March 5, 1963 L. CATALLO ETAL 3,079,905

ROTARY WHEEL DRESSER

Filed March 6, 1959 4 Sheets-Sheet 1

Fig 1

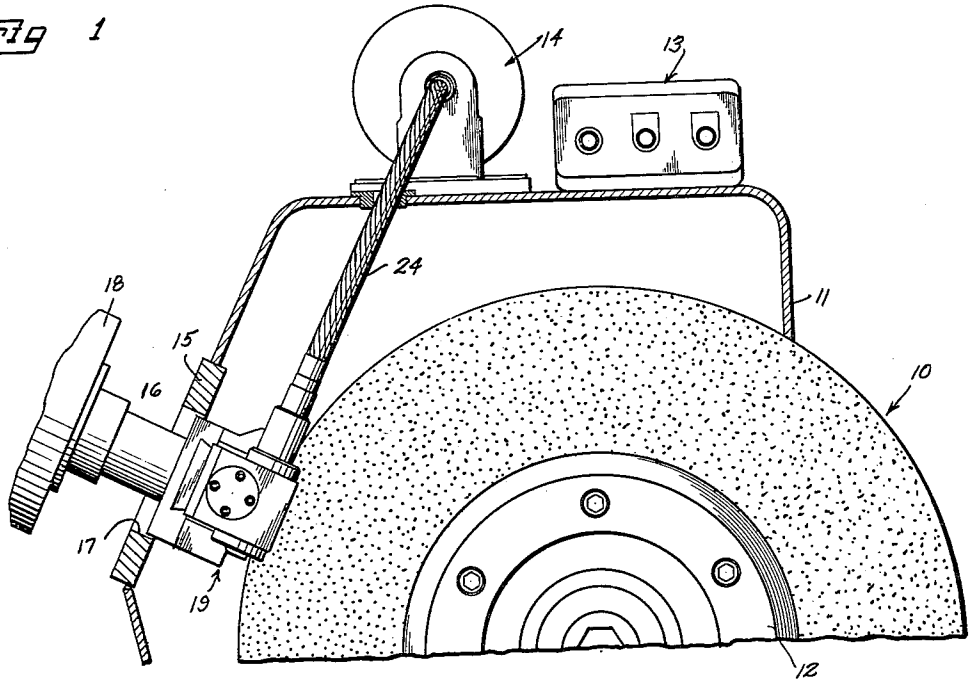

Fig 2

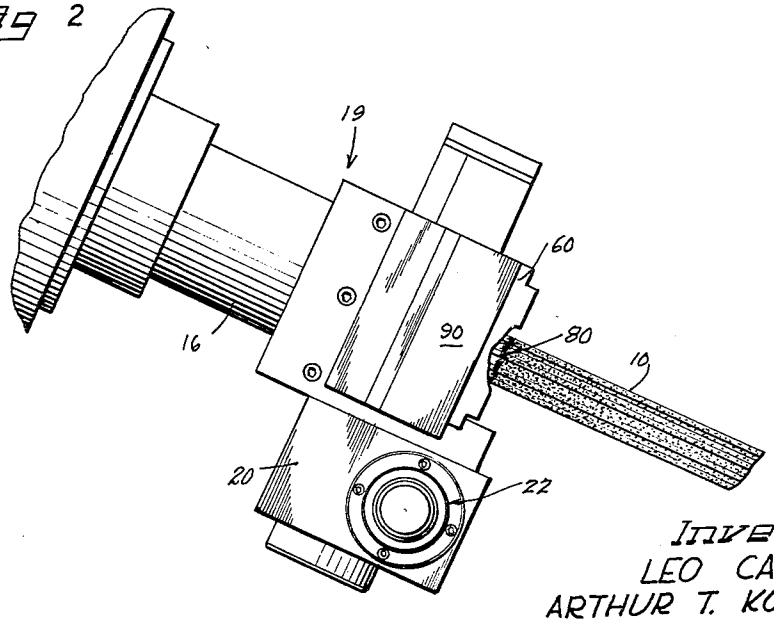

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Fig 3

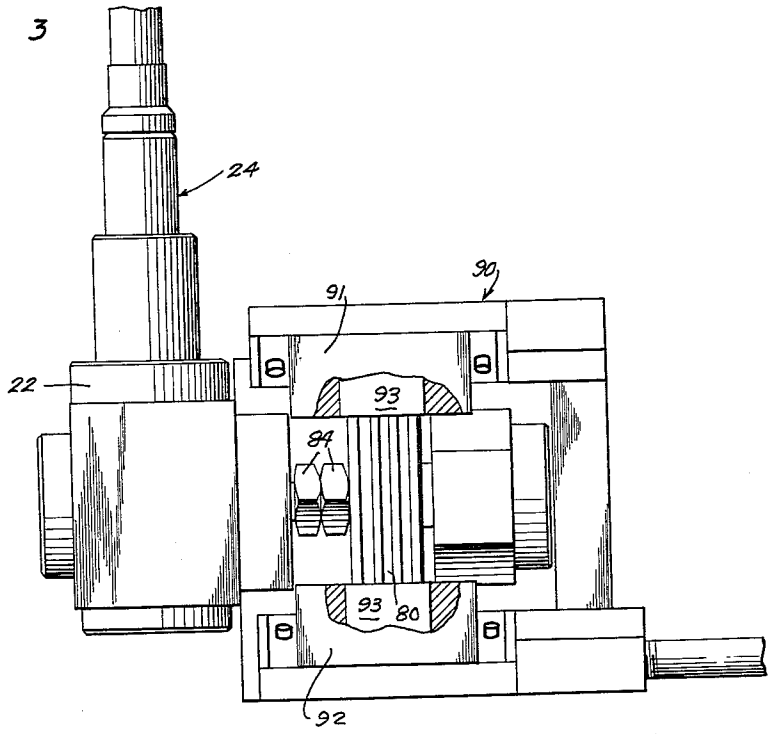

Fig 4

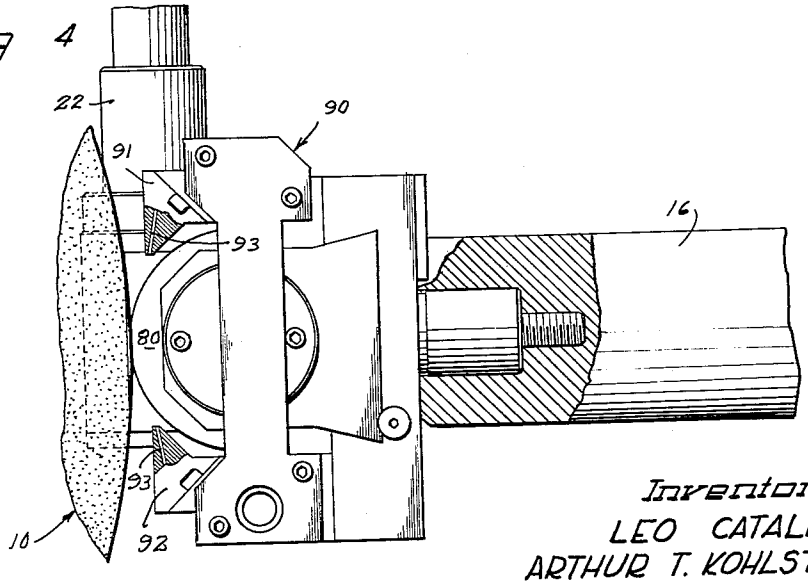

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Fig 5

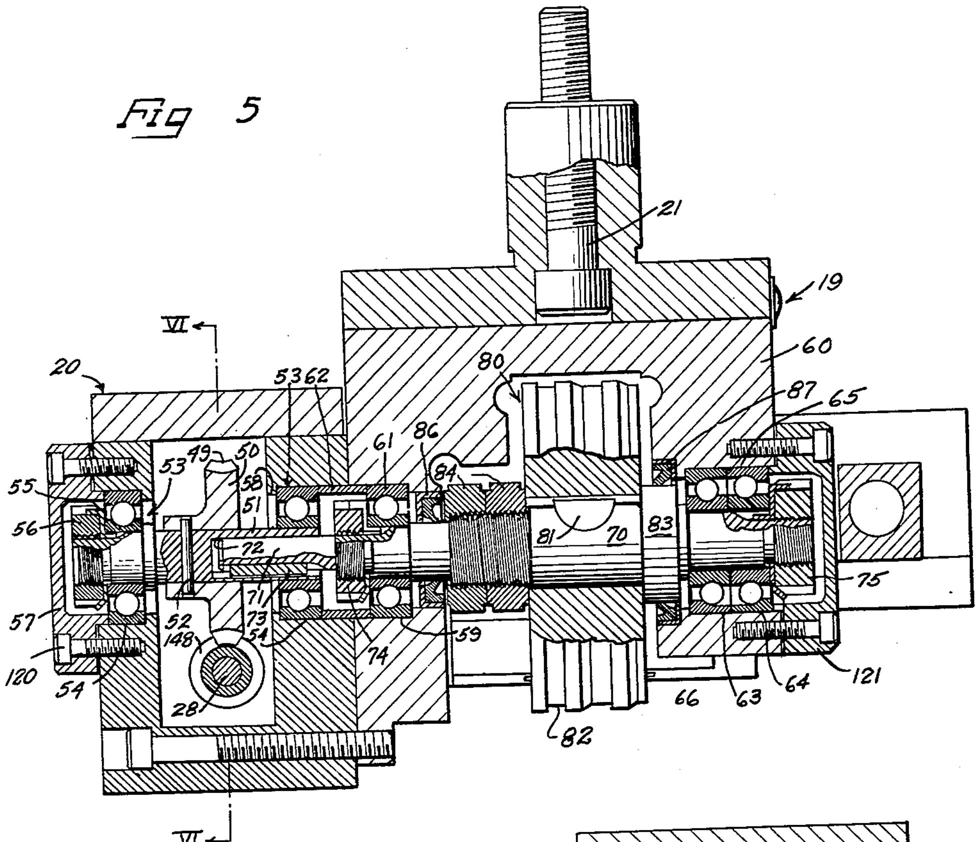

Fig 6

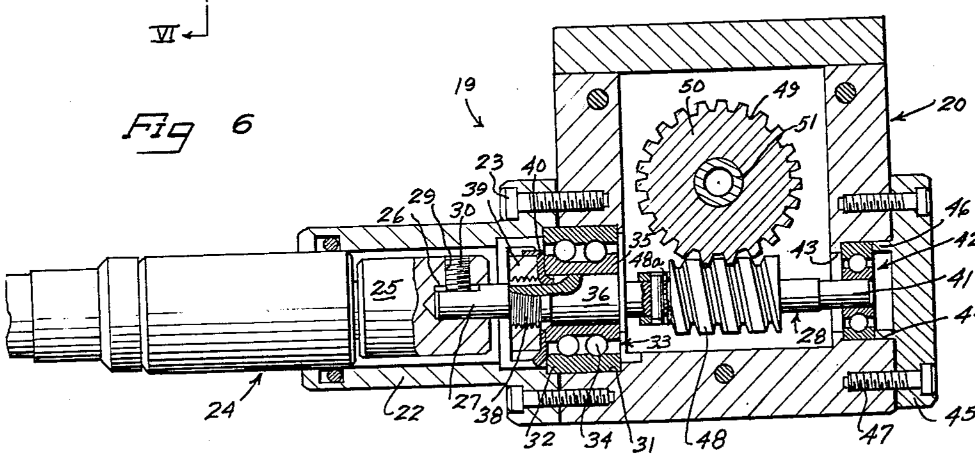

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Fig 7

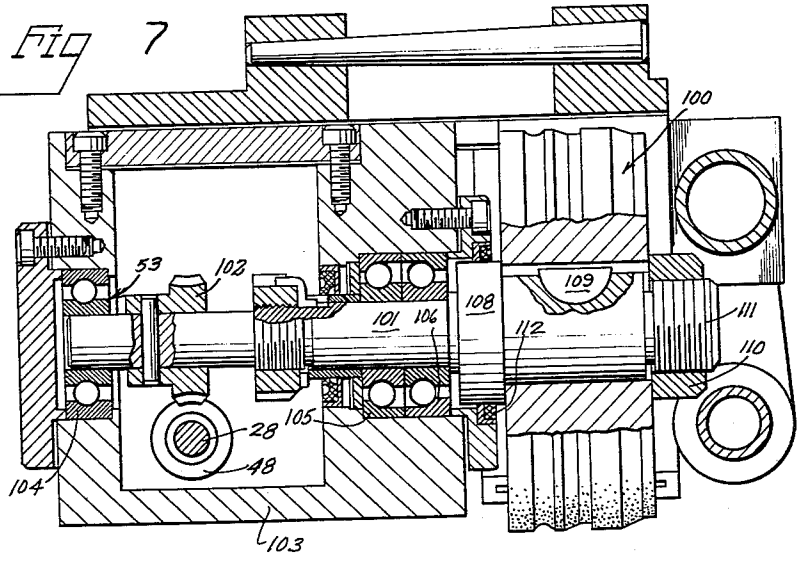


Fig 8

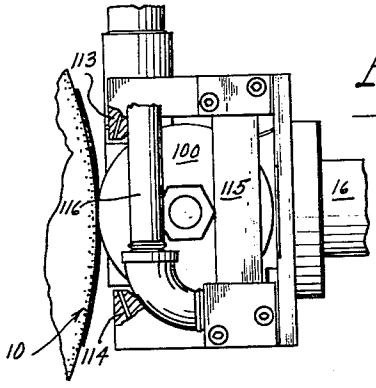
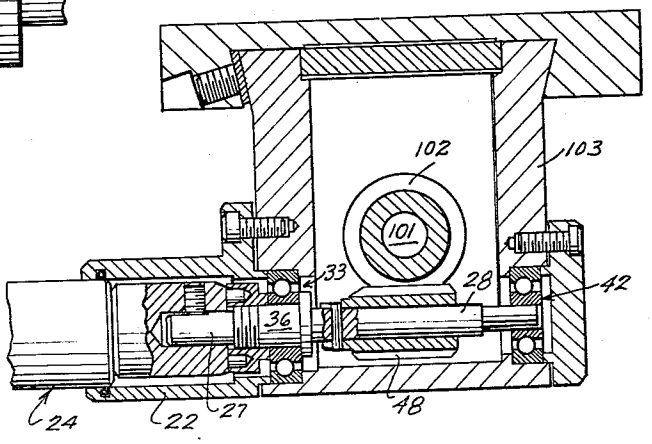


Fig 9



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ROTARY WHEEL DRESSER

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2 Claims. (Cl. 125—11)

