Nov. 23, 1943. C. G. FLYGARE ET AL 2,335,207

GRINDING WHEEL TRUING APPARATUS

Filed May 5, 1942 3 Sheets-Sheet 1

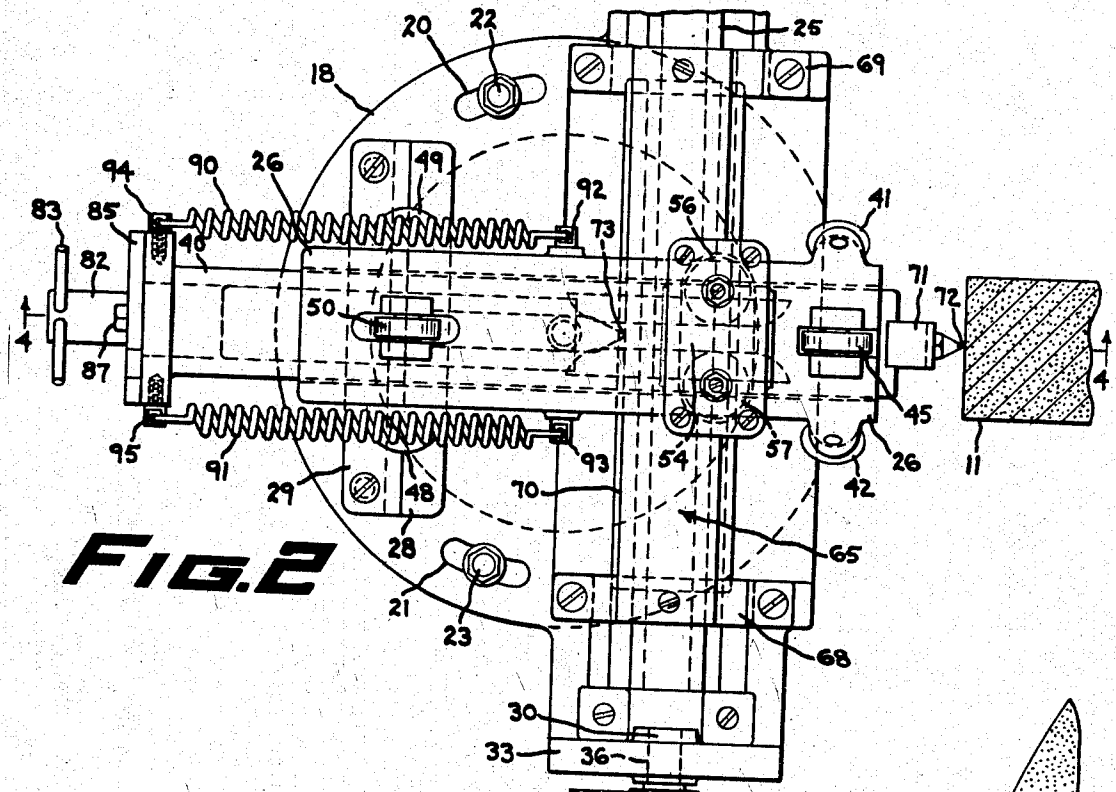


