Sept. 10, 1946. A. RICKENMANN 2,407,577

DEVICE FOR DRESSING GRINDING DISKS

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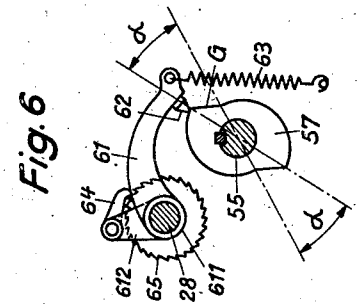


Fig. 6

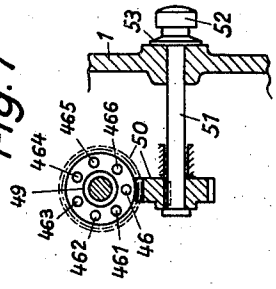


Fig. 7

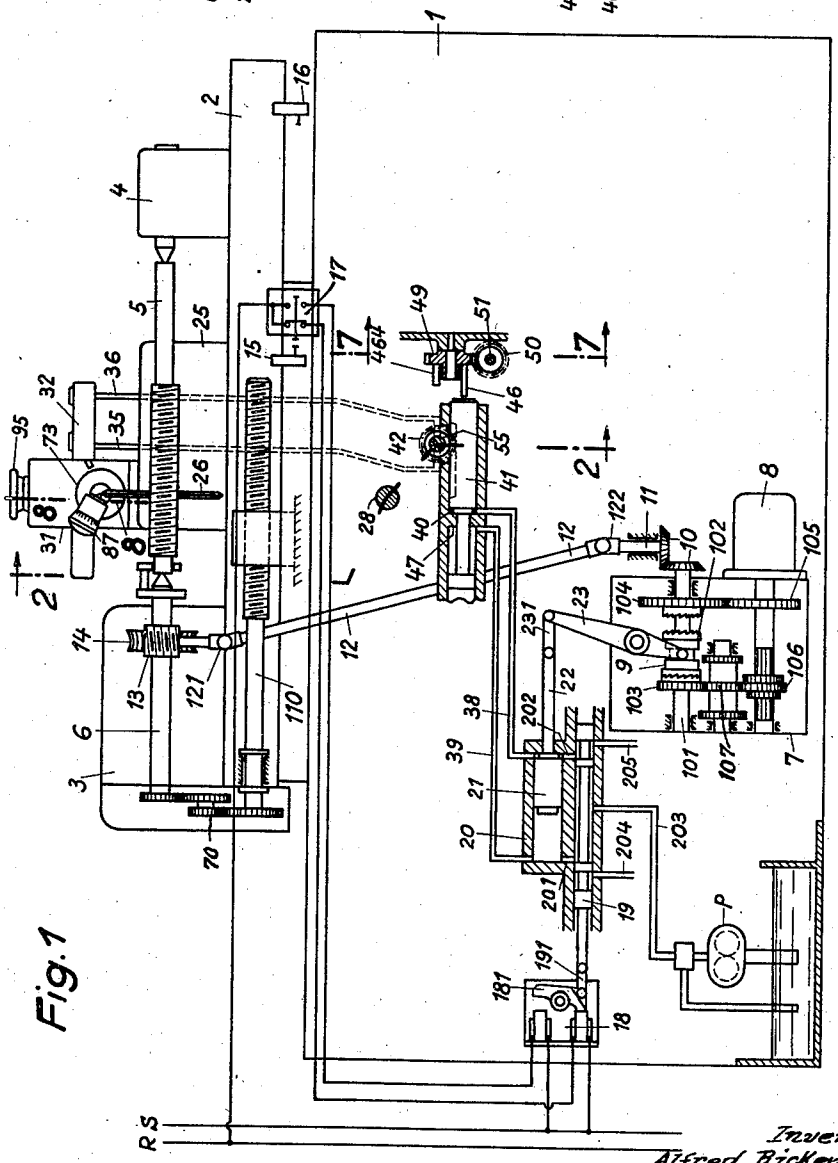


Fig. 1

Inventor
Alfred Rickenmann
By Swiger, Elliott, Stern & Carlberg
Att'ys

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DEVICE FOR DRESSING GRINDING DISKS

