Sept. 1, 1942. J. C. WILSON 2,294,494

GRINDING WHEEL DRESSER

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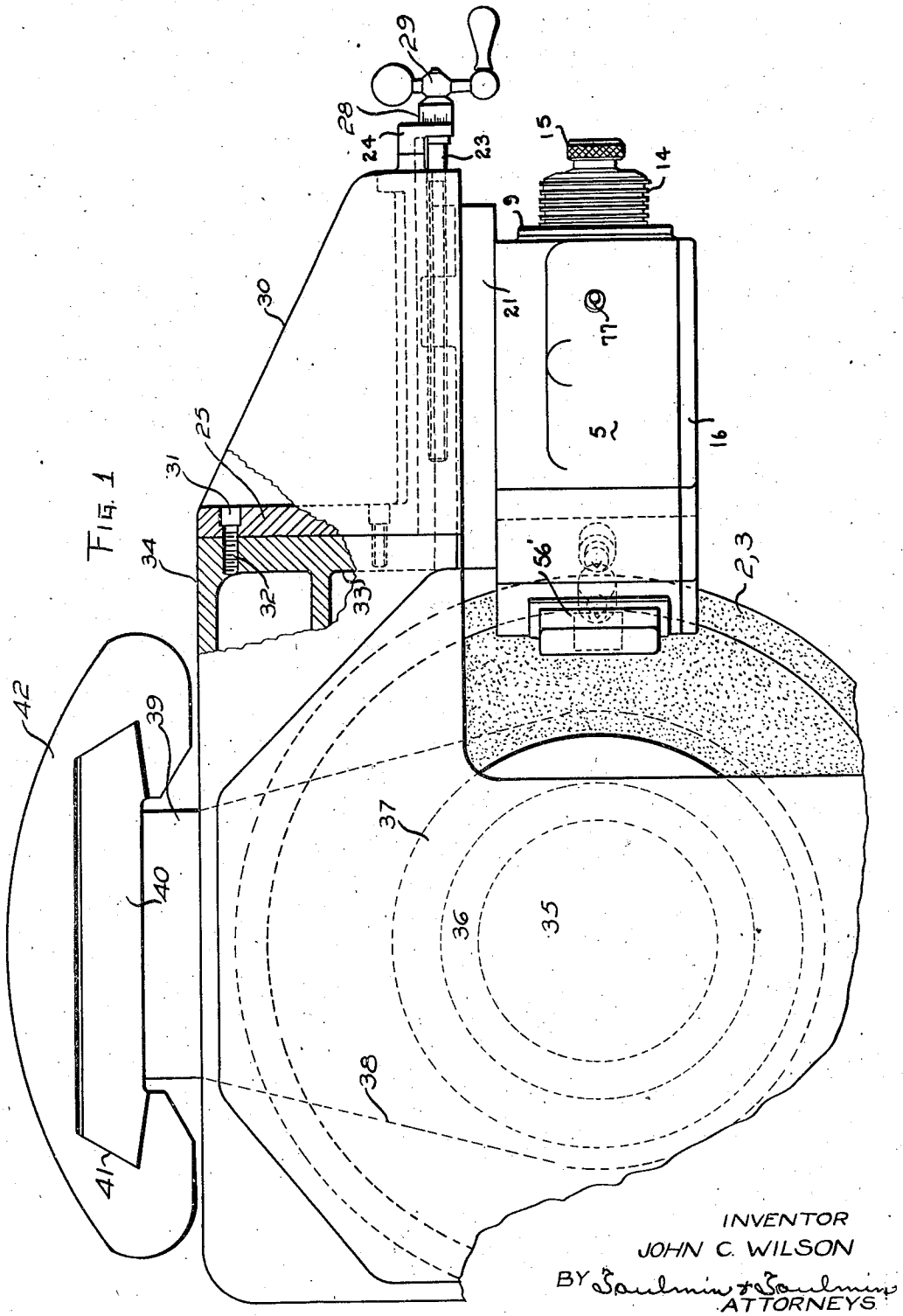