FIG. 2

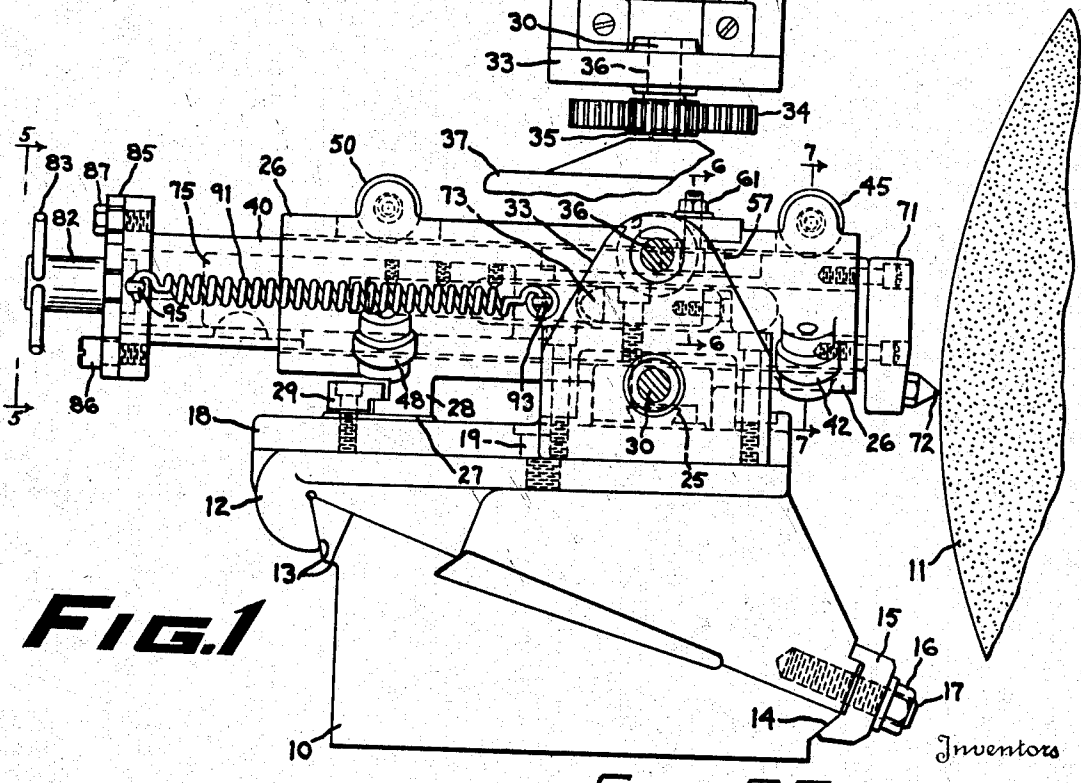


FIG. 1

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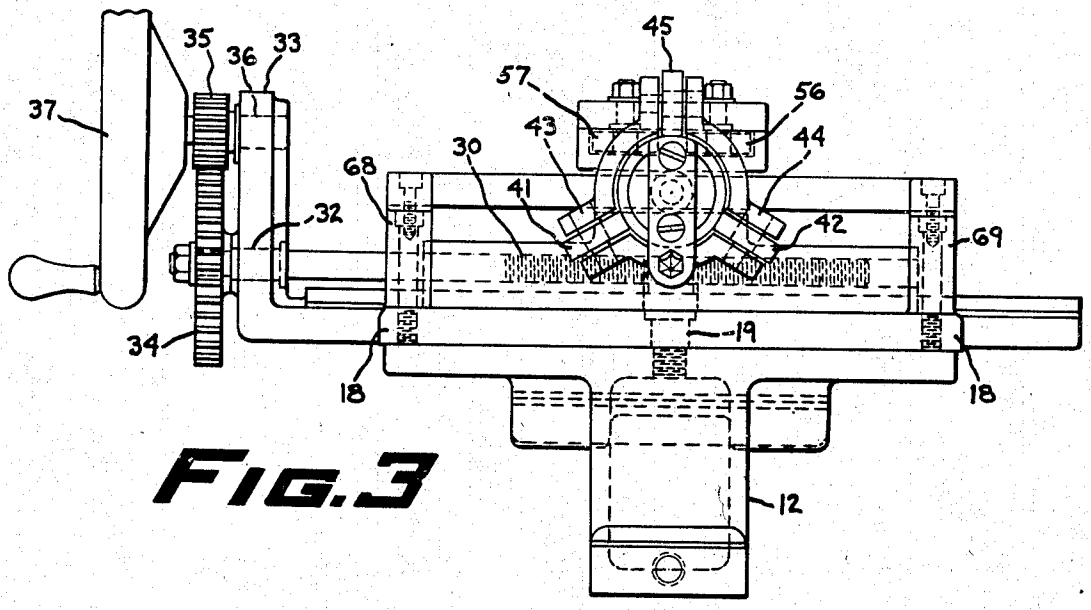


