustment of the slide relative to the pivot axis.

In accordance with the invention this is achieved in that there is provided in the slide guide a slider which is connected to the slide via adjusting screws extending in its direction of movement and movable in the same direction, which slider has an abutment surface at each end and is of a length that corresponds to the spacing of the two abutment surfaces on the slide guide of the carrier, the spring being a tension spring and having its ends connected to the stop elements.

The new trueing device is, in the first place much simpler in construction, because spacing bushings, hollow screws and above all a forked holder, such as were necessary in the known device, are absent. Not only because of the reduced number of individual parts, but also because the remaining individual parts require less accuracy in their manufacture, is the new device cheaper to manufacture. In particular, owing to the use of the slider, the length of which corresponds to the spacing of the stop surfaces on the slide, greater tolerances in manufacture are possible and moreover manufacture is simplified. The slider may be manufactured together with the slide guide, the abutment surfaces on both parts being ground in one operation. This ensures that the spacing of the abutment surfaces on the slider is exactly equal to the spacing of the abutment surfaces on the slide guide, which is of the greatest importance for operation of the device without play. In this operation it is also not necessary for the spacing of the abutment surfaces on both sides of the pivot axis to be exactly the same. On the contrary, owing to the provision of the adjusting screws adjustment of the slide relative to the slider can be effected at any time, in such manner that the point of the trueing tool takes up any desired position.

Further advantages and details of the invention are explained in the following description of an embodiment with reference to the accompanying drawings, in which

FIG. 1 is a longitudinal sectional view of a device according to the invention,

FIG. 2 is a cross-section on the line II—II of FIG. 1,

FIG. 3 is a cross-section on the line III—III of FIG. 1, and

FIG. 4 is an end view, looking in the direction IV of FIG. 1, on a smaller scale.

In the drawings, reference numeral 1 indicates a base plate, which serves for mounting the trueing device on a machine tool. To this base plate is connected a housing 2 in which a carrier 4 is pivotally mounted through the intermediary of a bearing sleeve 3. The carrier 4 has in its rear side an annular T-groove 5 in which stops 7 in the form of screws are guided by means of clamp-

ing members 6 so that they can be shifted and fixed in position. To the housing 2 is also secured a fixed stop 8. A ring 9 with a graduated scale may serve for setting the device. At the front side of the carrier 4 a slide guide 11 of dovetail shape is secured by means of the screws 10 shown in FIG. 2. A slide 12 is movable on the slide guide 11. The slide 12 is connected to an arm 13 which carries the trueing tool 14. Instead of one trueing tool, a plurality of trueing tools for coarse and fine trueing may be secured to the arm in known manner.

In accordance with the invention there is provided in the slide guide 11 a slider 15, which is also movable relative to the slide guide 11 in the direction of movement of the slide 12. This slide 15 is formed at both ends with abutment surfaces 16. The slide guide 11 also has abutment surfaces 17 at both ends. The distance A between the abutment surfaces 16 of the slider 15 and the distance A between the abutment surfaces of the slide guide 11 must be exactly equal. For this purpose it is advantageous during manufacture to mount the slider 15 and the slide guide 17 together and then to machine the abutment surfaces 16, 17 in one operation, for example by grinding.

The slider 15 has, on the side facing the slide guide 11, a groove 18 in which a tension spring 19 is arranged. The two ends of the tension spring are connected to stop elements, which are preferably constituted by pins 20. The pins 20 may have at their centers recesses 21 for engagement by the ends 19*a* of the spring.

The slider 15 is connected to the slide 12 via adjusting screws 22 engaging its ends. The slide 12 is longer than the slider 15, and is provided at both ends with end plates 23. Each of these end plates has a hole 24 for the passage of the adjusting screws 22, the heads 22*a* of which abut the end plates 23. By releasing one adjusting screw and tightening the other, the slide 12 may be adjusted relative to the slider 15 and hence the trueing tool 14 may be adjusted relative to the pivot axis *a*—*a* of the carrier 4.

Preferably the slide guide 11 is of the same length as the slide 15 in which case the abutment surfaces 17 are arranged to be at the ends of the slide guide 11. This facilitates grinding of the abutment surfaces 16, 17 when the slide guide and the slider are mounted together for machining.

Also for facilitating this operation, and also in order that the slider 15 may not set itself obliquely relative to the slide, it is advantageous for the slider 15 to be guided in a longitudinal groove 25 in the slide guide.

For driving the whole trueing device there is used a driving shaft 26 which is arranged within the carrier 4, concentric with its pivot axis *a*—*a*. The driving shaft 26 is provided at its rear end with a hand crank 27. At its front end it has, in the example illustrated, a pinion 28 which as shown in FIG. 2 extends around only half the circumference of the shaft. In the position shown in FIGS. 1 and 2 the pinion 28 engages with an upper rack 29 connected to the slider 12. Beneath the pivot axis the slide 12 is provided with a further rack 30. The driving shaft 26 is journalled so as to be movable in the axial direction B, and in the engaged position of the pinion 28 is held by a spring loaded ball 31 which engages in an annular groove 32 in the driving shaft 26. By shifting the driving shaft in the direction of the arrow B its pinion 28 can be brought out of engagement with the rack 29, the driving shaft can then be turned through 180° and then brought into engagement with the rack 30 by shifting it in the opposite direction to that of the arrow B. In this way the direction of movement that the slide executes after completion of a pivotal movement, is reversed.