This invention relates to grinding wheel dressing mechanisms and more particularly to an improved rotary grinding wheel dresser which is adapted to accurately form dress a grinding wheel with a minimum of attrition to the abrasive surfaces of the dressing wheel.

It has been usual in the art to form dress a grinding wheel by utilizing a plurality of single point diamond tools which are held in precise relation with respect to one another and which are rigidly affixed to a common traversing assembly and traversed across the grinding wheel as the dresser assembly follows a highly accurate profile. It has also generally been the practice to infeed the diamond dressing tools in increments of .002 of an inch per cycle but such multiple tools dressing mechanisms are subject to unequal diamond wear and breakage with the result that volume production from the grinding wheels depends to a large extent upon the ability of tool set-up personnel to replace the dresser assembly containing the worn or broken diamond dressing tool without undue loss of time. Obviously, the necessity for replacement or realignment of any of the plurality of diamond dressing tools in the dresser assembly also requires the realignment and repositioning of each of the other diamond dressing tools within the dresser.

Due to the uneven wear and attrition of the dressing tools mounted in the diamond dressing assembly the dressing-in of a new grinding wheel generally results in such wear to the diamond dressing tools that it is necessary to replace the diamond tools with a second set of similar tools and to thereby necessitate the repositioning and realignment of the second set of diamond tools before grinding can resume.

It has further been found in practice that the only convenient and practical method for setting up the diamond dressing assemblies and accurately positioning the respective diamond tools within the assemblies has been through the use of a multiple magnification comparator installed in close proximity to the grinding wheel dressing mechanisms.

In order to obviate the disadvantageous features set forth above, applicant has devised a rotary form dresser comprising generally a rotatable form dressing wheel having a diamond abrasive surface formed on the periphery thereof which has a configuration corresponding inversely to the configuration to be formed in the grinding wheel.

The abrasive dressing wheel is operably connected to a suitable power source and is arranged to be rotated at selected intervals so that the contacting surfaces of the dresser wheel and grinding wheel at their point of tangency are moving in opposite directions. The rotary wheel dresser is also quite compact and is adapted to be fitted to a standard tool bar associated with an infeeding mechanism.