FIG. 3

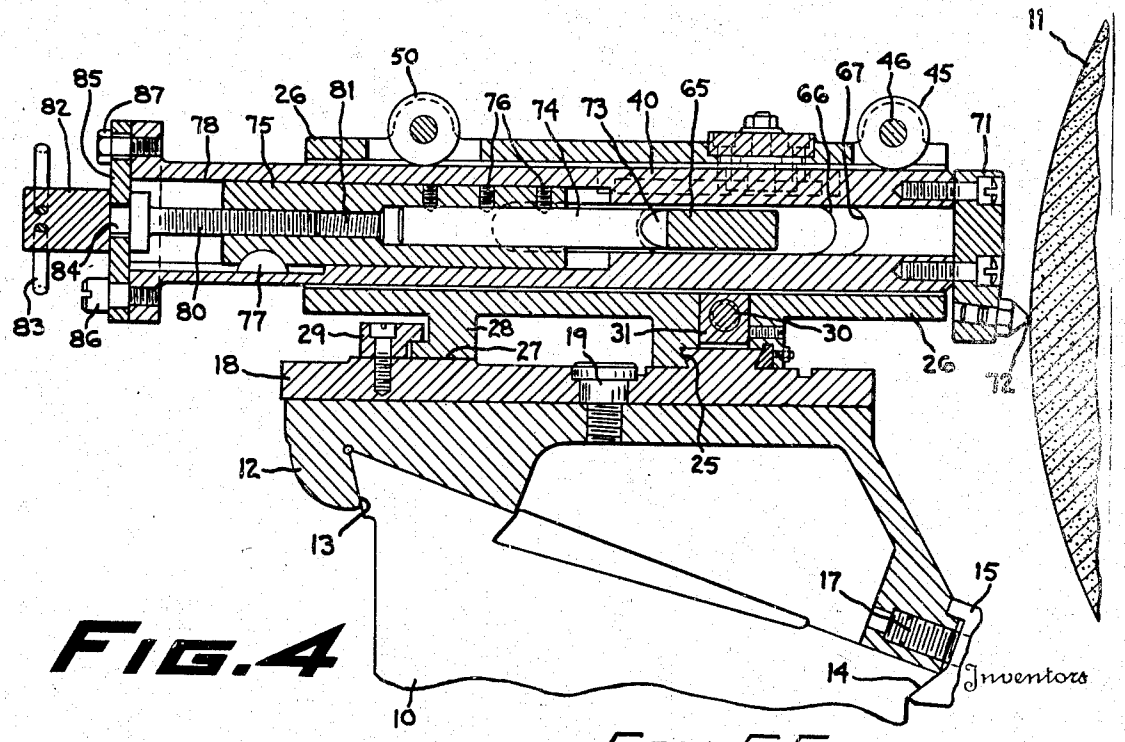


FIG. 4

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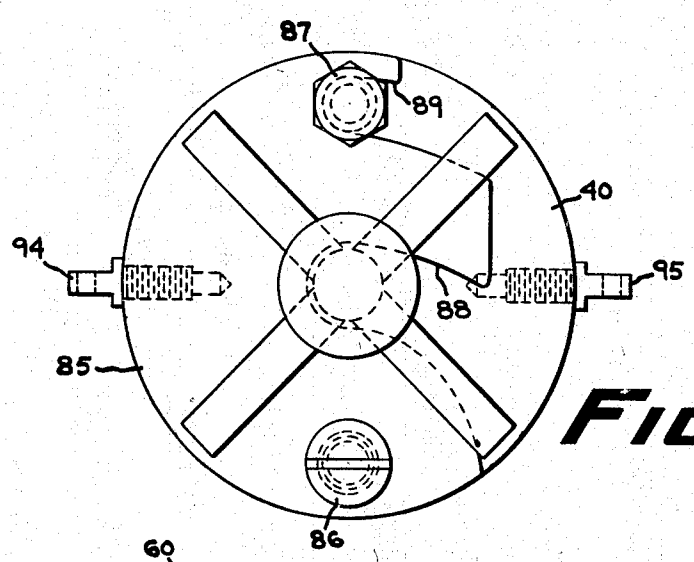


