

Feb. 18, 1958

O. W. WINTER
GRINDING DEVICES

2,823,496

Filed March 16, 1953

3 Sheets-Sheet 2

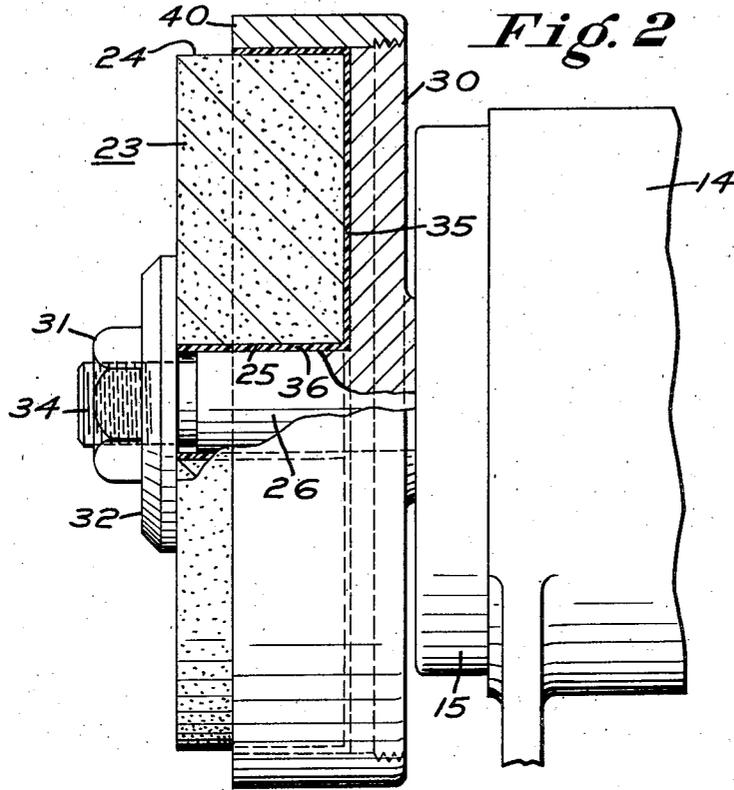


Fig. 2

Fig. 5

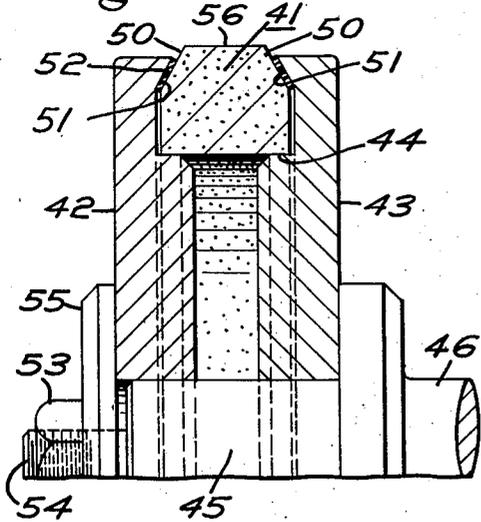
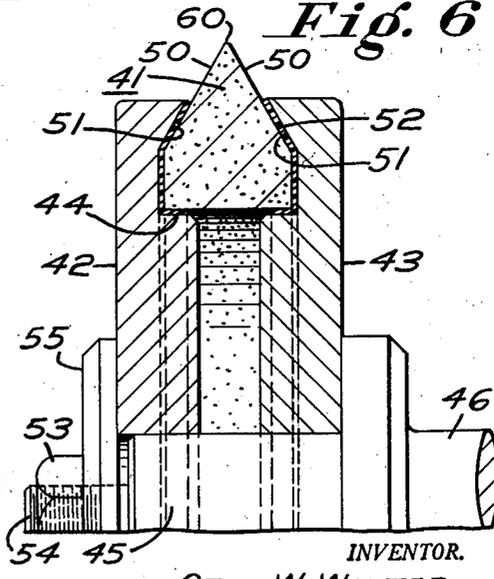


Fig. 6



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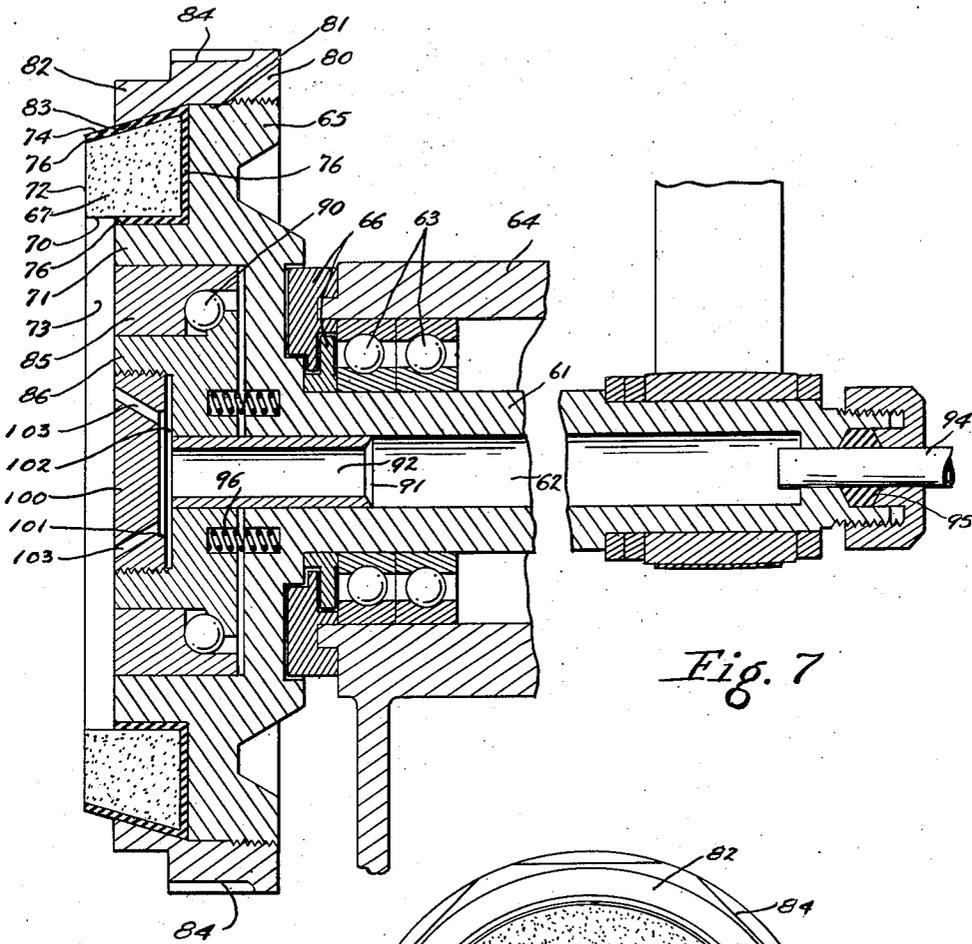