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Fig.2

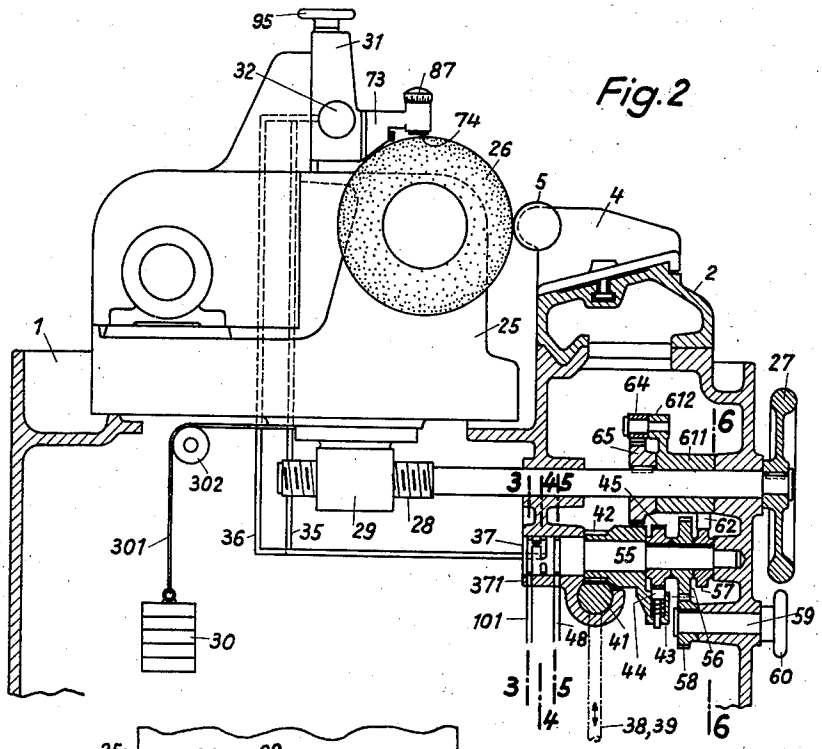


Fig.10

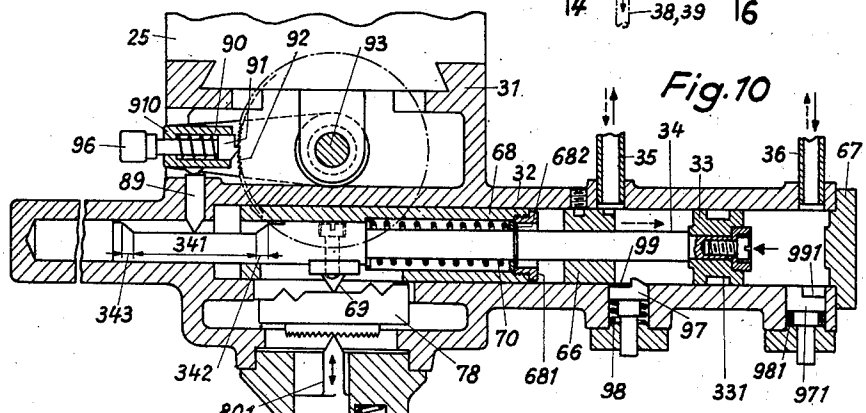


Fig.3

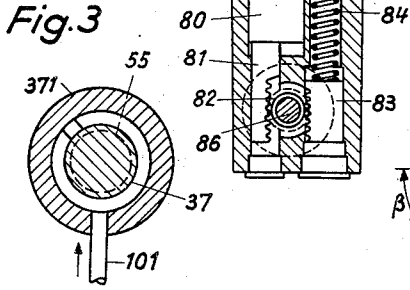


Fig.4

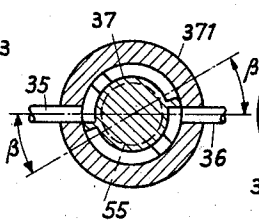
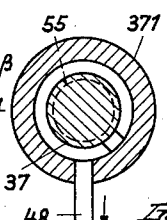


Fig.5



Inventor
Alfred Rickenmann
By Lugin, Ekhart, Stein & Barberg
Attys

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DEVICE FOR DRESSING GRINDING DISKS

