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FORM DRESSING ASSEMBLY

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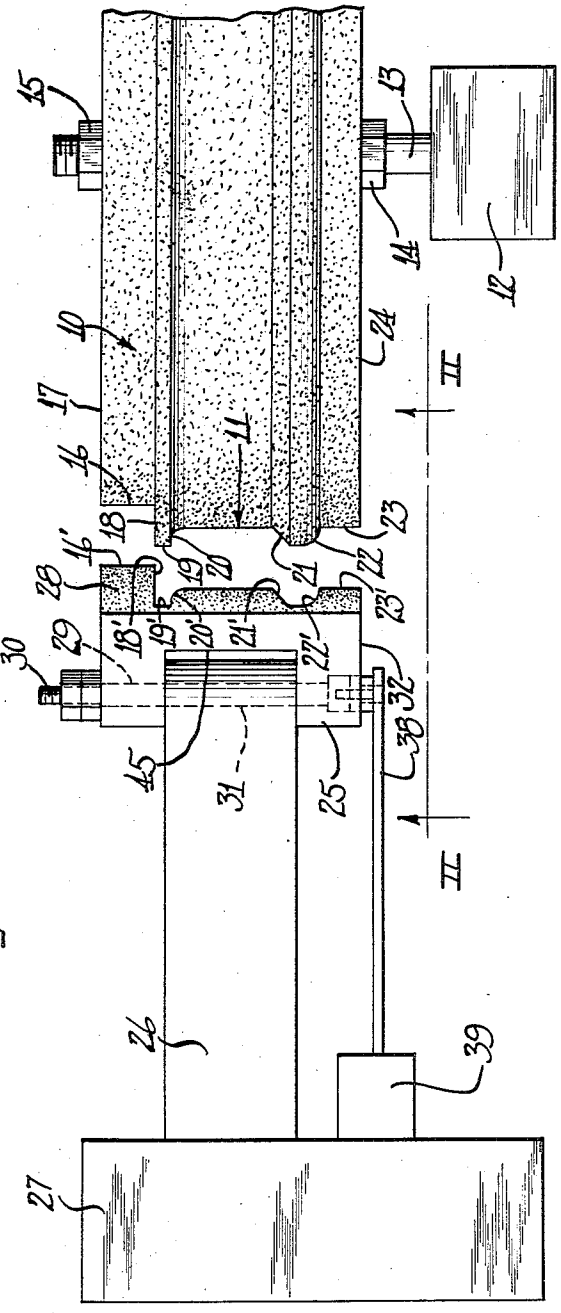


Fig. 1

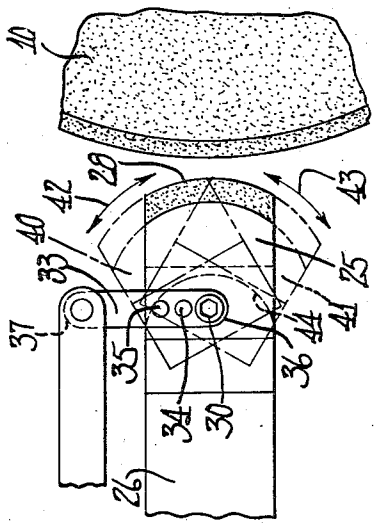


Fig. 2

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FORM DRESSING ASSEMBLY

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The present invention relates to a form dressing assembly and process of form dressing and more particularly relates to form dressing of grinding wheels including apparatus for properly form dressing the peripheral contour thereof to the preselected configuration and the process of so form dressing the same.

One of the outstanding features of the present invention is its adaptability for form dressing of grinding wheels, generally, such as for form dressing wheels of a single grinding wheel mechanism as well as for form dressing wheels of centerless grinders. Such form dressing may be accomplished most easily and efficiently in accordance with the principles of the present invention since the invention contemplates forming a segmental cylindrical form dressing tool with a peripheral contour on the arcuate face thereof corresponding reversely to the contour of the working face of the grinding wheel or wheels to be form dressed, and oscillating the tool arcuately about a relatively fixed center while the same is in engagement with the grinding wheel.