Fig. 1

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FIG. 2

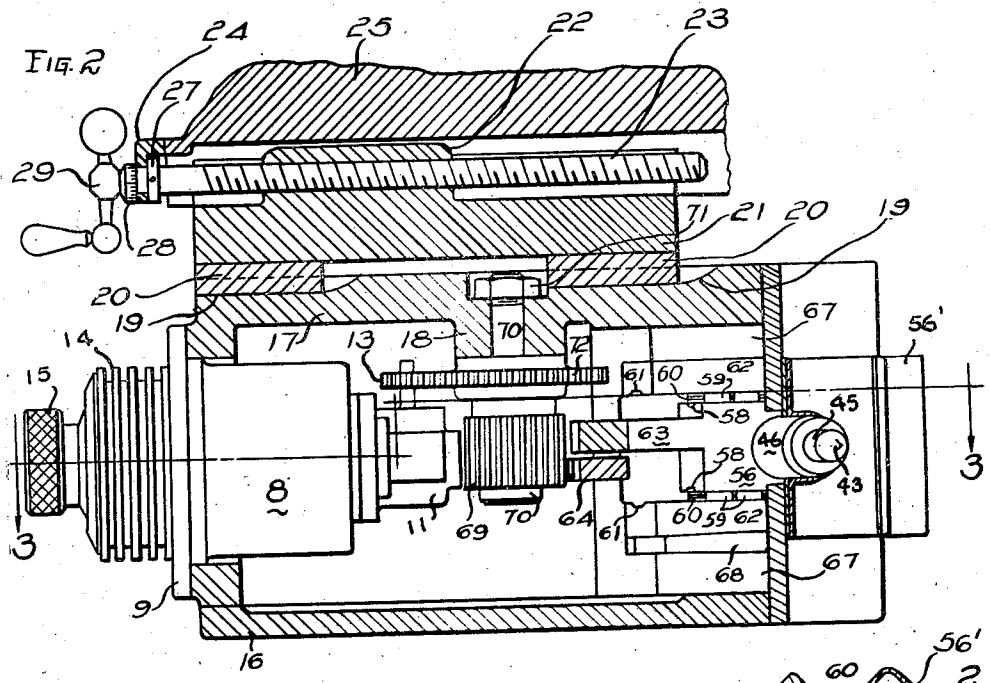
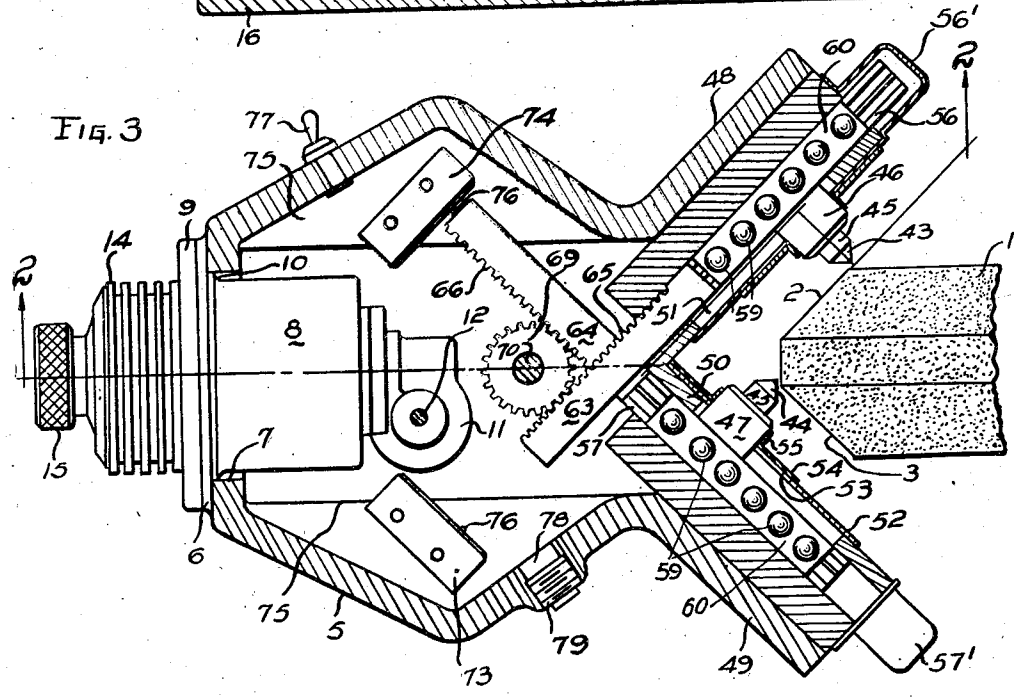