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Fig. 8

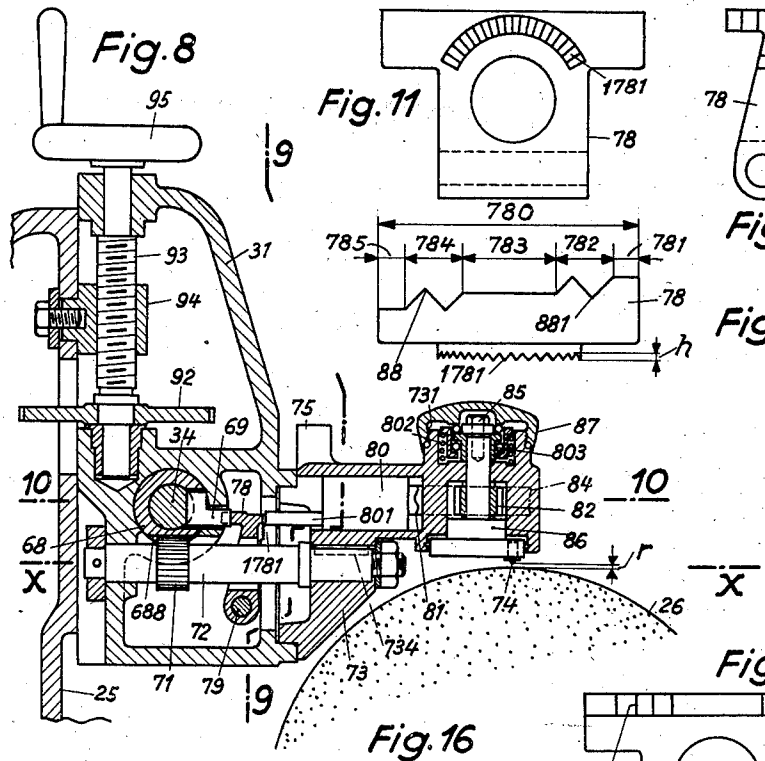


Fig. 11

Fig. 12

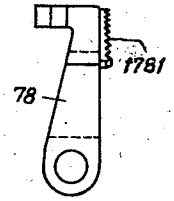


Fig. 14

Fig. 13

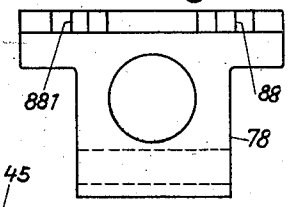


Fig. 16

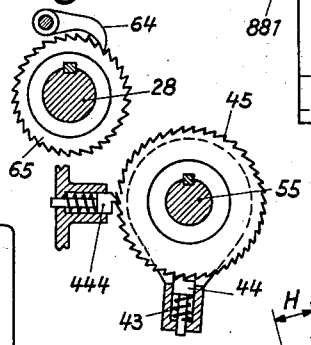


Fig. 9

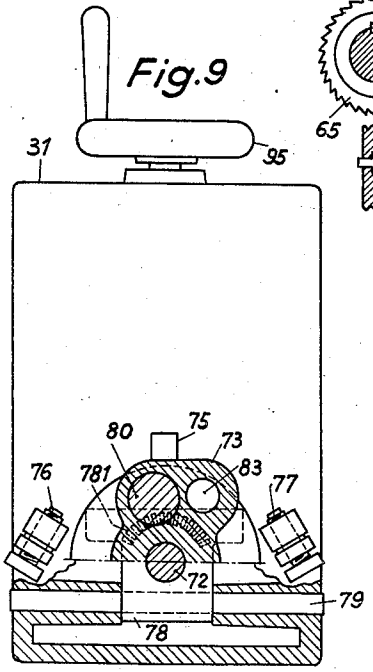
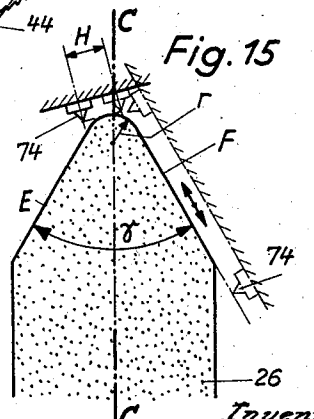


Fig. 15



Inventor
Alfred Rickenmann
by Lüge, Ellert, Stein & Ahlberg
Attys

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UNITED STATES PATENT OFFICE

2,407,577

DEVICE FOR DRESSING GRINDING DISKS

Alfred Rickenmann, Zurich, Switzerland

Application December 17, 1943, Serial No. 514,589
In Switzerland December 28, 1942

10 Claims. (Cl. 125—11)

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The invention relates to an improved device for accurately forming the profiled working face of a grinding disk for use in grinding and truing screw threads.

One object of the invention consists in the provision of a device by means of which even not high grade diamonds of any suitable shape may be used for dressing the grinding wheel and to produce thereon ridges of perfect profile for accurately grinding screw threads.

Another object consists to provide means to automatically adjust the dressing tool with reference to the grinding disk in conformity to the wear thereof and to compensate the same.

I attain these and other objects by means of a simple device which may be brought in and out of operation either by hand or by automatic governing devices in a predetermined sequence of operations.

In the accompanying drawings the new device is shown in a diagrammatical manner by way of an example in connection with screw thread grinding wheels of any of the well known constructions.

Fig. 1 shows in a side elevation a thread grinding machine parts being shown in section.

Figs. 2 to 8 are cross-sections taken respectively on the lines 2—2; 3—3; 4—4; 5—5; 6—6; 7—7; and 8—8 of Figs. 1 and 2.

Figs. 9 and 10 are sections on the lines 9—9 and 10—10 of Fig. 8.

Figs. 11 to 14 are a front view, a side view, a back view and a top view of the cam plate actuating the dressing tool.

Fig. 15 illustrates the manner of the operation of the diamond.

Fig. 16 shows a detail of construction.

On a base 1 of a screw thread grinding machine a carriage 2 is slidably mounted. On the carriage 2 a headstock 3 and a tailstock 4 are arranged in the usual manner adapted to receive the work piece 5 between their centres. The driving spindle 6 is journalled in the headstock 3, it is positively driven by a worm 13 and a worm wheel 14 which is keyed to spindle 6. The worm 13 is driven by a shaft 12 which is connected to the worm shaft by an universal joint 121 and by another universal joint with shaft 11. The latter is driven by bevel gears 10 from a shaft 101 journalled in a gear box 7. On the shaft 101 a sleeve 102 is slidably mounted on a key thereof, it may be brought in engagement either with toothed gear 103 or with gear 104. The shaft 101 is driven by the motor 8 and the gear 105 meshing with gear 104 or by change gears 106 driving

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by the intermediary change gears 107 the toothed gear 103.