FIG. 5

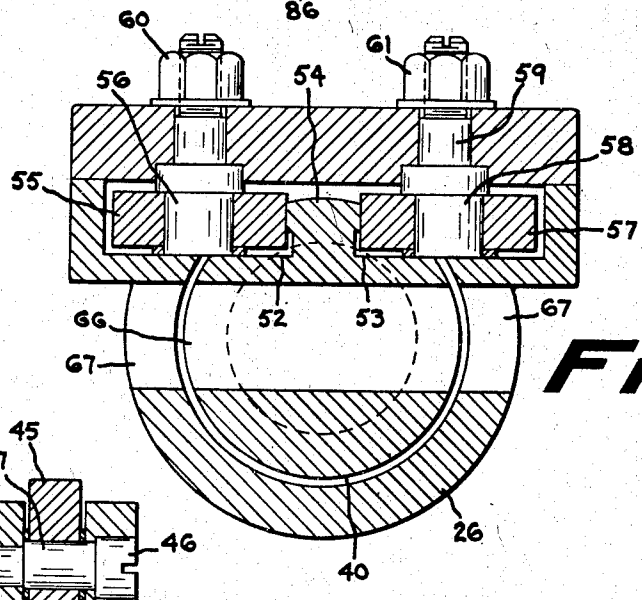


FIG. 6

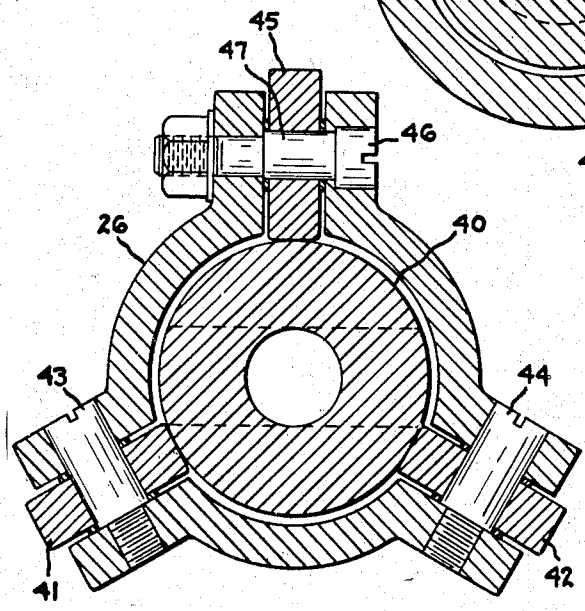


FIG. 7

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UNITED STATES PATENT OFFICE

2,335,207

GRINDING WHEEL TRUING APPARATUS

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Application May 5, 1942, Serial No. 441,802

6 Claims. (Cl. 125—11)

This invention relates to grinding machines, and more particularly to a truing apparatus for truing the operative face of a grinding wheel.

One object of the invention is to provide a simple and thoroughly practical grinding wheel truing apparatus which is arranged for truing either a true cylindrical, tapered or formed face on a grinding wheel. Another object of the invention is to provide a truing apparatus having a freely-movable roller-supported slide for supporting the truing tool. Another object of the invention is to provide a truing apparatus with a cylindrically shaped truing tool slide having a forming bar which passes thorugh an elongated slot in said slide and an adjustable follower axially located within the slide so that the thrust of the follower relative to the slide is in an axial direction, thereby preventing cramping of the slide during a truing operation.