FIG. 3



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FIG. 4

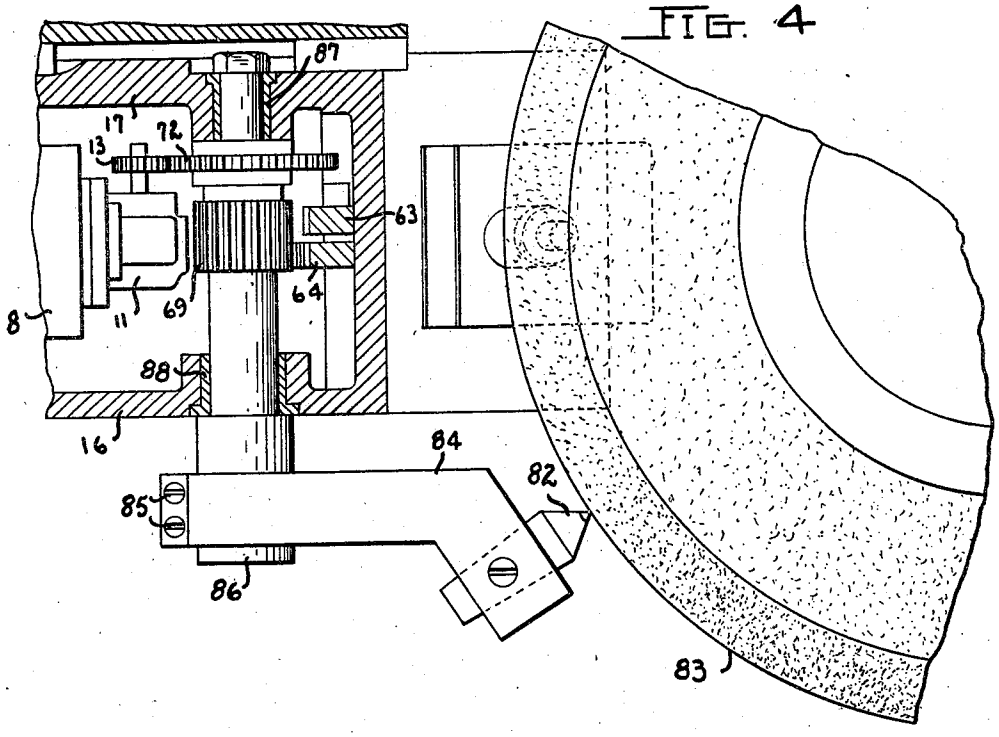


FIG. 6

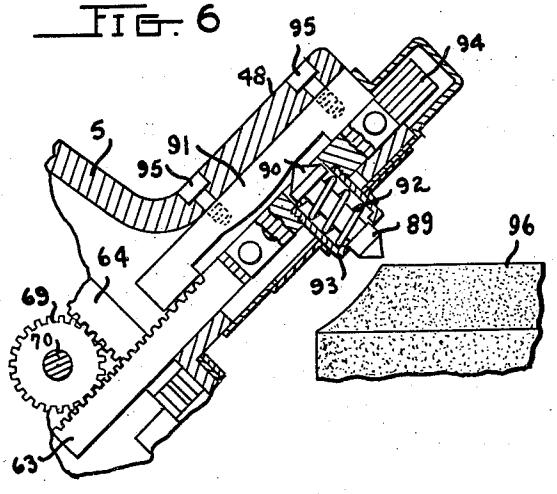
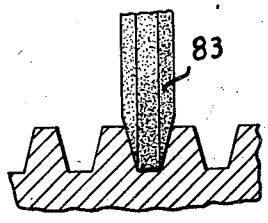


FIG. 5



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UNITED STATES PATENT OFFICE

2,294,494

GRINDING WHEEL DRESSER

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7 Claims. (Cl. 125—11)

The present invention relates to grinding machines, and more particularly to the dressing mechanism of such machines.