Heretofore, many various devices have been devised for form dressing a grinding wheel but many of these have proved to be somewhat inefficient and unsatisfactory since they employed stationary tools or rotary tools which were not power actuated or they employed single point dressing tools on mechanisms which were devised to follow templets as accurately as possible. The templet type of form dressing has, in many instances, been unsatisfactory commercially since it required expensive apparatus and setup, the need of which is completely obviated by the present invention.

Other forms of dressing grinding wheels include such processes as crush dressing or the like and these also have proven, in many instances, to be unsatisfactory because they did not provide the high degree of accuracy of dressing that is often desired and which may be obtained by form dressing or through the use of diamond point tools which will cut the abrading wheel or grinding wheel to the required shape rather than to crush the resin bonding of the wheel.

It is, therefore, one of the important features of the present invention to provide new and improved apparatus and processes for form dressing abrading wheels such as grinding wheels or the like to a true and accurate peripheral contour.

Another important feature of the present invention is to provide new and improved form dressing apparatus for dressing abrasive grinding wheels to a true and accurate peripheral contour with a single arcuately oscillating dressing tool which has a segmental peripheral contour cooperatively opposite to that which is to be imparted to the grinding wheel and the same as that which is to be imparted to the final workpiece by the grinding wheel.

Still another object of the present invention is to provide new and improved form dressing apparatus wherein the form dressing tool has an arcuate face or a segmental cylindrical face and is oscillated about a fixed center on the dressing device.

Still another object of the present invention is to provide a new and improved process of form dressing the periphery of an abrasive wheel such as a grinding wheel or the like by engaging the same with a form dressing tool having a peripheral configuration opposed to that which is to be imparted to the grinding wheel and angularly oscillating the form dressing tool.

Still other objects, features and advantages of the present invention will become readily apparent from the following detailed description of the principles and an embodiment thereof, from the claims, and from the accompanying drawings, in which each and every detail shown is fully and completely disclosed as a part of this specification, wherein like reference numerals refer to like parts, and wherein:

Figure 1 is a broken plan view of dressing apparatus embodying the principles of the present invention and shown in cooperating position with a grinding wheel to be dressed; and

Figure 2 is a broken elevational view of a portion of the apparatus viewed substantially as taken along the line II—II of Figure 1.

As shown on the drawings:

When dressing grinding wheels or the like on such installations as single grinding wheel devices or multiple grinding wheel devices, such as centerless grinders, it is important that they be dressed highly accurately. The accuracy of the dressing of the grinding wheel is determinative of the accuracy of the finished product and the trueness of the configuration thereof to the desired configuration. In view of this circumstance, it is frequently necessary to redress a grinding wheel at various intervals during the use thereof in grinding finished products. It, therefore, becomes necessary that the dressing operation be done as efficiently and economically as possible and yet as accurately as possible so that while the finished product has the accuracy desired, the cost of production thereof does not become prohibitive.

To this end, the present invention provides an economical, efficient and highly accurate method and apparatus for dressing a grinding wheel such as the grinding wheel **10** so as to provide the same with an accurate peripheral contour **11** as frequently as necessary. The grinding wheel **10** may be mounted on any particular type of grinder desired and the grinder is therefore illustrated more or less diagrammatically by the box **12** which would necessarily include driving means to drive the wheel shaft or spindle **13** carrying the grinding wheel **10** which is locked thereon by such convenient means as nuts **14** and **15** or the like threaded onto the spindle or shaft.