Heretofore the dressing down time for a grinding wheel being form dressed with a stationary dressing tool of a given hardness impressed on the grinding wheel at a given pressure was entirely a function of the rotational velocity of the grinding wheel so that by providing a rotary form dressing tool as is hereinafter disclosed in detail, the time necessary for the form dressing operation is considerably shortened.

Accordingly, it is a principal object of the present invention to provide a form dressing assembly for form dressing a grinding wheel which comprises generally a rotatable unitary form dressing wheel.

Another object of the present invention resides in the provision of a grinding wheel dressing mechanism which can form dress a grinding wheel in a relatively short time with a minimum of attrition to the abrasive surfaces of the wheel dresser.

A further object of the invention is to provide a rotary wheel dressing assembly of the type set forth above which is adapted to be mounted on a standard tool dresser bar associated with an ordinary infeeding mechanism.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings, wherein:

FIGURE 1 is a side elevational view of the form dressing mechanism of the present invention shown properly positioned with respect to a grinding wheel;

FIGURE 2 is substantially a plan view of the form dressing mechanism illustrated in FIGURE 1 and showing the coaction between the surfaces of the form dressing wheel and the grinding wheel;

FIGURE 3 is a front view of the form dressing mechanism illustrated in FIGURE 1 showing a portion thereof cut away;

FIGURE 4 is a side elevational view of the form dressing mechanism of the present invention illustrating the coolant nozzles in partial vertical section;

FIGURE 5 is a longitudinal sectional view taken through the form dressing mechanism;

FIGURE 6 is a sectional view of the form dressing mechanism taken along lines VI—VI of FIGURE 5;

FIGURE 7 is a horizontal sectional view through a form dressing mechanism constructed in accordance with the principles of the present invention which is similar in nature to FIGURE 5 but which illustrates a somewhat different embodiment thereof and which shows the rotary dressing wheel as being end mounted on a power shaft;

FIGURE 8 is a side elevation view of the second embodiment of the present invention; and

FIGURE 9 is a vertical sectional view through the second embodiment of the form dressing mechanism illustrated in FIGURE 7.

In the embodiment of the invention illustrated in FIGURES 1–6, a grinding wheel 10 is shown as being disposed for rotatable movement within a housing or cowling 11 and as having annular metallic wheel flanges fitted to opposite sides thereof and encircling the grinding wheel power shaft (not shown) for supporting the grinding wheel 10.

The housing or cowling 11 is shown as having a control panel 13 and an electrical power source 14 mounted on the upper surface thereof and as being apertured on the side wall thereof to receive an annular apertured plate 15.

A diamond bar 16 is shown as extending through the aperture 17 in the plate 15 and as interconnecting an infeeding mechanism 18 with the form dressing assembly 19 which forms the subject of the present invention.

Referring now most particularly to FIGURES 5 and 6, the form dressing assembly 19 is shown as comprising generally a multi-part housing 20 having an attachment bolt 21 secured therein which is adapted to be screw-threaded into the threaded end portion of the diamond bar 16 for rigidly securing the form dressing assembly 19 to the diamond bar 16. The gear housing 20 has an elongated cylindrical housing 22 secured thereto by means of a plurality of screws 23 which are screw-threaded into the gear housing 20, and is apertured at the outer end thereof to operably receive one end of a flexible power cable 24 which is connected at its opposite end to the output power

shaft of a power source 14. The cable 24 may be secured within the housing 22 in any suitable manner and has a rotatable flexible power shaft 25, journaled within the casing of the flexible cable 24, which terminates within the interior of the housing 22.

The power shaft 25 is axially apertured as at 26 so as to receive the input end 27 of a worm shaft 28. The power shaft 25 is also radially apertured as at 29 to threadedly receive a set screw 30 which is arranged to be screw-threaded into abutment with the input end 27 of the worm shaft 28 to secure the shaft 28 to the shaft 25 for corotatable movement therewith.