The carriage 2 is moved in the well known manner by a lead screw 110 and a set of change speed gears 70 interconnecting spindle 6 and lead screw 110. By bringing the clutch member 9 in engagement with one or the other gear 103 or 104 the travel of the carriage 2 and the direction of rotation of spindle 6 and therewith of the work piece 5 is reversed.

The clutch member 9 is actuated by a lever 23 which is connected by a link 231 to the rod 22 of a piston 21 slidably arranged in a cylinder 20. The latter is provided with ports 201, 202 communicating with the casing of a piston valve 19. The valve casing communicates by a pipe 203 with a hydraulic pump P and is provided with two exit ports 204, 205. The piston valve 19 is connected by a link 191 with the armature 181 of two electromagnets 18. By exciting the electromagnets 18 the armature 181 shifts the piston valve 19 to allow oil under pressure to pass on either side of piston 21. The circuits in which the electromagnets 18 are arranged are opened and closed by a reversing switch 17 which is actuated by the dogs 15, 16 adjustably mounted on the carriage 2.

The valve 19 controls moveover the flow of oil from the pump P to a cylinder 40 by the pipes 38, 39. The piston 41 of cylinder 40 is provided with a rack (Figs. 1, 2) meshing with a toothed gear 42 rotatably mounted on a shaft 55 journalled in the base 1. On the hub of gear 42 an arm 43 is keyed carrying a spring actuated pawl 44 engaging a ratchet wheel 45 fast on shaft 55 (Figs. 2, 16). A pawl 444 (Fig. 16) engaging ratchet wheel 45 retains same in its position. On the shaft 55 a rotary distributing valve 37 is arranged within a casing 371 (Figs. 2 to 5) controlling the flow of pressure oil through pipes 35, 36 (Figs. 1, 2) to a cylinder 32 fast on a slide 31 (Figs. 1, 8, 10) of the carriage 25 in which the grinding disk 26 is journalled the edge of which is to be trimmed.

The carriage 25 is slidably mounted on the base 1. A weight 33 (Fig. 2) fixed to a band 301 and running over a pulley 302 tends to draw the carriage 25 and therewith the grinding disk 26 away from the work piece 5. To the carriage 25 a nut 29 is fastened with which a screw threaded shaft 28 is in engagement. The latter is journalled in the base 1 and carries a hand wheel 27 by turning of which the carriage 25 may be adjusted by hand. The shaft 28 co-operates moreover with the shaft 55 by means of a cam 57 keyed to shaft

55 (Figs. 2, 6). With the cam 57 contacts an arm 61 of a sleeve 611 rotatably mounted on shaft 28. A coiled spring 63 (Fig. 6) keeps the tooth 62 of the arm 61 in contact with cam 57 which when turning with shaft 55 rocks the arm 61 and therewith the sleeve 611. On a second arm 612 of sleeve 611 a pawl 64 is mounted (Fig. 6) engaging a ratchet wheel 65 (Figs. 2, 6) keyed to shaft 28. By turning shaft 55 by means of piston 41 say for an angle α and by setting thereby the distributing valve 37 the ratchet wheel 65 is also turned and therewith the shaft 28. The carriage 25 is moved with reference to the work piece 5 as will be explained hereinafter. The way of piston 41 and therewith the angle about which the shaft 55, the distributing valve 37 and the shaft 28 may be turned may be limited by any one of a plurality of pins 46 (Figs. 1, 7). The pins 46, 461, 462, 463, 464, 465, 466 are fastened to the face of a toothed gear 49 journalled in the base 1. The pins 46, to 466 are all of different lengths each one may be brought in the path of piston 41 by turning the gear 49 by means of a toothed gear 50 fast on a shaft 51. The latter is journalled in the base 1 it may be rotated by a knob 52. A scale 53 indicates which one of the pins 46 is in its operative position. The travel of piston 41 is limited at its other end by an abutment 47 (Fig. 1) fixed to cylinder 40. The shaft 55 and therewith shaft 28 may further be turned by hand by means of a shaft 59 carrying a hand wheel 60 and a toothed gear 58 meshing with a gear 56 keyed to shaft 55 (Fig. 2).

