March 29, 1938. A. RICKENMANN ET AL 2,112,679

MEANS FOR DRESSING GRINDING DISKS

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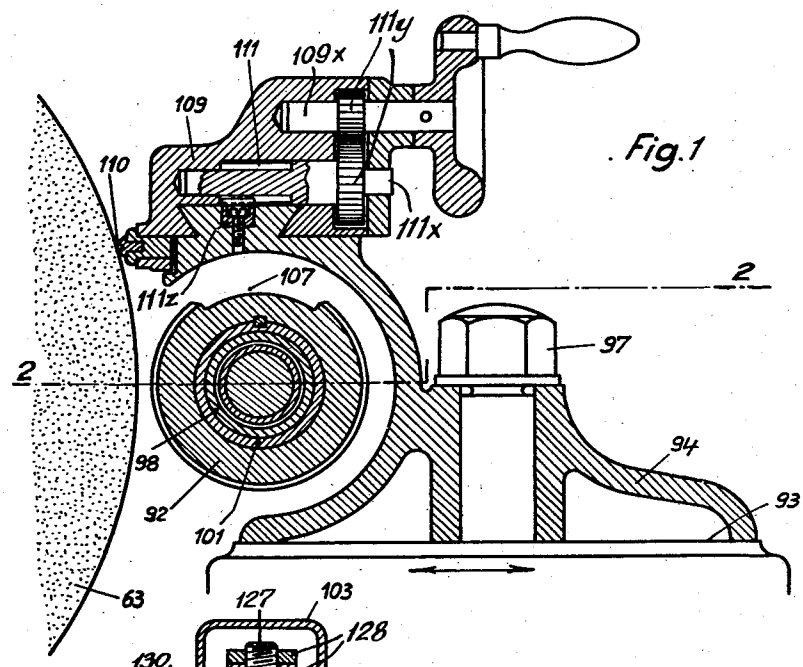