Another object of the invention is to provide a longitudinally and transversely movable truing tool slide. Another object of the invention is to provide a truing apparatus having a longitudinally movable slide and a transversely movable truing tool slide thereon and a forming bar and a follower arranged so that the thrust of the latter is in an axial direction relative to the truing tool slide. A further object of the invention is to provide a truing apparatus which may be adjustably swivelled to facilitate the truing of a tapered face on a grinding wheel. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, as will be exemplified in the structure to be hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings in which is shown one of various possible embodiments of the mechanical features of this invention,

Fig. 1 is a right-hand end elevation of a fragment of a cylindrical grinding machine, showing the improved grinding wheel truing apparatus;

Fig. 2 is a plan view of the truing apparatus;

Fig. 3 is a rear elevation of the truing apparatus as shown in Figs. 1 and 2;

Fig. 4 is a cross sectional view, on an enlarged scale, taken approximately on the line 4—4 of Fig. 2;

Fig. 5 is a fragmentary front elevation of the truing tool slide, on an enlarged scale, taken approximately on the line 7—7 of Fig. 1;

Fig. 6 is a fragmentary cross sectional view, on an enlarged scale, taken approximately on the line 6—6 of Fig. 1; and

Fig. 7 is a cross sectional view, on an enlarged scale, taken approximately on the line 5—5 of Fig. 1.

A portion of a cylindrical type grinding machine has been illustrated in the drawings, comprising a longitudinally movable table 10 and a rotatable grinding wheel 11. The improved truing device is preferably detachably mounted on the work supporting table 10 and comprises a base 12 having dovetailed shaped supporting surfaces 13 which mate with correspondingly shaped surfaces on the table 10. The table 10 is also provided with a dovetailed surface 14 which is arranged to mate with a correspondingly shaped surface on a clamping block 15. The clamping block 15 is supported on a threaded stud 17 which is in turn fixedly supported by the base 12. A nut 16 on the stud 17 serves to lock the clamping block 15 in position to securely hold the truing apparatus base 12 in an operative position on the work supporting table 10.

The base 12 pivotally supports a circular shaped platen 18. A stud 19 passes through the plate 18 and is screw threaded into the base 12. The platen 18 is provided with elongated arcuate shaped slots 20 and 21. Clamping bolts 22 and 23 pass through the slots 20 and 21 and are screw threaded into the base 12. It will be readily apparent from the foregoing that the platen 18 may be swivelled about the stud 19 and clamped in the desired position by means of the clamping bolts 22 and 23

The platen 18 is provided with a dovetailed slideway 25. A longitudinally traversable slide 26 is provided with a correspondingly shaped dovetailed slideway which mates with the slideway 25 so that the slide 26 may be guided in a straight line path relative to the platen 18. The platen 18 is also provided with a plane way 27 which is formed on a downwardly projecting portion 28 of the slide 26. A guide block strip 29 is fastened to the platen 18 and serves to hold the slide 26 downwardly with its plane flat way in operative engagement with the plane way 27 on the platen 18.

A traversing mechanism is provided for traversing the slide 26 longitudinally, comprising a rotatable screw 30 which is screw threaded into a nut 31. The nut 31 is fixedly supported on the under side of the longitudinally movable slide 26. The screw 30 is rotatably supported in a bearing 32 formed in an upwardly extending bracket 33 which is formed integral with the

platen 18. A gear 34 is mounted on the outer end of the screw shaft 30 and meshes with a gear 35 which is rotatably supported on a stud 36. The stud 36 is fixedly supported in the bracket 31. A manually operable traverse wheel 37 is mounted to rotate the gear 35 so that any rotary motion of the hand wheel 37 will be transmitted through the gears 35—34 to rotate the screw 30 so as to impart a longitudinal traversing movement to the slide 26.