Certain types of grinding work have such a shape as to require abrasive wheels with tapered edges. These wheels are provided with an inclined abrading surface at each edge, tapering from the sides of the wheel at a predetermined angle toward one another so as to leave a ring portion at the middle of the wheel of large diameter.

The primary object of the present invention is to provide a method and apparatus for carrying out the method, by which a plurality of angularly positioned surfaces of a grinding wheel can be dressed simultaneously by the use of a simple and inexpensive mechanical accessory of the grinding machine.

Another object is to provide a method and apparatus of the type referred to in the foregoing object for carrying out the method by which the dressed surfaces have the same angular relation with respect to one another, and with respect to the wheel, after the dressing operation as they had before the dressing operation, and in which all of the surfaces are dressed simultaneously at a rate that may be adjustably controlled.

In brief, my invention contemplates the use of diamond point cutters, as many as there are surfaces to be dressed, and which are connected together through a mechanical linkage and gearing in such a way that while one diamond point is cutting one of the surfaces in one direction, another diamond point is cutting another of the surfaces in a different direction. In the case of two surfaces disposed at right angles to one another, the travel of the diamond points is preferably in opposite directions during the cutting or dressing operation.

The invention will be better understood after perusal of the specification in connection with the accompanying drawings.

In the drawings:

Figure 1 is an elevational view of the improved attachment, and showing the manner of securing the attachment to a grinding machine. Small portions of the attachment and machine have been broken away where they are secured together to show the manner of attachment.

Figure 2 is a vertical section of the attachment taken along the line 2—2 in Figure 3.

Figure 3 is a horizontal section of the attachment taken along the line 3—3 in Figure 2, and showing the grinding wheel in plan view.

Figure 4 is a partial section showing a modification of the arrangement seen in Figure 2, in which an additional cutting point is provided for dressing the peripheral edge of the grinding wheel.

Figure 5 is a diagrammatic view showing how a grinding wheel, so dressed, is used for grinding threads.

Figure 6 is a further modification in which a cam plate is added for the purpose of imparting a curvature to the dressed surface of the wheel.

Referring to the drawings, the use of the improved dresser attachment has been illustrated in connection with a grinding wheel 1 having tapered sides 2, 3 (Figure 3), which merge at the middle in a portion 4 having a periphery parallel to the axis of the wheel. The dressing mechanism is contained within a heavy casting 5, cored out on its interior and having a shape which may be generally termed a "double V." As will be seen in Figure 3, the V-shaped portions are inverted with respect to one another, and the end of one of these portions terminates in a boss 6 and is provided with an opening 7.

There is a motor 8 of any suitable direct or alternating current type, the flange 9 of which bears against the boss 6, and the motor is provided with a collar 10 which fits snugly within the opening 7. I prefer a universal motor with a governor and have so shown it herein. As will be seen from the drawings, this motor projects into the interior of the casting 5, and the shaft (not shown) communicates its power to the mechanical parts of the attachment through a reduction gearing contained within a casing 11. This casing supports a shaft 12, on which is mounted a pinion 13. On the opposite side of the motor 8 from the shaft 12, i. e. external of the casting 5, there is a housing 14 which contains a rheostat connected in series with one of the winding of the motor 8, this rheostat being controllable by a knurled knob 15, the purpose of which is to control the speed of the motor 8.