Fig. 1

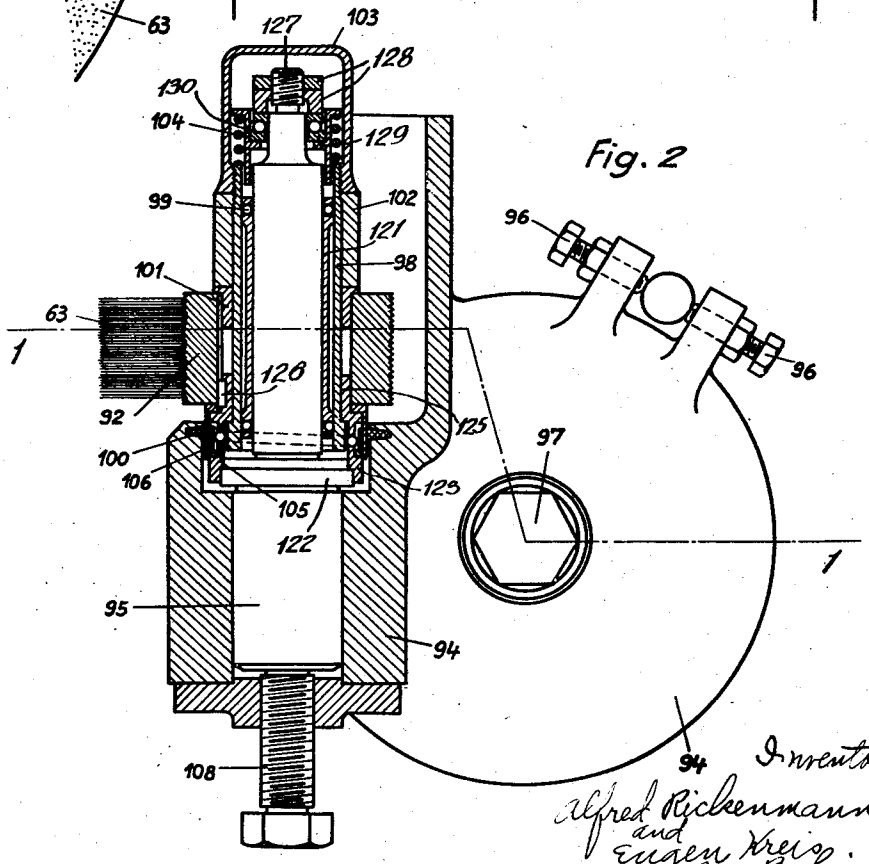


Fig. 2

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Fig.3

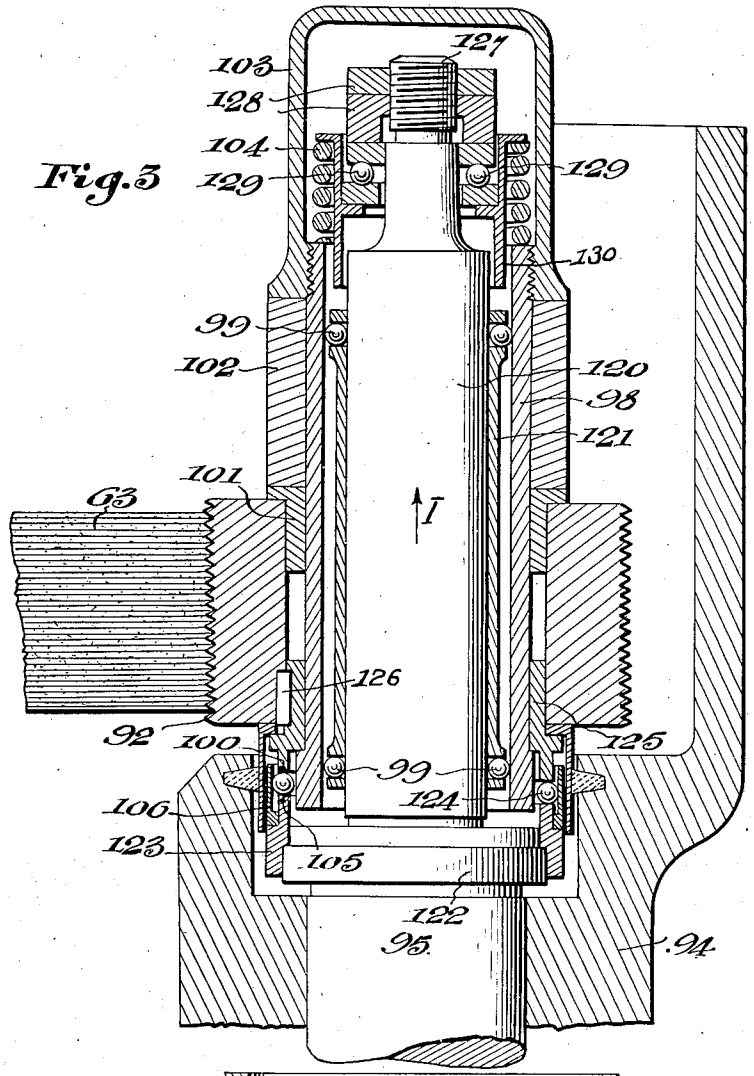
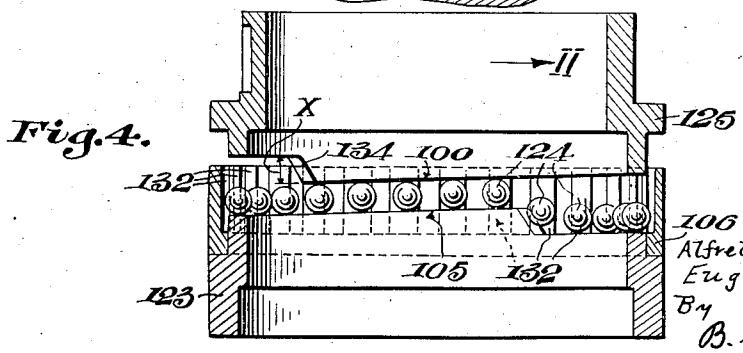


Fig.4.