An aperture 31 formed within the gear housing 20 and through which the worm shaft 28 extends, is considerably larger than the shaft 28 and is adapted to receive and support the outer ball race 32 of a self-aligning radial bearing 33. A plurality of ball bearings 34 are disposed intermediate the outer ball race 32 and an inner ball race 35 which, in turn, is secured to a diametrically enlarged portion 36 of the worm shaft 28. The worm shaft 28 is threaded as at 38, intermediate the input end 27 and the diametrically enlarged portion 36 thereof, to threadedly receive a bearing lock nut 39 which serves to maintain a bearing lock washer 40 in engagement with the inner ball race 35. The outer end 41 of the worm shaft 28 is similarly suitably journaled in a radial bearing 42 which is disposed in the gear housing 20 against a shoulder 43 defining an aperture 44 within the housing. The radial bearing 42 is maintained in this position by means of a cap 45 which has an annular ring 46 disposed in abutment with the bearing 42 and which is attached to the gear housing 20 by means of a plurality of screws 47.

A worm 48 is secured to the worm shaft 28 by means of a pin 48a and is disposed within the gear housing 20 and is arranged to mesh with the peripheral gear teeth 49 formed about the periphery of a cooperating worm wheel 50.

The worm wheel 50 is secured to a worm wheel shaft 51 for corotatable movement therewith by means of a pin 52 extending through aligned apertures in the wheel 50 and the shaft 51 and the worm wheel shaft is, in turn, suitably journaled within radial bearings 53 disposed within coaxially aligned apertures 54 in opposite walls of the gear housing 20. The radial bearing 53 at the outer end of the worm wheel shaft 51 is secured within its respective aperture 54 in the gear housing 20 by means of a lock screw washer and a lock screw 55 and 56, respectively, in a manner similar to that described with respect to the radial bearing 33. A cap 57 is secured, like the cap 45, to the gear housing 20 by means of a plurality of screws 120 which are screw-threaded into the side wall of the gear housing 20.

The bearing 53 at the opposite end of the shaft 51 is disposed in abutment with an annular shoulder 58 formed about its respective aperture 54 and rotatably supports one end of the worm wheel shaft 51. An aperture 59 is formed within a spindle housing 60 and is disposed coaxially with the apertures 54 and has a radial bearing 61 disposed therein which is spaced from the radial bearing 53 by means of an annular bearing spacer 62. A pair of self-aligning radial bearings 63 and 64 are similarly disposed within an aperture 65 formed on the opposite side of the spindle housing 60 which is concentrically aligned with the apertures 54 and 59 and are maintained in abutment with an annular shoulder formed integrally with the spindle housing in a manner which will hereinafter be described. A cap 121, like the cap 57, is also screw-threaded into the spindle housing 60 to cover the bearings and associated components adjacent thereto.

A spindle shaft 70 is disposed within the spindle housing 60 and is journaled in the radial bearings 53, 61, 63 and 64 and has a radially reduced input end portion 71 which extends within an elongated bore 72 in the worm wheel shaft 51. A key 73 is suitably disposed within receiving slots in the spindle shaft 70 and the worm wheel shaft 51 to provide for corotatable movement of the two interconnected shafts.

The spindle shaft 70 is threaded at a point intermediate the bearings 53 and 61 and at the outer end thereof to threadedly receive lock screw nuts 74 and 75, respectively, which serve to maintain the inner ball races of the bearings 61, 63 and 64, respectively, in their proper secured relation with respect to the shaft 70.

The form dressing wheel 80, which forms the principal subject of the present invention, is affixed to the spindle shaft 70 for corotatable movement therewith by means of a key 81 and has its peripheral surface 82 contoured inversely from the desired contour to be formed in the grinding wheel. The form dressing wheel 80 abuts, at one side thereof, a collar 83 which is formed integrally with the spindle shaft 70 and is maintained in engagement therewith by a pair of form wheel lock nuts 84 which are threadedly mounted on the spindle shaft 70.

It will further be noted that a pair of spindle bearing seals 86 and 87 are affixed within the spindle housing 60 about the spindle shaft 70 on opposite sides of the form dressing wheel 80, which serve to prevent foreign particles from entering the radial bearings. The spindle bearing seals may, of course, be of any suitable design and would preferably have a resilient member forming a part thereof adapted to fit about the spindle shaft 70.