The casting 5 is closed at the bottom by a plate 16 having a generally flat configuration, while the top of the casting is closed by a plate 17 provided with an internally extending hub 18. The plate 17 is provided with a pair of milled-out grooved portions 19, each of which receives a key member 20. The keys fit into a plate member 21 which rests on the plate portion 17 of the main casting. The plate member 21 carries the usual dove-tail slide and is provided with an upstanding projection 22 having a threaded bore for receiving a threaded rod 23. One end of this rod is journalled in a hanger 24 which ex-

tends downwardly from an L-shaped casting 25 shown in detail in Figure 1. The left-hand end of the rod (Figure 2) is provided with a fixed collar 27 positioned at the inside of the hanger 24, and bearing against the outside of the hanger member there is an index collar 28 which carries a handle 29. The arrangement is such that when the handle is turned the plate member 21 and the casting 5 are moved as a body with respect to the casting 25 at a rate depending on the pitch of the screw threads on the rod 23.

The L-shaped casting 25 is provided with one or more strengthening ribs 30 (Figure 1), and the vertical portion of the casting has a pair of holes 31 on each side of the rib or ribs 30 to receive screws 32. These screws are threaded into an upwardly extending plate 33 which bears against the vertical portion of the casting 25, and forms part of the main frame 34 of the grinding machine. The latter is constituted of a large casting having a length somewhat greater than the diameter of the grinding wheel, and is hollowed out to receive the wheel. The latter is provided with a shaft 35 which is adapted to rotate within a bearing 36 contained in a housing 37, and the latter is supported from the frame of the grinder by a pair of hanger members 38 which straddle the wheel and terminate at their upper ends in a plate 39. This plate depends from a dove-tail slide member 40 which is adapted to slide in an opening 41 of corresponding shape formed in an extension 42 of the main frame. Thus the grinding wheel is carried by the dove-tail slide member 40 and is adapted to be shifted in any suitable and well known manner in a direction along the axis of the shaft 35.

In accordance with the present invention, it is desired simultaneously to dress the surfaces 2, 3 (Figure 3) from their highest point downwardly, and preferably adding to this motion a movement to dress the wheel from the lowest point of each surface upwardly, i. e. in the opposite direction from the first movement. Thus each dresser point is caused to move over the surfaces, first in one direction and then in the other. For this purpose the diamond points 43, 44 are provided, these points being fused or otherwise secured in a cylindrical matrix member 45. There are as many of the latter as diamond points, and the number of these points depends on the number of the surfaces of the grinding wheel it is desired to dress. These matrices are secured to cylinders 46, 47, and the latter are adapted to slide along portions of the casting 5, which will now be explained.

The casting terminates at the right-hand end, as seen in Figure 3, in a pair of outwardly extending projections 48, 49, which as shown, are positioned approximately 90 degrees apart but correspond with the angular relation between the surfaces 2, 3 of the grinding wheel. The inner sides of the projections 48, 49 are provided with a V-shaped closure plate member 50, each side of the V being of flat configuration and the plate itself preferably having uniform thickness. The plate member 50 is provided with an opening indicated at 51 along each of its legs, which is sufficiently large to receive the cylinders 46, 47 and has a length somewhat greater than the length of travel of these cylinders. These openings are provided with sheet-metal covers 52 which are secured to the legs of the plate 50 in any suitable manner.

The cover members are slotted, as indicated at 53, to accommodate the longitudinal travel of the cylinders 46, 47 which carry the diamond points 43, 44, as will be described presently. In order to guide the movement of the cylinders 46, 47, slidable plates 54 having hubs 55 which fit snugly around the cylinders 46, 47 are provided. The plates 54 are adapted to slide over the cover members 52 and have such a length that regardless of the instantaneous position of the cylinders 46, 47 no part of the openings 53 will be exposed. Consequently, none of the material which is dressed from the wheel can enter the interior of the casting 5.

The cylinders 46, 47 are mounted on a pair of blocks 56, 57, each of which has a V-shaped groove 58 (Figure 2) along its upper and lower surfaces. Each of these grooves is adapted to receive a plurality of ball bearings, indicated at 59, which are kept apart by a retaining plate 60. There are cap members 56', 57' secured to the outer ends of the projections 48, 49 to provide a chamber around the blocks 56, 57 when the latter are in their extended position, as will be explained hereinafter. The ball bearings 59 are adapted to rotate in a track, indicated at 61, formed in a pair of suitably grooved plate members 62. It will be understood that there is a grooved member 62 for each groove 58 formed in the blocks 56, 57, and these grooved members face either upwardly or downwardly, depending on the position of the grooves 58, their purpose being to complete the track structure over which the ball bearings 59 move.