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Filed Jan. 6, 1936 3 Sheets-Sheet 3

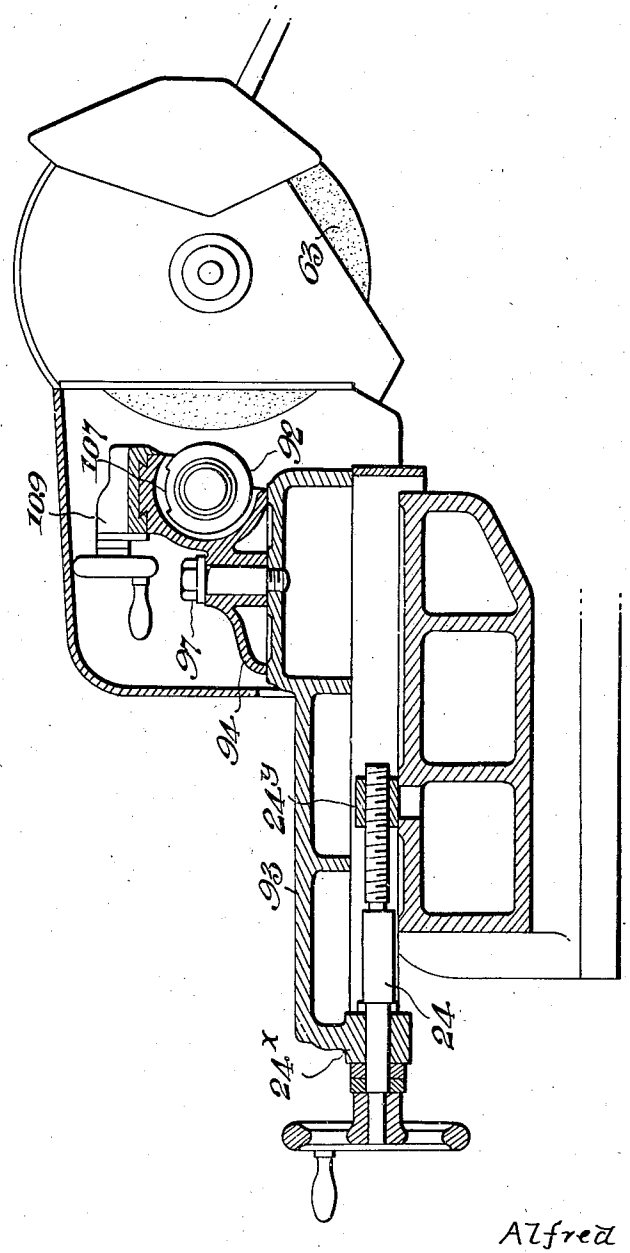


Fig. 5.

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UNITED STATES PATENT OFFICE

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MEANS FOR DRESSING GRINDING DISKS

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Application January 6, 1936, Serial No. 57,812

6 Claims. (Cl. 125—11)

The present invention relates to a new and improved device for trueing profiled grinding wheels having a plurality of annular grooves employed to produce a screw thread upon a workpiece, say taps, stock dies and so on.

The invention relates more particularly to a profiled rotary tool which has the converse profile of that of the grinding wheel in the form of one or more cylindrical screw threads and which tool is in engagement with the driving grinding wheel and returns after each complete revolution by an axial displacement to its initial position.

It has been proposed to effect the axial displacement of the trueing roller by means of cams corresponding with the screw pitch, bearing against one another over their cam surfaces of which cam one is fixedly connected to a stationary part and the other rotates with the roller, the roller being provided with a segmental recess at the point of its periphery which would be in contact with the grinding wheel at the time the axial return movement is to take place. The segmental recess allows the axial displacement of the roller relatively to the grinding wheels.

The main object of the invention is to provide reliable means to ensure the uninterrupted rotation of the roller while the axial displacement takes place, that is, while the grinding wheel and the roller are temporarily out of driving engagement.

A further object is the provision of a roller of a type aforesaid which is continuously rotated without the aid of auxiliary means.

Other objects of the invention will in part be obvious and in part be pointed out hereinafter.