The slide 26 serves as a support for a transversely movable truing tool slide 40. The slide 40 is preferably cylindrical in shape and is preferably supported by a roller support in order to facilitate a free movement of the slide relative to the longitudinally movable slide 26. Two sets of spaced supporting rollers are provided, each comprising three symmetrically arranged rollers. The forward end of the slide 40 is supported by a pair of rollers 41 and 42 which are in turn supported on fixed studs 43 and 44, respectively. An upper roller 45 is supported by means of a stud 46. The stud 46 is provided with an eccentric portion 47 by means of which the axis of the roller 45 may be adjusted toward and from the axis of the slide 40 whereby the roller 45 may be adjusted to facilitate taking up any lost motion between the slide and its supporting rollers so as to provide a free and easy movement of the slide 40 relative to the longitudinally movable slide 26. The other end of the slide is supported by a pair of lower fixed rollers 48 and 49 and an upper roller 50. The support for this set of rollers is identical with the set just previously described. The lower supporting rollers 48 and 49 are mounted on fixed studs and the upper roller 50 is adjusted on an eccentric stud to facilitate adjustment of the roller 50 as desired. It will be readily apparent from the foregoing disclosure that by adjustment of the rollers 45 and 50, the slide 40 may be freely moved without lost motion therebetween. The provision of the adjustable mounts for the upper rollers serves not only for an initial adjustment but also serves to compensate for any wear between the parts as the truing apparatus is used.

A portion of the upper part of the cylindrically shaped slide is provided with longitudinally extending cut-out portions 52 and 53 forming an outwardly projecting guide 54 which serves to hold the slide 40 against rotary motion. In order to provide free movement thereof, a roller 55 is mounted on a stud 56 which is fixedly mounted relative to the slide 26. The roller 55 rides against one side face of the guide 44. A roller 57 is mounted on an eccentric portion 58 of an adjustably mounted stud 59. The roller 57 bears against the opposite side face of the guide 54. By adjusting the position of the eccentric portion 58 of the stud, the roller 57 may be adjusted toward or from the axis of the stud 56, as desired. The studs 56 and 59 may be locked in adjusted position by means of nuts 60 and 61. When it is desired to adjust the position of the eccentric 58, the nut 61 may be loosened and the stud 59 rotated by placing a screw driver in the slot formed in the upper part of the screw threaded portion of the stud 59 to position the eccentric 58 and the roller 57. After the desired adjustment has been made, the nut 61 is then clamped in position rigidly to maintain the eccentric 58 and the roller 57 in adjusted position. By this adjustment of the roller 57, lost motion may be taken up and the slide held so that it travels freely in a straight line path.

In order to true a predetermined shape on the periphery of the grinding wheel 11, a forming bar 65 is provided. The forming bar passes through an elongated slot 66 formed in the transversely movable slide 40 and through an elongated slot 67 formed in the longitudinally movable slide 26. The opposite ends of the forming bar 65 are fastened to brackets 68 and 69, respectively, which are fixedly mounted to the swivel plate 18. The forming bar 65 is provided with a formed edge portion 70 which in the present case is illustrated as a plane surface to facilitate truing a cylindrical face on the grinding wheel 11. If desired, a forming bar 65 having an irregularly shaped or curved face 70 may be provided, if desired, to true a corresponding shape upon the periphery of the grinding wheel 11.

The forward end of the slide 40 is provided with a truing tool holder 71 which serves as a support for a diamond or truing tool 72. A follower 73 is adjustably supported in a manner to be hereinafter described by the slide 40. The follower, as shown in Fig. 2, is preferably shaped to correspond with the shape of the truing tool 72 and is formed on the forward edge of the rod 74 which is held in adjusted position within a sleeve 75 by means of screws 76. The sleeve 75 is slidably keyed by means of a key 77 within a cylindrical bore 78 formed within the slide 40.

To facilitate adjustment of the follower 73 relative to the slide 40, a nut and screw adjusting mechanism is provided, comprising a rotatable screw 80 which is screw threaded into a threaded aperture 81 formed within the left-hand end of the sleeve 75 (Fig. 4). The outer end of the screw 40 is formed as an enlarged head 82 having spokes 83 which serve as a hand wheel to facilitate adjustment of the screw to position the follower 73 as desired. The enlarged portion 82 is provided with a groove 84. An end cap or plate 85 is pivotally supported by a stud 86 on the end of the slide 40. The end cap or plate 85 is arranged to be locked in an operative position by means of a clamping screw 87. In order to facilitate replacement or adjustment of the follower 73, the plate 85 is provided with arcuate shaped cut-out portions 88 and 89, respectively. The arcuate cut-out portion 88 serves to surround and ride within the groove 84 and the arcuate cut-out portion 89 serves to surround a portion of the clamping screw 87.