The blocks 56, 57 have considerable depth at the portions to which the cylinders 46, 47 are secured, these blocks being milled down at the remaining portions to form the legs 63, 64 (Figure 2). The upper surface of the leg 63 (Figure 3) is provided with rack teeth 65, and the lower surface of the leg 64 is provided with similar teeth 66. The legs 63, 64 are positionally arranged in the vertical direction as to permit the leg 63 to slide over the leg 64. They are supported in this position by the grooved plate members 62, the latter in turn being maintained in position within the interior of the casting 5 by means of a pair of L-shaped blocks 67, one of which is secured to the upper plate 17 and extends downwardly, while the other block is secured to the lower plate 16 and extends upwardly. In order to control the distance between the interior surfaces of the blocks 67 and thus control the force exercised by the grooved plate members 62 on the ball bearings, there may be provided a tapered plate member 68, a movement of which will cause the lower plate member 62 either to approach toward or recede from the lower set of ball bearings, depending on the direction in which the tapered plate is moved.

For moving the blocks 56, 57 with respect to one another there is provided a gear 69 mounted on a shaft 70, this shaft being secured to the plate 17 by the nut 71 which fits into a countersunk opening in the plate. The gear 69 has a thickness sufficient to permit the teeth to mesh with the teeth 65, 66 of the legs 63, 64 respectively. The shaft 70 carries a gear 72 which meshes with the pinion 13. Consequently, the motor 8 communicates its rotative effort through the pinion 13, the gear 72 and through the shaft 70 to the gear 69, causing the leg portion 63 to move either upwardly or downwardly, depending on the direction of rotation of the motor, and the leg portion 64 to move in the opposite direction from which the leg 63 is moved. The motion of the leg portions 63, 64 causes the blocks

56, 57 to move in transverse directions, and assuming that the gear 69 rotates counter-clockwise, the blocks 56, 57 both move downwardly. These blocks carry the diamond points 43, 44 so that in moving downwardly, as explained above, the diamond points are caused to pass over the surfaces 2, 3 of the grinding wheel and to dress the same, assuming that the hand wheel 29 has been given the proper motion to cause the diamond points initially to rest against the grinding wheel. In accordance with another feature of my invention, there is provided mechanism by which the diamond points 43, 44 are not only caused to move downwardly over a distance determined by the length of the surfaces 2, 3 of the grinding wheel, but having reached the lowermost points of these surfaces the dresser points are caused to return upwardly over the same paths. Thus each surface of the grinding wheel is dressed twice.

For performing this function there is provided a reversing switch 73 and a stopping switch 74, each mounted on horizontal webs 75 formed within the interior of the casting 5. Each of these switches contains electrical contacts (not shown) and a spring-biased plunger 76. The contacts within the switch 73 are connected through suitable and well known circuits to the motor 8, the arrangement being such that when the plunger 76 is depressed the motor 8 will reverse its direction of rotation. The contacts within the switch 74 are so arranged that when its plunger 76 is depressed the motor will be caused to stop. There is a small snap switch 77 provided at any suitable place on the casting 5, this switch being connected through the switches 73 and 74 to the motor in such a way that movement of the switch 77 will cause the motor to start at a speed determined by the position of the rheostat within the casing 14.

The gear 69 is thus caused to rotate in the clockwise direction, forcing the diamond points 43, 44 to move over and to dress the surfaces 2, 3 of the grinding wheel. As these points reach the lowermost parts of these surfaces the lower end of the leg 63 will depress the plunger or button 76, whereupon the motor will immediately reverse. The gear 69 is therefore caused to rotate in the clockwise direction, causing the diamond points 43, 44 to move upwardly and once again over the surfaces 2, 3. As the leg 64 of the block 57 reaches its uppermost position the plunger or button 76 will be depressed, causing the motor to stop. Thus the diamond points are caused to make a single excursion over the abrading surfaces of the grinding wheel. If an additional excursion is desired the switch 77 is snapped into its energizing position, the circuits of this switch being so correlated with the contacts contained within the stopping switch 74 as to permit the motor again to start. Thus any number of dressing operations across the surfaces 2, 3 may be obtained, it being assumed that the wheel 29 is turned the proper amount between each excursion as determined by the index 28. In order to permit access to the interior of the casting 5 for lubricating and installation purposes, there may be provided an opening 78 closed by a screw 79.