To the attainment of the aforesaid objects and ends the invention still further resides in the novel details of construction, combination and arrangement of parts, all of which will be first fully described in the following detailed description, and then be particularly pointed out in the appended claims, reference being had to the accompanying drawings, in which:—

Fig. 1 is a vertical section on the line 1—1 of Fig. 2.

Fig. 2 is a horizontal section on the line 2—2 of Fig. 1.

Fig. 3 is an enlarged detail view of a portion of Fig. 2.

Fig. 4 is a further enlargement of a portion of Fig. 3 showing the sleeves provided with grooves.

Fig. 5 is a detail section and part elevation of the invention.

In the drawings, in which like numerals of reference indicate like parts in all the figures, it will be understood that the grinding is effected by means of groove-shaped grinding devices which are selected somewhat wider than the amount of the width of the workpiece.

The profiling of the disks is effected by rolling the profiles by means of pressure rollers 92 at a considerably reduced disk speed. The roller is given the very best dimensions and speed to attain the best results with a minimum of outlay for material which, owing to the kind of work to be performed, has to be of very good quality. The values suitable are all within very narrow limits. In finding the value it has to be considered:

The diameter of the roller cannot be less than the diameter of the pinions by which the rotary tool is journalled to obviate vibrations. On the other hand the diameter has to be kept as small as possible to reduce the cost, the material necessary being of a very high quality and very expensive. If the cost price of the roller exceeds a certain upper limit, the whole method of trueing the grinding wheels will not be economical. The diameter of the roller is of great importance too. In the method of trueing the grinding wheels referred to, the roller is driven by the grinding wheel and the roller is displaced in axial direction by a coiled spring while the grinding wheel is out of contact with the roller. The time in which this displacement can be performed depends on the speed at which the roller runs; there is normally very little time. The time for shifting the roller, moreover, depends on the breath of the segmental recess or gap of the roller. This size cannot exceed a certain limit if good work is to be performed by the roller.

The desired result is to be attained only if all the said values are found so that at a certain speed the inertia of the roller is sufficient to keep the roller in rotation while its recess passes over the periphery of the grinding wheels. The best results are to be obtained by a peripheral speed of the roller of 0.4 to 0.9 meter per minute. At such a speed the angle of the segmental recess is to be 58 to 67 degrees. The diameter of the roller is best not less than 75 and not more than 85 millimeters. The diameter of the roller may be below the said minimum if by auxiliary means the mass, and therefore the inertia, of the roller is increased, for instance, by attaching some heavy metal, body of lead, or so on, to the roller.

A roller having the dimensions as aforesaid and running at the speed mentioned will have sufficient inertia to rotate without an appreciable loss in speed while its drive by the grinding

wheel is interrupted. If a loss in speed would occur the roller would have to be accelerated by the grinding wheel when engaging the roller again. The difference in the circumferential speed leads to a very rapid wear of the profiled part of the roller. If, on the other hand, the circumferential of the roller is in excess of that of the grinding wheel, a larger gap or recess would have to be made, or else a spring will be necessary which would be strong enough to perform the axial displacement of the roller in the very shortest time to obviate an impact of the roller on the profiled part of the grinding wheel. The use of a strong spring increases the friction of the cams and the wear thereof so that the accuracy decreases rapidly.

The pressure rollers 92 are not provided with closed profile grooves but are constructed as single screw threads, according to the desired profile. The pressure roller must therefore carry out at each revolution an axial movement corresponding with the size of the pitch.

The slide 109 carries a crank shaft 109^x geared to a shaft 111^x, as at 111^y, the shaft 111^x having the toothed wheel 111 which meshes with a rack 111^z held in a groove in the support 94 by a screw as shown in Fig. 1.