The cylinder 32 (Figs. 2, 8 to 15) with piston 33 which operates the dressing tool 74 (Fig. 8) is arranged on the slide 31 which may be vertically adjusted with reference to the grinding disk 26 by means of a screw threaded spindle 93 screwed in a nut 94 of the carriage 25. The shaft 93 carries a hand wheel 95 and a ratchet wheel 92 with which a pawl 91 is kept in engagement by a spring 90 (Fig. 10). The pawl 91 may be withdrawn from the ratchet wheel 92 by a knob 96. The pawl 91 is arranged in a casing 910 which is rockingly mounted in the slide 31 and which may be rocked by a pin 89 actuated by the rod 34 of the piston 33 of cylinder 32. The pawl 91 turns wheel 92 and shaft 93 on each stroke of piston 33 and feeds the slide 31 and therewith the tool 74 towards the grinding wheel 26. The piston 33 is provided with an annular groove 331 (Fig. 10) into which enters one of two catches 97 or 971 as soon as the piston 33 comes to bear on the abutment 66 or on the lid 67 of cylinder 32. The catches 97, 971 are brought in engagement with the piston 33 by springs 98 and 981 and are brought out of engagement therewith by oil pressure acting on the faces 99 and 991 of the catches 97, 971. In the position of piston 33 shown in Fig. 10 oil under pressure enters by pipe 36, the catch 991 has released piston 33, the latter moves to the left and actuates by its rod 34 and a bevelled face 342 the pin 89 and therewith the feed screw 93. On the return stroke of piston 33 the bevelled face 343 of piston rod 34 actuates said pin 89 again. The faces 342, 343 are apart for a distance equal to 341, the feeding of the slide 31 and the tool 74 is timely distanced and coordinated to other functions which the piston 33 is to perform. On the piston rod 34 a sleeve 68 is slidingly mounted being provided with a rack 688 engaging a pinion 71 (Fig. 8) keyed to a shaft 72. The latter is journalled in the slide 31 and carries on its free end a casing 73, by a key 734. The casing 73 is provided with a lug 75 (Fig. 9) and in the path of lug 75 project two stop screws 76, 77 adjustably mounted in the slide 31. The stops 76, 77 limit the movement of casing 73 when the latter is reciprocated by the piston 33 and the rack 688 of sleeve 68. The rocking movement of casing 73 differs while the stroke of the piston 33 is always a full stroke. Between a shoulder of piston rod 34 and a nut 681 of sleeve 68 a spring 70 is arranged. The nut 681 rests on a washer 682 fastened to the piston rod 34. The spring 70 which is under tension allows a movement of the slide 68 with reference to piston rod 34. The piston 33 may perform therefor a full stroke whatever the way of the casing 73 will be.

The piston rod 34 is provided with a tooth 69 projecting through a slot of sleeve 68 and cooperating with a cam plate 78 (Figs. 8 to 14) rockingly mounted on a shaft 79 of slide 31. The reciprocating piston rod 34 forces the tooth 69 over the cams 781 to 785 formed on the one face of lever 78. On the other face the cam lever 78 is provided with a segmental row of teeth 1781. A pin 891 of a block 89 is in engagement with said row of teeth 1781, the block 89 being slidably mounted in the casing 73. The block 89 is provided with a rack 81 meshing with a toothed gear 82 on a shaft 86. With the gear 82 a rack 83 is in engagement on which a spring 84 is acting tending to keep pin 891 in contact with lever 78 and the latter in contact with tooth 69. Any movement of the pin 891 is transmitted to shaft 86 on the face of which a pointed diamond piece 74 is eccentrically mounted adapted to work the flanks of the grinding disk 26 (Figs. 8, 15). The shaft may be adjusted in axial direction by a nut 87 screwed on the screw threaded portion 731 of the casing 73. The nut 87 acts on a ball bearing 893 fixed to shaft 86 by a screw 85 and displaces the shaft 86 against the action of a spring 892.

The piston rod 34 oscillates by means of rack 688 and toothed gear the casing 73. The pin 891 passes thereby over the toothed segment 781 mounted on shaft 79 of the casing 31 and transmits a vibratory movement to the tool 74 depending on the number and the height h (Fig. 14) of the teeth 1781. In addition thereto the cam plate 78 is rocked about shaft 79 and the pin 891 displaced. Shaft 86 is turned by the tooth 69 of piston rod 34 passing over the ridges 88 into the recess 881 on the face of plate 78. The total length of the distances 781 to 785 of plate 78 equals the length of the distance 341 (Figs. 10, 14) and the total distances 341, 342, 343 is equal to the full stroke of piston 33. When the piston 33 makes one full stroke the tooth 69 passes over the distance 783 of the cam plate 78 and the casing 73 passes from stop 76 to stop 77 or vice versa and ratchet wheel 92 and therewith spindle 93 makes a part rotation, adjusting the slide 31 towards the grinding disk 26. While the tooth 69 passes over the portion 783 of the cam 78 the latter remains stationary and only a vibratory motion is imparted to the tool 74 by the teeth 781. The tool 74 performs oscillating movements H (Fig. 15). While the casing 73 is rocking about axis X—X of shaft 72 from one stop 76 to stop 77 or vice-versa the tool 74 passes over the centre line C—C (Fig. 15) of the grinding disk 26. The latter is rounded off the radius R corresponds to the radial distance of the working point of the tool 74 from the axis of rotation X—X denoted by r in Fig. 8.