In the instant case the grinding wheel **10** is shown as having a peripheral contour with a cylindrical axial shoulder **16** adjacent to one edge **17** of the wheel and adjacent to a radial face **18** which extends outwardly to an axial relatively short face **19**. Progressively across the periphery **11** of the grinding wheel, the periphery is further contoured with arcuate variations **20**, **21** and **22** leading to a last axial shoulder or face **23** adjacent to the other radial face **24** on the grinding wheel **10**. This particular peripheral configuration is exemplary only, since methods and apparatus for dressing grinding wheels in accordance with the present invention are not restricted to any particular facial configuration but may be utilized to form dress any desired peripheral configuration on a grinding wheel. The grinding wheel itself may be of any desired manufactured characteristic such as a resin bonded wheel or the like.

To dress the periphery **11** of the grinding wheel accurately to its desired configuration, however, there is provided a dressing tool or dressing block **25** which is mounted on the dressing mechanism spindle or support arm **26** at the outer end thereof. This dressing mechanism

spindle or support arm is mounted on the dressing mechanism, which is not critical to the present invention and therefore is illustrated diagrammatically by the box 27.

The dressing tool itself, however, does form an important part of this invention and while the composition thereof is not significant, it is important that it be shaped generally as a cylinder segment, as shown in Figure 2, so that its dressing face 28 will be substantially cylindrical. That is, the dressing face itself will be configurated peripherally reversely to the configuration of the periphery of the grinding wheel 10 but each circumferential line on the arcuate face will be substantially a true circular arc with a radius equal to the distance between the line and the center of the oscillating shaft aperture 29 in the block. Still more particularly, the block or dressing tool 25 is a somewhat rectangular block having one arcuate face 28 and a shaft aperture 29 extending longitudinally through the block and so related to the arcuate face 28 as to be along the axis or center of curvature of the face so that a peripheral line on the arcuate face 28 is a substantially true circular arc having its center on the axis of the shaft aperture 29. An axle or other equivalent pin 30 extends through the shaft aperture 29 and through an equivalent aperture 31 in the region of the outer end of the dressing spindle or support arm 26 to support the dressing tool 25 on the spindle or support arm at the outer end thereof.

The arcuate face 28 is the form dressing face of the tool or block 25 and, as stated hereinbefore, is configurated with peripheral variations corresponding, reversely, to the faces and variations in the periphery of the grinding wheel 10 so that it is provided with an axial outwardly extending shoulder 16' adjacent to one end face thereof and further adjacent to a radial face 18' which extends radially inwardly to a second axially extending face 19' that progressively leads to arcuate variations 20', 21' and 22'.

Adjacent to the other end face 32 of the blank 25, the periphery 28 is provided with an axially extending face 23' corresponding to the face 23 on the grinding wheel 10.

The dressing face 28 of the dressing tool 25 is impregnated with a layer of abrading diamonds or the like which may vary in size from as small as diamonds passing through a 400 mesh screen to diamonds as large as 50 per carat. In a preferred construction the cutting surface or abrading surface 28 of the tool 25 is provided with a single particle thickness diamond layer thereon since the dressing tool will lose some of the accuracy thereof after having been used sufficiently to dull or wear down the diamond points on a top layer of diamonds.

In accordance with the principles of the present invention, to dress the grinding wheel 10 with the dressing tool 25, the dressing face 28 of the dressing tool 25 and the periphery 11 of the grinding wheel 10 are brought into engagement with each other while the grinding wheel 10 is being rotatably driven, as by the mechanism 12. At the same time, the dressing tool 25 is being arcuately oscillated about its axis or the axis of the tool shaft 30 by an actuating mechanism which includes a link 33 that is pinned or otherwise secured to the tool, as indicated at 34 or 35 and which has one end 36 thereof fixed on the tool-supporting shaft 30. The other or outer end 37 is pinned to the actuating arm 38 for rocking movement with respect thereto so that reciprocatory motion of the arm 38 which may be imparted thereto by any convenient reciprocating mechanism schematically illustrated at 39, and which may be such a mechanism as a cam mechanism or an hydraulic or an electric or other mechanical eccentric mechanism, will cause oscillating motion of the link 33.