The rolling device is located at the rear of the machine. By a slide 93 the roller can be set against the disk. The support 94 carries the mandrel 95 on which the actual rolling device runs. By means of the screw 96 the mandrel 95 is brought parallel to the disk axis and the support is clamped firmly by means of the nut 97. The bush 98 runs on balls 99 on the mandrel 95. The pressure roller itself is firmly clamped on the bush 102, by means of the cap nut 103. By means of the spring 104 the whole is pressed against the counter cam 105 which is seated firmly on the mandrel 95. In order that the cam can move easily on the counter curve, balls are interposed which are held by the cage 106. When the pressure roller is pressed against the slowly rotating disk then the disk causes the roller to rotate. By pressing against the cam the roller has simultaneously imparted thereto an axial movement which corresponds with the pitch of the cam and of the roller. When the roller has nearly made a revolution it must again be returned. For this purpose the roller is provided with a recess 107. The position of this recess relatively to the disk is identical with the position of the cam to the counter cam as regards the axial return movement. When producing the pressure rollers or cams it is therefore always necessary to consider the positions of the cam track to the cam beginning and to the recess of the roller according to a separate table. The mandrel 95 is clamped in the rolling support by a clamping screw. The axial movement of the mandrel for the purpose of adjustment in pre-rolled disks is effected by means of the screw 108. When using new disks for the first time or when a new profile is to be rolled in a disk the disk must be turned to cylindrical shape. For this purpose there is provided on the rolling support a small slide 109 which carries a diamond 110 and which can be moved past the disk by means of the toothed wheel 111.

The core or mandrel 95 is mounted within the supporting part 94 so as not to be rotatable therein. The core or mandrel 95 has a portion of reduced diameter at 120, and on this portion there is mounted the sleeve 121 which supports the balls 99. An extension 122 of the core or mandrel 95 carries a sleeve 123. The latter is fixedly connected with the core and shows the cam 105 which is intended to cooperate with the companion cam 100 of the sleeve 125 through the interaction of the balls 124. The sleeve and the supporting ring 101 are carried by the sleeve 98. This sleeve 98 again rests on the balls 99. The pressure roller 92 is located within the sleeve 125 and the ring 100. The bush 101, the pressure roller 92 and the sleeve 125 are fixedly secured on the sleeve 98 by means of the nut 103 and the spacer sleeve 102. A wedge 126 is located between the roller 92 and the sleeve 125. Owing to this arrangement, the recess 107, Fig. 5, and the cam 100 will continuously remain in the same relative position. At the free end of the core or mandrel 95 a threaded portion 127 is located carrying two nuts 128 which exert pressure against sleeve 98 by urging the spring 104 against said sleeve, the pressure being exerted through the ball bearing 129 and another sleeve 130. In this manner the cam 100 of sleeve 125 is pressed against the balls 124. Now, while the mandrel 95, the sleeve 121 and the nuts 128 are stationary, all of the other elements are rotatable and will rotate whenever the rotary grinding disk 63 is pressed against the roller 92.

In order to make sure that the balls 124 during rotation remain uniformly spaced from each other, a cage 106 is mounted on the sleeve 123, and this cage is provided on its inner face with grooves 132. A portion of each ball projects into each groove.

Since the grinding disk 63 is provided with grooves which are closed grooves, and since the pressure roller 92 has a corresponding screw thread, it is obvious that this roller 92 must be displaced, in the direction of the arrow I, the stretch of the displacement during each revolution corresponding to the screw pitch. Upon the termination of a revolution, however, the pressure roller must now be shifted back to the same extent. For this purpose the curves 100 and 105 are shown. The interposed balls 124 serve for reducing the friction as in an ordinary ball bearing. From Fig. 4 it is apparent that the pressure roll 92 upon rotation of the sleeve 125 in direction of arrow II is displaced in direction of the arrow I owing to the inclined position of the cams 100, 105. A short time before the revolution is completed, the inclined surface 134 of the cam 100 slips off the ball 124 located at the highest point of the cam 105. The result is that due to the action of the spring 104, the parts 125, 92, 101, 102, 103 and 98 are displaced in a direction opposite the direction of the arrow I a distance x which is equal to the pitch of the screw thread. This displacement is effected by the pressure roll 92. In order to make this possible, this pressure roll must not be in engagement with the grinding disk 63 at this instant. For this purpose the roll 92 has a recess 107 which makes it possible that the above mentioned elements can be displaced. With each revolution of the pressure roll, therefore, the advance movement in the direction of the arrow I, as described above and as conditioned by the cams 100, 105 is repeated, this continuous advance movement of the pressure roll being of a value equal to the pitch and sudden jerk-like return movement then takes place owing to the inclined surface 134, and to the same extent. The increase or distance x, therefore, must always be in agreement with the pitch of the screw thread on the pressure roll.