When it is desired to remove the follower 73, the screw or clamping bolt 87 may be loosened and the plate 85 swung in a clockwise direction (Fig. 5), thus swinging the plate clear of the enlarged knob 82 of the screw 80, after which the screw 80 together with the sleeve 75 and the follower 73 may be readily withdrawn so that the follower 73 may be adjusted or interchanged for a new or differently shaped follower when desired.

In order to prevent clamping of the truing tool slide 40 and to provide a free movement thereof as the slide 26 is moved longitudinally so that the follower 73 may freely follow the formed surface 70 on the forming bar 65, the follower 73 and the forming bar are arranged in a plane passing through the axis of the truing tool slide 40 so that any thrust of the forming bar on the follower will be imparted in an axial direction, thus eliminating any tendency of the slide 40 to clamp as it is moved transversely by the forming bar.

A yieldable means is provided for maintaining the follower in operative contact with the surface 70 of the forming bar 65 and may comprise a pair of tension springs 90 and 91 which are connected

at one end by means of studs 92 and 93, respectively, which are fixedly mounted on the longitudinally movable slide 26. The other ends of the springs 90 and 91 are supported by studs 94 and 95 which are fixedly supported on the transversely movable truing tool slide 40. These springs, as illustrated, are both arranged to exert tension in the same plane with the axis of the transversely movable truing tool slide 40 and the forming bar 55 and follower 73. It will thus be seen that all of the thrust exerted upon the truing tool slide 40 is in the same plane and exerts balanced or axial thrust on the truing tool slide 40, thus facilitating a free uncramped movement thereof.

The operation of this improved truing apparatus will be readily apparent from the foregoing disclosure. Assuming the rollers 45, 50 and 57 to have been previously adjusted to facilitate a free controlled transverse movement of the transversely movable truing tool slide 40, the truing tool 72 together with the transverse slide 40 and longitudinally movable slide 26 are moved longitudinally by rotation of the manually operable traversing wheel 37. The spoked wheel 83 may be rotated to adjust the screw 80 so as to adjust the position of the follower 73 relative to the transversely movable truing tool slide 40 so as to position the diamond or truing tool 72 in operative truing contact with the periphery of the grinding wheel 11. The truing tool 72 may be adjusted transversely to govern the extent of the truing operation by manipulation of the spoked wheel 83. After the truing tool has been adjusted transversely, the truing tool may be traversed longitudinally by rotation of the manually operable traverse wheel 37 to traverse the truing tool 72 across the face of the grinding wheel 11 to true a true cylindrical surface on the periphery of the wheel 11. The desired amount of truing may be obtained by manipulation of the spoked adjusting wheel 83 and by actuation of the manually operable traverse wheel 37.

If it is desired to true an irregular or curved face on the periphery of the wheel 11, the forming bar 65 may be readily removed and replaced with a similar bar having a formed surface 70 of a shape corresponding to the shape desired to be reproduced on the periphery of the grinding wheel, after which the operation of the truing apparatus is identical with that previously described.

If it is desired to true a frusto-conical face on the periphery of the grinding wheel 11, the clamping bolts 22 and 23 may be loosened and the plate 18 swivelled in either direction about its supporting stud 19 as a pivot, after which the plate 18 may be clamped in adjusted position by clamping the screws 22 and 23, after which the diamond may be traversed across the periphery of the grinding wheel 11 in a path at an angle to the axis of the grinding wheel 11 so as to true a tapered face on the periphery of the grinding wheel 11.