Such relative oscillatory movement of the link 33 will be imparted to the tool 25 through the pins 34 and 35 and the tool shaft 30 so that the tool will angularly oscillate between the two phantom line positions shown therefor and indicated generally at 40 and 41. By oscillating the tool between the positions 40 and 41 the form dressing face 28 thereof will be bidirectionally arcuately oscillated as indicated by the double headed arrows 42 and 43 so that it will oscillate on the rotating peripheral face 11 of the grinding wheel 10 and thereby truly form dress the described or any other desired periphery thereon most economically and efficiently.

While the outer end of the supporting spindle or arm 26 is curved, as at 44, to permit rotational oscillation of the form dressing tool 25 and the rearward face of the tool is channeled as at 45 to receive the outer end of the support arm 26, it will be understood that modification and variation of this structure and various other parts of the mechanism described and various details of the process described may be made without departing from the true spirit and scope of the novel concepts and principles of this invention. We, therefore, intend to cover all such modifications and variations as fall within the true spirit and scope of the novel concepts and principles of this invention.

We claim as our invention:

1. In form dressing apparatus for form dressing a grinding wheel to the desired contour of its peripheral working face, means for rotating said wheel about its axis, a form dressing tool having an arcuate abrasive face of a transverse non-rectilinear contour the reverse of that to be imparted to said grinding wheel working face, means pivotally mounting said tool about an axis parallel to the axis of said wheel and including the centers of curvature of all circular arcs in said arcuate face, and means secured to said tool for driving said arcuate face at differential speeds with respect to said wheel face while in abrading contact with said wheel face, said arcuate abrasive face having finely divided abrasive particles equivalent to diamonds of a fineness of 50 particles per carat and finer embedded therein.

2. In a form dressing apparatus as defined by claim 1, the improvement which comprises means rigidly and eccentrically connected to said tool for oscillating said tool about its axis while in abrading contact with said wheel face.

3. In form dressing apparatus for form dressing a grinding wheel to the desired contour of its peripheral working face, means for rotating said wheel about its axis, a form dressing tool having an arcuate abrasive face of a transverse non-rectilinear contour the reverse of that to be imparted to said grinding wheel working face, means pivotally mounting said tool about an axis parallel to the axis of said wheel and including the centers of curvature of all circular arcs in said arcuate face, and a rocking arm rigidly secured to said tool for driving said arcuate face at differential speeds with respect to said wheel face while in abrading contact with said wheel face, said arcuate abrasive face having finely divided abrasive particles equivalent to diamonds of a fineness of 50 particles per carat and finer embedded therein.

4. In a form dressing apparatus such as defined by claim 3, means including a link rigidly and eccentrically affixed to the tool and a reciprocably actuatable arm pivotally connected to said link to oscillate said link and said tool about the axis of said tool while the latter is in abrading contact with said wheel face.

5. In form dressing apparatus for form dressing a grinding wheel to the desired contour of its peripheral working face, means for rotating said wheel about its axis, a form dressing tool having an arcuate abrasive face of a transverse non-rectilinear contour the reverse of that to be imparted to said grinding wheel working face, means pivotally mounting said tool about an axis parallel to the axis of said wheel and including the centers of curvature of all circular arcs in said arcuate face, and means secured to said tool to drive said arcuate face at differential speeds with respect to said wheel face while in abrading contact with said wheel

face, said arcuate abrasive face having finely divided abrasive particles equivalent to diamonds of a fineness of 50 particles per carat and finer embedded therein, said abrasive particles being in a surface layer of substantially a single particle thickness.

6. In a form dressing apparatus such as defined by claim 5, means for oscillating said tool about its axis including an axle pin for supporting said tool, a link carried on said axle pin and eccentrically secured to said tool for movement therewith, and a reciprocably actuable arm pivotally connected to said link for oscillating said link in said tool about the latter's axis while

the abrasive face of said tool is in abrading contact with said wheel face.

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