The slide 93 is moved back and forth by means

of a hand wheel and screw device 24 swivelling in a bearing 24^x on slide 93 and threaded into a relatively stationary lug 24^y on a part of the machine.

What I claim as my invention is:

1. A grinding disk rotating on its axis, a rotatable pressure roller having a peripherally grooved cutting surface provided with an interrupted portion, means by virtue of which said roller may be brought into operative contact with said grinding disk to be rotated thereby, means to move said roller axially in one direction during a part of a revolution thereof, and means to return said roller to its initial operative position during the remainder of the revolution.

2. A grinding disk rotating on its axis, a rotatable pressure roller having a peripherally grooved cutting surface provided with an interrupted portion, means by virtue of which said roller may be brought into operative contact with said grinding disk to be rotated thereby, and means to move said roller slowly in one direction along its axis during the greater part of a revolution of the roller and to return the roller rapidly to its initial operative position along the axis during the remainder of said revolution.

3. A grinding disk rotating on its axis, a rotatable pressure roller having a peripherally grooved cutting surface provided with an interrupted portion, means by virtue of which said roller may be brought into operative contact with said grinding disk to be rotated thereby, and means to move said roller slowly in one direction along its axis during the greater part of a revolution of the roller and to return the roller rapidly to its initial operative position along the axis during the remainder of said revolution, said last-named means comprising a cam device and a return spring acting on said roller.

4. A rotatable grinding disk having a grooved periphery to provide grinding edges, a pressure roller having in its periphery the negative grooves and edges to those of said disk, a slide adapted to be movable toward and from said grinding disk, a support pivotally adjustably mounted on said slide, means for mounting said roller in said support, means to adjust said support to bring the axis of said roller into parallelism with the axis of said grinding disk, said roller being driven to rotate by contact with said grinding disk, means by which said roller may be moved axially in one direction relatively slowly during a portion of the revolution of the roller and moved relatively rapidly axially in the opposite direction during the remainder of said revolution to return the roller to its initial operative position, and means operatively disconnect said roller from contact with said grinding disk during said return movement.

5. A rotatable grinding disk having a grooved periphery to provide grinding edges, a pressure roller having in its periphery the negative grooves and edges to those of said disk, a slide adapted to be movable toward and from said grinding disk, a support pivotally adjustably mounted on said slide, means for mounting said roller in said support, means to adjust said support to bring the axis of said roller into parallelism with the axis of said grinding disk, said roller being driven to rotate by contact with said grinding disk, means by which said roller may be moved axially in one direction relatively slowly during a portion of the revolution of the roller and moved relatively rapidly axially in the opposite direction during the remainder of said revolution to return the roller to its initial operative position, and means operatively to disconnect said roller from contact with said grinding disk during said return movement, said last-named means residing in a recess formed in the periphery of said roller and extending the length thereof.

6. A rotatable grinding disk having a grooved periphery to provide grinding edges, a pressure roller having in its periphery the negative grooves and edges to those of said disk, a slide adapted to be movable toward and from said grinding disk, a support pivotally adjustably mounted on said slide, means for mounting said roller in said support, means to adjust said support to bring the axis of said roller into parallelism with the axis of said grinding disk, said roller being driven to rotate by contact with said grinding disk, means by which said roller may be moved axially in one direction relatively slowly during a portion of the revolution of the roller and moved relatively rapidly axially in the opposite direction during the remainder of said revolution to return the roller to its initial operative position, means operatively to disconnect said roller from contact with said grinding disk during said return movement, said roller mounting means including a mandrel on which the roller is carried, and means to adjust the mandrel axially to accommodate pre-rolled grinding disks.

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