As shown most clearly in FIGURES 3 and 4, a coolant housing 90 extends about the form dressing wheel 80 and has a pair of coolant nozzles 91 and 92 connected thereto which have elongated passages 93 formed therein having a width preferably substantially equal to the width of the form dressing wheel 80. Coolant, such as water, is supplied under pressure, in a manner which is not shown, to the coolant housing 90 and from there travels to the coolant nozzles 91 and 92 and through the passages 93 so that streams of coolant flow from above and below the point of tangency of the form dressing wheel 80 and the grinding wheel 10 which are aimed substantially at that point of contact to reduce the heat generated by friction between the coacting members.

It will be understood that the worm 48 may be provided with either right or left hand threads to thereby effect rotatable movement of the form dressing wheel 80 in the same or opposite direction as or to the grinding wheel 10. The peripheral surface of the form dressing wheel 80 may be impregnated with any suitable abrasive such as, for instance, a diamond abrasive and the wheel may be formed of any desired contour conforming to the contour of the desired product of the grinding wheel.

It will further be noted that due to the compact size of the form dressing wheel assembly, the form dresser may be affixed to the usual diamond bar 16 extending from the infeeding mechanism 18, intermediate the grinding wheel 10 and the usual cowling or housing 11.

Referring now more particularly to the embodiment of the invention illustrated in FIGURES 7, 8 and 9, the composition of the rotary wheel dressing assembly is substantially the same as that illustrated in FIGURES 1–6 but the rotary dressing wheel 100 is mounted in cantilever fashion on the outer free end of the output power shaft 101 which is, in turn, operably connected to the worm wheel 102 and which is suitably journaled within the housing 103 by means of a plurality of radial bearings 104, 105, and 106.

In this second embodiment of the invention the power shaft 101 is provided with a collar 108 which provides an abutment means for the rotary wheel dresser 100. The dresser wheel 100 is keyed to the shaft 101 for corotatable movement therewith by means of a key 109 and is maintained in proper position on the shaft 101 in engagement with the collar 108 by means of a lock screw 110 which is threadedly mounted on the threaded outer free end portion 111 of the shaft 101. As with the em-

bodiment of the invention illustrated in FIGURES 1–6, a spindle bearing seal **112** is fitted about the shaft **101** on the collar **108** and is disposed intermediate the radial bearings **104**, **105** and **106**, and the dresser wheel **100** to prevent the entrance of foreign particles from the dresser wheel to the area in which the bearings are disposed.

A pair of coolant nozzles **113** and **114** are disposed above and below the point of tangency of the rotary dresser wheel and the grinding wheel and are each communicable with a coolant housing **115** which, in turn, is supplied with coolant through a coolant supply pipe **116**.

Since the means for positioning and properly securing the bearings and their respective seals within the housing in this second embodiment of the invention is substantially the same as has hereinbefore been described with respect to the embodiment of the invention illustrated in FIGURES 1–6, such will not hereinafter be further described.

It will be understood that it would be preferable to form the dressing wheel of a width slightly greater than the width of the grinding wheel and, further, that it may be found desirable to connect a plurality of dressing wheels to a common shaft or to interconnected shafts to dress a single wheel or a plurality of grinding wheels simultaneously from the same power source. Such modifications could, of course, be effected without departing from the scope of the present invention.

It will, therefore, be understood that these embodiments of the invention have been used for illustrative purposes only and that various modifications and variations in the present invention may be effected without departing from the spirit and scope of the novel concepts thereof.

We claim as our invention:

1. The combination with a grinding wheel assembly, including an independently driven rotatably mounted grinding wheel, a housing therefor having an opening therethrough for access to the face of said wheel, and an independently supported infeed mechanism having a bar the inner end of which freely extends through said opening toward the face of said wheel, a form dresser assembly rigidly carried by said bar end for movement therewith within said housing, said form dresser assembly comprising a rotatable power shaft having its axis in operative relationship to the axis of said grinding wheel, an abrasive form dressing wheel mounted on said shaft for rotation therewith, power means mounted outside of said housing, a flexible power transmission shaft extending from said power means through said housing and driving means directly interconnecting said flexible shaft and said power shaft to drive the latter and said form dressing wheel independently of the driving of said grinding wheel to form dress said grinding wheel, said flexible power transmission shaft accommodating itself to the movement of said bar end and said form dresser assembly.

2. The combination defined by claim 1 in which the abrasive form dressing wheel is mounted at a free end of said rotatable power shaft.

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