From the foregoing it is evident that I have disclosed a dresser attachment for a grinding wheel in which the direction of travel of the dresser points is rigidly fixed by the shape of the end portions 48, 49 of the casting 5, this shape being accurately determined to correspond with the original or any other desired shape of the inclined surfaces 2, 3 of the grinding wheel. Consequently, the shape of the grinding wheel is exactly the same after the dressing operation as it was before the operation, and this is of considerable importance in those classes of work which require grinding wheels of non-planar configuration. It will be understood that the work is normally placed just below the grinding wheel so that the improved dresser attachment may be left permanently secured to the grinding machine and without any interference whatever with the travel of the work under the grinding wheel, or any movement of the wheel over the work depending on the type of machine.

It is further apparent that in view of the simultaneous movement of the diamond points over the grinding wheel much time is saved in the dressing operation. While I have shown and described my invention in connection with a double diamond point attachment for dressing only two surfaces of the wheel, it is evident that the casting 5 could be provided with three or more extensions each containing their reciprocating blocks to which diamond points are attached, and all simultaneously operated by the gear 69.

In the modification of Figure 4 an additional diamond point 82 is provided for dressing the peripheral face of the wheel 83, this being desirable for certain grinding operations. The diamond point 82 is mounted in an arm 84, this arm in turn being mounted by means of clamping screws 85 upon a shaft 86, which shaft replaces the stub shaft 70 seen in Figure 2. In the present modification the shaft 86 is made integral with gears 69 and 72, bearings 87 and 88 being provided in the top and bottom plates 16 and 17 of the casting 5. It is evident that as gear 69 is driven to reciprocate the legs 63 and 64, shaft 86 will be oscillated through an angle identical with that of gear 69, and that likewise the arm 84 and diamond point 82 will be oscillated, causing a double dressing cut across the outer face of the grinding wheel 83.

Figure 5 shows how a grinding wheel dressed by the machine just described might be used, for example, in the grinding of a very accurate thread.

In the modification of Figure 6 there is shown a fragmentary horizontal section, similar to a portion of Figure 3, means being added in this view for guiding the diamond point transversely of the reciprocating leg and block to produce any desired curvature of the angular dressing cut on the grinding wheel. To this end there is provided the diamond point holder 89, having at its inner end a follower 90 which is adapted to bear on the surface of a cam 91, of any desired contour. A spring 92 bears against the follower 90 to maintain it in engagement with the cam 91. The stationary end of this spring is retained in a barrel 93, this barrel being mounted as by threading into a bore in a block 94, this block being in all other respects identical with the block 56 of Figure 3. The cam 91 is removably mounted in the projection 48 of the casting 5 by any suitable means, such as screws 95.

In action, as the gear 69 rotates it causes the reciprocation of the leg 63 and block 94 for the purpose of dressing the angular side of the grinding wheel 96, and the follower 90 moves the diamond point holder 89 transversely of the block 94 as said follower passes over the contour of cam 91. There is thus imparted to the wheel a cut which is not only angular with respect to the

side of the grinding wheel but also curvilinear, the character of the curve being determined by the contour of the cam 91.

It will be understood that I desire to comprehend within my invention such modifications as come within the scope of the claims.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A dresser attachment for a grinding wheel which has a pair of inclined abrading surfaces, said attachment comprising a frame which terminates in a pair of hollow projections parallel to the pair of inclined abrading surfaces, said projections containing slidable blocks carrying dresser tools, and means for sliding said blocks simultaneously within their respective frame projections in order simultaneously to dress the abrading surfaces of the grinding wheel, said slidable blocks being carried on ball bearings mounted in tracks secured to said projections and terminating in racks which cross one another, and a pinion for moving said racks and the slidable blocks with respect to one another, said pinion being on the opposite side of the racks from the grinding wheel.