The length of the straight portion 783 of the cam 78 corresponds to the greatest angle through which the casing 73 may swing, the said angle corresponds to the greatest possible angle α, Fig. 15, enclosed by the flanks E, F of the grinding disk 26. When the casing 73 comes to bear either on stop 76 or on stop 77 the cam plate 78 cannot turn any further about the axis of shaft 72 the oscillatory movement of the tool 74 is interrupted. The piston rod 34 moves on and the tooth 69 co-operates now with one of the portions 782 or 784 of the cam plate 78. The latter is rocked about the shaft 79 by the combined action of the tooth 69 and of the spring 84. Each portion 782 and 784 has three flanks over which the tooth 69 passes successively rocking thereby the plate 78 about the shaft 79. The plate 78 moving in one direction transmits its movement over the members 801, 80, 81, 82 to shaft 86 and to tool 74 against the action of spring 84. The tool 74 is swung over the flank E or F. The spring 84 returns the plate 78 and keeps the same in contact with tooth 69. The tool 74 swings three times over the flank E or F while the tooth 69 passes over the portion 782 or 784 of plate 78. It may happen that the pin 801 comes to rest on the ground or on the top of a tooth of the segment 781 and in such a case the tool 74 would not be rocked far enough to work the flank E or F of grinding disk 26 on its whole breadth. To obviate this drawback the edge 88 is slightly above and the edge 881 slightly below the plane of the centre portion 783. After the tooth 69 has passed the portions 782 or 784 the piston rod 34 still moves on the tooth 69 passing over the end portions 781 or 785. By passing these portions 781 and 785 the tool 74 is brought out of contact with the disk 26. With the tool 74 in this position the bevelled portions 342 or 343 actuate the pin 89 and feed the tool 74 towards the grinding disk 26. After each stroke of the piston rod 34 the tool 74 is advanced towards the grinding disk 26. The infeed of the slide 31 towards disk 26 is equal to the infeed of the carriage 25 towards the work piece 5 by means of the cam disk 57. The piston 33 remains stationary at its end position as long as the oil exerts pressure on it. To prevent the piston 33 to leave this end position accidentally, for instance by stopping the machine, the above described catches 97, 971 are provided for. The said catches are brought out of their catching position as soon as the oil pressure on the faces 99 and 991 attains a certain hight sufficient to overcome the pressure of the springs 98, 981.

By starting the machine, the motor 8 drives the spindle 6 and work piece 5 and table 2 moreover oil is supplied by pump P and pipe 203 to cylinder 20 and to the distributing valve 37. The table 2 actuates by its dogs 15, 16 switch 17 electro magnets 18, the valve 19 and the reversing gear. Moreover oil under pressure is brought to reciprocate the piston 41 which turns step by step the distributing valve 37. The latter governs the flow of oil to the cylinder 32 by the pipes 35, 36 to operate the piston 33 and therewith the cam plate 78 and the tool 74. The valve 37 reverses the stroke of piston 33 when completing half a turn. Therefore the tool 74 is set to work only when the valve 37 has been turned by piston 41 by half a full rotation. The way of piston 41 may be varied by placing one of the several stop pins 46 in its path. The pins 46 are positioned by turning the gear 49 by knob 52. By making a full stroke the piston 41 turns the valve 37 for half a full turn, by placing any of the pins 461 to 466 in the path

of piston 41 the latter has to perform several strokes to turn the valve 37 for half a full turn. Each reversal of piston 41 corresponds to a reversal of piston 21 and therefore to the reversal of direction of rotation of work piece 5 and table 2 as the piston 21 commands the reversing clutch 9. By placing a certain stop pin 461 to 466 in the way of piston 41 by knob 52 the number of strokes of table 2 and of reversals of the shaft 6 may be determined until the piston 33 makes a stroke and sets the tool 74 to work on the grinding disk 26. The valve 37 may be set by hand by means of knob 60 (Fig. 2) on shaft 59 on which the gear 58 is keyed meshing with gear 56 fast on shaft 55.

The cam 57 (Figs. 2 and 6) and the valve 37 are fastened on the same shaft 55. The position of the active flank G of cam 57 with reference to the point 62 of the lever 61 in Fig. 6 corresponds to the position of the valve 37 with reference to the ports of the pipes 35, 36 in Fig. 4. While the valve 37 turns about angle β the cam 57 turns about a like angle α. The change of pressure in the pipes 35 and 36 takes place while the cam 57 passes the angle α. The cam 57 therefore shifts the ratchet wheel 65 and turns therewith the shaft 28 and advances the carriage 25 at that moment at which the pressure in the pipes 35, 36 and therewith on the side of the piston 33 changes and that timely co-incides with its positions at one of the ends of cylinder 32, that is when the tooth 69 is free off the cam plate 78 and with the tool 74 out of contact with the grinding disk 26. A part rotation of cam 57 equal to angle α will compensate the wear of the grinding disk 26. This compensation takes place positively but only after the piston 33 has performed a stroke and thereby initiated the dressing of the grinding disk 26.

What I wish to claim by United States Letters Patent is:

1. In a screw thread grinding machine, the combination of a reciprocable work carriage and a tool carriage mounted for cross-feed movement in a direction transverse to the path of reciprocation of said work carriage, manually operable means to adjust said tool carriage, power actuated means for reciprocating said work carriage, a grinding disk rotatably mounted in said tool carriage about an axis substantially parallel to said path of reciprocation of said work carriage, a slide mounted on said tool carriage for movement thereon at a right angle with respect to the movement of said tool carriage, a housing in which is arranged a grinding disk dressing tool, said housing being mounted for oscillatory movement on said slide, a second manually operable means for adjusting said slide to bring said dressing tool into operative position with respect to said grinding disk, means in said slide for oscillating said housing and said dressing tool, means operated by said oscillating means for rotating said dressing tool in said housing, whereby said dressing tool is moved once over the grinding face of the grinding disk during each oscillating movement of said housing, and means actuated by said power actuated means for operating said oscillating means in timed relation to the movement of said work carriage, namely when the latter changes its direction of movement.