The operation of the device is as follows:

It will first be assumed that the slide 12 is in its mid-position. In this mid-position it is held by the spring 19 and the pins 20. The pins 20 bear against the abutment surfaces 16 and against the abutment surfaces 17. If the driving shaft 26 is now set in rotation by means of the hand crank 27, the whole carrier first swings with the slide guide, the slide and the trueing tool. The point of the trueing tool executes a circular motion. This swinging of the carrier continues until the stop screw 7 connected to the carrier 4 abuts the fixed stop 8. If further pressure is exerted on the hand crank 27, the slide 12 is shifted by the pinion 28 and the rack 29, the spring 19 opposing this movement. If for example the slide 12 moves to the left in the direction of the arrow C in FIG. 3, the left-hand pin 20 moves away from the abutment surface 17 of the slide guide, while it continues to bear against the abutment surface 16 of the slider 15. Conversely, the right-hand pin 20 remains in contact with the abutment surface 17 of the slide guide 11. During the displacement of the slide 12 against the spring force the point of the trueing diamond executes a rectilinear movement. This continues until the movement of the slide is stopped either by its end plate 23 coming into contact with the slide guide, or by an adjustable stop screw 33 which coacts with a nose 34 on the slide 12.

If now the hand crank 27 is moved in the opposite direction, the slide is first returned to its mid-position under the action of the tension spring 19. Only when the slide has again reached its mid-position does swinging of the carrier occur until the second adjustable stop screw 7*a* abuts the fixed stop 8 and the slide is then shifted again by the pinion 28 and the rack 29, against the force of the spring 19, as above described.

We claim:

1. A trueing device for grinding wheels, comprising:
base means;
first limit means mounted on said base means;
carrier means mounted on said base means and including means for supporting said carrier means for rotation relative to said base means, said carrier means having second limit means thereon engageable with said first limit means to limit the rotational movement of said carrier means relative to said base means;
shaft means mounted on said carrier means for rotation with and with respect to said carrier means;
elongated guide means of finite length mounted on said carrier means for movement therewith and having means defining first abutment surfaces thereon;
elongated slider means of finite length mounted on said guide means for sliding movement therealong and having means defining second abutment surfaces thereon;
gear transmission means connecting said shaft means to said slider means, said gear transmission means being ineffective in moving said slider means along

said guide means on a rotation of said shaft means when said carrier means is free to rotate with said shaft means, said gear transmission means effecting a movement of said slider means along said guide means when said first and second limit means are engaged; and

stop means engaging said first and second abutment surfaces and adapted to hold said slider means in a mid-position relative to said guide means when said first and second limit means are out of engagement so that a rotation of said shaft means will effect a translational movement of said slider means along said guide means only when said first and second limit means are engaged and said shaft means is rotated in a direction to cause said first and second limit means to remain engaged.

2. A trueing device according to claim **1**, wherein said guide means and said slider means have abutment surfaces on opposite ends; and

wherein said stop means comprise a pair of stop elements positioned to engage said abutment surfaces at opposite ends of said slider means and said guide means and tension spring means connected between said pair of stop elements to hold said stop elements in engagement with said first and second abutment surfaces on said slider means and said guide means.

3. A trueing device according to claim **2**, wherein said elements are pins which extend transversely to the direction of pull of said tension spring means and at their centers have recesses for engagement by the ends of said spring means.

4. A trueing device according to claim **1**, wherein said guide means is of the same length as said slider means.

5. A trueing device according to claim **1**, wherein said guide means comprises a slide member mounted on said carriage means and a guide member mounted for translational movement along said slide member, said slider means being mounted on said guide member for translational movement therealong; and

including adjusting means for adjusting the position of said guide member relative to said slide member.

6. A trueing device according to claim **5**, wherein said adjusting means comprise adjusting screws and wherein said slide means is longer than said slider means and is provided at its ends with end plates, each end plate being formed with a hole for the passage of said adjusting screw the head of which bears on said end plate.

7. A trueing device according to claim **5**, wherein said slider means is guided in a longitudinal groove in said slide member.

8. A trueing device according to claim **5**, wherein said slider means has in the side facing the slide member a groove for the reception of said spring member.

9. A trueing device according to claim **5**, wherein said slide has on each side of the axis of rotation of said carrier means a rack, said shaft means being provided with a pinion extending around half its circumference, said shaft means being axially shiftable so that the pinion can, by axial movement, be brought out of engagement with one rack and after rotation of said shaft means through 180° and axial movement in the opposite direction can be brought into engagement with the other rack.

10. A trueing device according to claim **9**, wherein said pinion on said shaft means is held in its engaged position with said rack by a spring loaded ball which engages an annular groove in said shaft means.

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