It will thus be seen that there has been provided by this invention apparatus in which the various objects hereinbefore set forth together with many thoroughly practical advantages are successfully achieved. As many possible embodiments may be made of the above invention and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

We claim:

1. In a truing apparatus for a grinding machine having a rotatable grinding wheel, a truing apparatus base, a transversely movable slide on said base which is arranged to move in a plane normal to the axis of the grinding wheel, a truing tool on one end of said slide, an elongated slot passing through said slide, a forming bar extending through said slot and fixed to said base, an adjustably mounted follower, an axial bore in said slide adjustably to support said follower, and yieldable means to maintain said follower in operative engagement with said forming bar, said forming bar and follower being arranged so that the thrust thereof on the slide is in an axial direction to prevent cramping of the slide.

2. In a truing apparatus for a grinding machine having a rotatable grinding wheel, a truing apparatus base, a transversely movable slide which is arranged to move in a plane normal to the axis of the grinding wheel, an anti-friction support on said base to support said slide, a truing tool on one end of said slide, an elongated slot passing through the axis of said slide, a forming bar extending through said slot and fixedly supported relative to said base, an axial bore in said slide, an adjustably mounted follower supported therein, and yieldable means to maintain said follower in operative engagement with said forming bar.

3. In a truing apparatus for a grinding machine having a rotatable grinding wheel, a truing apparatus base, a longitudinally movable slide thereon, a transversely-movable cylindrically-shaped slide which is arranged to move in a horizontal plane normal to the axis of the grinding wheel, a plurality of sets of spaced symmetrically arranged rollers on said longitudinally movable slide to support said transversely movable slide, a truing tool on one end of said transversely movable slide, an elongated slot passing through the axis of said transversely movable slide, a forming bar extending through said slot and fixedly supported relative to said longitudinal slide, an adjustably mounted follower, an axial bore in said transversely movable slide adjustably to support said follower, and yieldable means to maintain said follower in operative engagement with said forming bar, said forming bar, follower and yieldable means being arranged so that their thrust is in an axial direction relative to the transversely movable slide to prevent cramping thereof.

4. In a truing apparatus for a grinding machine having a base, an angularly adjustable swivel platen thereon, a longitudinally movable slide on said platen, a manually operable nut and screw mechanism to traverse said slide longitudinally, a transversely-movable cylindrically-shaped slide on said first slide which is movable in a plane normal to the axis of the grinding wheel, an anti-friction support on said first slide to support said latter slide, a truing tool fixedly mounted adjacent to one end of said latter slide, an elongated slot passing through the axis of the second slide, a forming bar fixedly mounted relative to said first slide and passing through said slot, an axial bore extending within said second slide, and a follower adjustably mounted within said bore.

5. In a truing apparatus for a grinding machine having a base, an angularly adjustable swivel platen thereon, a longitudinally movable slide on said platen, a manually operable nut and

screw mechanism to traverse said slide longitudinally, a transversely-movable cylindrically-shaped slide on said first slide which is movable in a plane normal to the axis of the grinding wheel, a plurality of sets of spaced symmetrically-arranged rollers on said first slide to support said latter slide, a truing tool fixedly mounted adjacent to one end of said latter slide, an elongated slot passing through the axis of the second slide, a forming bar fixedly mounted relative to said first slide and passing through said slot, an axial bore extending within said second slide, and a follower adjustably mounted within said bore.

6. In a truing apparatus for a grinding machine having a rotatable grinding wheel, a truing apparatus base, a transversely-movable cylindrically-shaped slide thereon, a truing tool supported adjacent to one end of said slide, two sets of spaced, symmetrically arranged rollers on said base to support said slide, means to adjust the position of at least one roller of each set toward or from the other rollers, a longitudinally extending rib formed integrally with the upper portion of said slide, a pair of adjustably spaced guiding rollers engageable with opposite sides of said rib to hold the slide against rotation, a horizontally arranged elongated slot passing through said slide, a horizontally extending forming bar passing through said slot and fixedly mounted to said base, an adjustable follower within said slide which is engageable with said forming bar, and a pair of spaced tension springs which are arranged in a horizontal plane with the follower, forming bar and the axis of the slide yieldably to maintain said follower in operative engagement with said forming bar.

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