2. In a screw thread grinding machine, the combination of a reciprocable work carriage and a tool carriage mounted for cross-feed movement in a direction transverse to the path of reciprocation of said work carriage, manually

operable means to adjust said tool carriage, power actuated means for reciprocating said work carriage, a grinding disk rotatably mounted in said tool carriage about an axis substantially parallel to said path of reciprocation of said work carriage, a slide mounted on said tool carriage for movement thereon at a right angle with respect to the movement of said tool carriage, a housing in which is arranged a grinding disk dressing tool, said housing being mounted for oscillatory movement on said slide, a second manually operable means for adjusting said slide to bring said dressing tool into operative position with respect to said grinding disk, means in said slide for oscillating said housing and said dressing tool, means operated by said oscillating means for rotating said dressing tool in said housing, whereby said dressing tool is moved once over the grinding face of the grinding disk during each oscillating movement of said housing, means actuated by said power actuated means for operating said oscillating means in timed relation to the movement of said work carriage, namely when the latter changes its direction of movement, and means for automatically operating said first mentioned manually operable means to advance the tool carriage toward the path of movement of the work carriage a distance which compensates for the amount of wear caused by the dressing tool on said grinding disk, said automatic advancing means being operated by said power actuated means.

3. In a screw thread grinding machine, the combination of a reciprocable work carriage and a tool carriage mounted for cross-feed movement in a direction transverse to the path of reciprocation of said work carriage, manually operable means to adjust said tool carriage, power actuated means for reciprocating said work carriage, a grinding disk rotatably mounted in said tool carriage about an axis substantially parallel to said path of reciprocation of said work carriage, a slide mounted on said tool carriage for movement thereon at a right angle with respect to the movement of said tool carriage, a housing in which is arranged a grinding disk dressing tool, said housing being mounted for oscillatory movement on said slide, a second manually operable means for adjusting said slide to bring said dressing tool into operative position with respect to said grinding disk, means in said slide for oscillating said housing and said dressing tool, means actuated by said power actuated means for operating said oscillating means in timed relation to the movement of said work carriage, namely when the latter changes its direction of movement, and means for automatically operating said second manually operable means to feed the dressing tool toward the grinding disk, said last named means being operated by said means oscillating said housing and said dressing tool.

4. In a screw thread grinding machine, the combination of a reciprocable work carriage and a tool carriage mounted for cross-feed movement in a direction transverse to the path of reciprocation of said work carriage, manually operable means to adjust said tool carriage, power actuated means for reciprocating said work carriage, a grinding disk rotatably mounted in said tool carriage about an axis substantially parallel to said path of reciprocation of said work carriage, a slide mounted on said tool carriage for movement thereon at a right angle with respect to the movement of said tool carriage, a housing in which is arranged a grinding disk dressing tool, said housing being mounted for oscillatory movement on said slide, a second manually operable means for adjusting said slide to bring said dressing tool into operative position with respect to said grinding disk, means in said slide for oscillating said housing and said dressing tool, means actuated by said power actuated means for operating said oscillating means in timed relation to the movement of said work carriage, namely when the latter changes its direction of movement, means for automatically operating said first mentioned manually operable means to advance the tool carriage toward the path of movement of the work carriage a distance which compensates for the amount of wear caused by the dressing tool on said grinding disk, said automatic advancing means being operated by said power actuated means, and means for automatically operating said second manually operable means to feed the dressing tool toward the grinding disk, said last named means being operated by said means oscillating said housing and said dressing tool.

5. In a screw thread grinding machine, as claimed in claim 1, in which said means for oscillating said housing and dressing tool include a power actuated piston mounted for reciprocable movement in said slide, a piston rod secured to said piston and supporting a member provided with rack teeth, a shaft having gear teeth meshing with said rack teeth and supported by said slide, said housing being attached to said shaft to oscillate with the latter, a cam plate pivotally mounted within said slide and engaged by a lateral extension on said piston rod, said dressing tool being rotatably mounted in said housing, and an operative connection between said cam plate and said dressing tool for rotating the latter about an axis at a right angle to the axis of said shaft when said housing is being oscillated, whereby said dressing tool is caused to progressively engage first one flank of the grinding disk, then the apex of the same and finally the other flank of said disk during each movement of said piston in one direction.