2. A dresser attachment for a grinding wheel which has a pair of inclined abrading surfaces, said attachment comprising a frame which terminates in a pair of hollow projections parallel to the pair of inclined abrading surfaces, said projections containing slidable blocks carrying dresser tools, means for sliding said blocks simultaneously within their respective frame projections in order simultaneously to dress the abrading surfaces of the grinding wheel, said slidable blocks being carried on ball bearings mounted in tracks secured to said projections and terminating in racks which cross one another, a pinion for moving said racks and the slidable blocks with respect to one another, a motor for rotating said pinion, and a switch responsive to a predetermined length of movement of one of said racks for reversing the motor and thereby reversing the movement of each of said racks whereby the abrading surfaces of the wheel are dressed twice.

3. A dresser attachment for a grinding wheel which has a pair of inclined abrading surfaces, said attachment comprising a frame which terminates in a pair of hollow projections parallel to the pair of inclined abrading surfaces, said projections containing slidable blocks carrying dresser tools, means for sliding said blocks simultaneously within their respective frame projections in order simultaneously to dress the abrading surfaces of the grinding wheel, said slidable blocks being carried on ball bearings mounted in tracks secured to said projections and terminating in racks which cross one another, a pinion for moving said racks and the slidable blocks with respect to one another, a motor for rotating said pinion, a switch responsive to a predetermined length of movement of one of said racks for reversing the motor and thereby reversing the movement of each of said racks whereby the abrading surfaces of the wheel are dressed twice, and a switch responsive to a predetermined length of the reverse movement of the other of said racks for stopping said motor.

4. In a dresser attachment for a grinding machine having a wheel with a front and a pair of inclined abrading surfaces, said attachment comprising a frame, a master actuating shaft, a gear on said shaft, racks engaging said gear, dressing tools associated with said racks and adapted to be moved in angular planes with respect to one another to dress the inclined abrading surfaces of the wheel, and an arm carrying a dressing means, said arm being mounted on said shaft whereby the rotation of the arm will simultaneously dress the face of said wheel while the inclined surfaces thereof are being dressed, said racks crossing one another and said gear being positioned on the opposite side of the racks from the grinding wheel.

5. A dresser attachment for a grinding wheel which has a pair of inclined abrading surfaces, said attachment comprising a frame which terminates in a pair of hollow projections parallel to the pair of inclined abrading surfaces, said projections containing slidable blocks carrying dresser tools, means for sliding said blocks simultaneously within their respective frame projections in order simultaneously to dress the abrading surfaces of the grinding wheel, said slidable blocks terminating in racks which cross one another, a pinion for moving said racks and the slidable blocks with respect to one another, a motor for rotating said pinion, and a switch responsive to a predetermined length of movement of one of said racks for reversing the motor and thereby reversing the movement of each of said racks whereby the abrading surfaces of the wheel are dressed twice.

6. A dresser attachment for a grinding wheel which has a pair of inclined abrading surfaces, said attachment comprising a pair of supports positioned parallel to said inclined surfaces, blocks slidably mounted on said supports and carrying dresser tools, means including a motor for sliding said blocks simultaneously on said supports in order simultaneously to dress the abrading surfaces of the grinding wheel, and means automatically operable when the abrading surfaces of the wheel have been dressed in one direction for reversing the motor in order that the abrading surfaces may be dressed in the opposite direction.

7. A dresser attachment for a grinding wheel which has a pair of inclined abrading surfaces, said attachment comprising a pair of supports positioned parallel to said inclined surfaces, blocks slidably mounted on said supports and carrying dresser tools, means including a motor for sliding said blocks simultaneously on said supports in order simultaneously to dress the abrading surfaces of the grinding wheel, electrical means automatically operable when the abrading surfaces of the wheel have been dressed in one direction for reversing the motor in order that the abrading surfaces may be dressed in the opposite direction, and electrical means automatically operable on the return of the blocks to their initial positions for stopping the motor.

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