6. In a screw thread grinding machine as claimed in claim 3, including a power actuated piston mounted for reciprocable movement in said slide, a piston rod secured to said piston and supporting a member provided with rack teeth, a cam face on said piston rod adapted to actuate said second manually operable means to automatically feed the slide and therewith the dressing tool toward the grinding disk one step during each reciprocating movement of said piston, a shaft having gear teeth meshing with said rack teeth and supported by said slide, said housing being attached to said shaft to oscillate with the latter, a cam plate pivotally mounted within said slide and engaged by a lateral extension on said piston rod, said dressing tool being rotatably mounted in said housing, and an operative connection between said cam plate and said dressing tool for rotating the latter about an axis at a right angle to the axis of said shaft when said housing is being oscillated, whereby said dressing tool is caused to progressively engage first one flank of the grinding disk, then the apex of the same and finally the other flank of said disk during each movement of said piston in one direction.

7. In a screw thread grinding machine as claimed in claim 1, in which said means for oscillating said housing and dressing tool include

a power actuated piston mounted for reciprocable movement in said slide, a piston rod secured to said piston and supporting a member provided with rack teeth, a shaft having gear teeth meshing with said rack teeth and rotatably supported in said slide, said housing being non-rotatably attached to said shaft to oscillate with the latter, a cam plate pivotally mounted within said slide about an axis parallel to said piston rod, said cam plate having a cam surface on one of its sides engaged by a lateral projection on said piston rod, said dressing tool being rotatably mounted in said casing by being attached eccentrically to the end face of a shaft journalled in said casing, said last named shaft carrying a pinion engaging a rack slidably mounted in said casing, said rack being urged lengthwise in yielding engagement with the other side of said cam plate to be slidably moved when said cam plate is moved about its pivot by the lateral projection on said piston rod when the latter is reciprocated to oscillate said housing, whereby said dressing tool is caused to progressively engage first one flank of the grinding disk, then the apex of the same and finally the other flank of said disk during each movement of said piston in one direction.

8. In a screw thread grinding machine as claimed in claim 1, in which said means for oscillating said housing and dressing tool include a power actuated piston mounted for reciprocable movement in said slide, a piston rod secured to said piston and supporting a member provided with rack teeth, a shaft having gear teeth meshing with said rack teeth and rotatably supported in said slide, said housing being non-rotatably attached to said shaft to oscillate with the latter, a cam plate pivotally mounted within said slide about an axis parallel to said piston rod, said cam plate having a cam surface on one of its sides engaged by a lateral projection on said piston rod, said dressing tool being rotatably mounted in said casing by being eccentrically attached to the end face of a shaft journalled in said casing, said last named shaft carrying a pinion engaging a rack slidably mounted in said casing, said rack being urged lengthwise in yielding engagement with the other side of said cam plate to be slidably moved when said cam plate is moved about its pivot by the lateral projection on said piston rod when the latter is reciprocated to oscillate said housing, whereby said dressing tool is caused to progressively engage first one flank of the grinding disk, then the apex of the same and finally the other flank of said disk during each movement of said piston in one direction, and means on that side of the cam plate which engages said rack for causing the latter and therewith said dressing tool to vibrate while the housing is being oscillated by said piston.

9. In a screw thread grinding machine, the combination of a reciprocable work carriage and a tool carriage mounted for cross-feed movement in a direction transverse to the path of reciprocation of said work carriage, manually operable means to adjust said tool carriage, power actuated means for reciprocating said work carriage, a grinding disk rotatably mounted in said tool carriage about an axis substantially parallel to said path of reciprocation of said work carriage, a slide mounted on said tool carriage for movement thereon at a right angle with respect to the movement of said tool carriage, a housing in which is arranged a grinding disk dressing tool, said housing being mounted for oscillatory movement on said slide, a second manually operable means for adjusting said slide to bring said dressing tool into operative position with respect to said grinding disk, means in said slide for oscillating said housing and said dressing tool, means operated by said oscillating means for rotating said dressing tool in said housing, whereby said dressing tool is moved once over the grinding face of the grinding disk during each oscillating movement of said housing, means actuated by said power actuated means for operating said oscillating means in timed relation to the movement of said work carriage, namely when the latter changes its direction of movement, and stop means on said slide for positively limiting the extent of the oscillatory movement of said housing in both directions.

10. In a screw thread grinding machine, the combination of a reciprocable work carriage and a tool carriage mounted for cross-feed movement in a direction transverse to the path of reciprocation of said work carriage, manually operable means to adjust said tool carriage, power actuated means for reciprocating said work carriage, a grinding disk rotatably mounted in said tool carriage about an axis substantially parallel to said path of reciprocation of said work carriage, a slide mounted on said tool carriage for movement thereon at a right angle with respect to the movement of said tool carriage, a housing in which is arranged a grinding disk dressing tool, said housing being mounted for oscillatory movement on said slide, a second manually operable means for adjusting said slide to bring said dressing tool into operative position with respect to said grinding disk, means in said slide for oscillating said housing and said dressing tool, means actuated by said power actuated means for operating said oscillating means in timed relation to the movement of said work carriage, namely when the latter changes its direction of movement, means for automatically operating said first mentioned manually operable means to advance the tool carriage toward the path of movement of the work carriage a distance which compensates for the amount of wear caused by the dressing tool on said grinding disk, said automatic advancing means being operated by said power actuated means, and means for rendering said automatically operating means inoperative at will.

ALFRED RICKENMANN.