Fig. 7

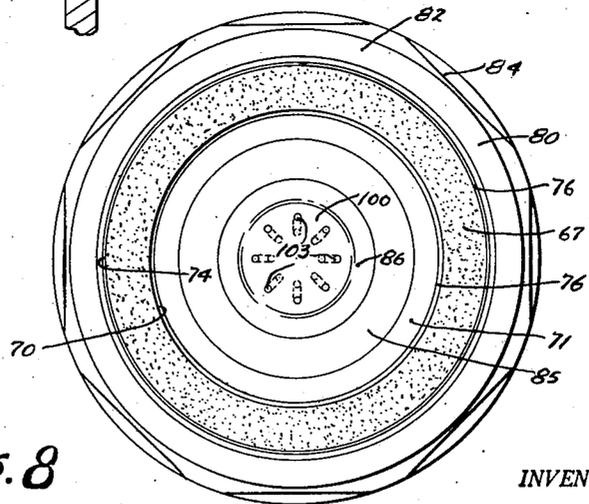


Fig. 8

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GRINDING DEVICES

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10 Claims. (Cl. 51-168)

My invention relates in general to grinding devices, and in particular to wheels for grinding carbide-tipped machine tools.

I have discovered that certain types of grinding wheels will successfully grind carbide-tipped tools if rotated at very high surface speed of approximately 25,000 feet per minute, and it has been the principal object of my invention to provide means for supporting such a wheel against rupture while rotating at such high speed.

Another object is to provide suitable clamping means for surrounding a large portion of the peripheral surface of a grinding wheel.

The above objects and advantages have been accomplished by the device shown in the accompanying drawings, of which:

Fig. 1 is a side sectional elevation of a grinding device embodying my invention;

Fig. 2 is a fragmentary sectional view showing a modified form of the invention;

Fig. 3 is a reduced face view of the device;

Fig. 4 is a fragmentary sectional view of a modification;

Figs. 5 and 6 are fragmentary sectional views of other modified forms of my invention;

Fig. 7 is a longitudinal sectional view of another modification of my invention; and,

Fig. 8 is a face view thereof.

Referring to the form of invention shown in Fig. 1, 5 represents the grinding wheel, which is designed specifically for grinding on its face 6. This wheel is formed with a frusto-cone-shaped periphery 10 arranged at an angle of more than 90° with the grinding face 6 and having its smaller diameter at said grinding face. The wheel is mounted upon a shaft 12 which is provided with a supporting flange 11. This flange may have its surface arranged substantially normal to the axis of rotation, or it may have a surface of any other shape which will conform to the shape of the wheel face. The shaft is preferably carried by anti-friction bearings 13 suitably mounted in a housing 14. Suitable dust rings 15 are carried by the housing to protect the bearing 13.

The flange 11 is formed on the peripheral with screw-threads for receiving a reinforcing ring 16. This ring is formed with interior screwthreads for engagement with the screwthreads on the flange 11, whereby the ring may be moved axially to clamp the wheel in position. The supporting flange 11 is preferably formed with a pilot 17 which is engaged by a cylindrical surface 18 provided in the ring 16, whereby the ring is supported by the pilot and a more accurate centralization of the ring and the wheel is brought about. The ring is formed with an interior frusto-cone-shaped surface 20 arranged at substantially the same angle as the frusto-cone-shaped periphery 10 of the wheel. Suitable packing means 21 may be disposed between the adjacent surfaces of the wheel and the ring. The packing means may be of any suitable material, such as plastic, rubber, or metal. The shaft 12 is preferably

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formed with a reduced portion or pilot 22 for engagement with the sleeve 19 carried by the central bore 23 of the wheel.

From the foregoing, it will be obvious that when the reinforcing ring is moved axially with respect to the flange 11, the inclined surface 20 will force the packing means 21 into firm clamping contact with the periphery 10 of the wheel and, therefore, securely hold the same against breakage due to the high speed of rotation. As shown in the drawing, it is preferable that the reinforcing ring 16 covers substantially the entire periphery of the wheel except for a small portion at the outside face thereof to provide for wear at the face of the wheel. Obviously a suitable tool support 27 is provided for holding tools while being ground and dressed on the face of the wheel.

In the form of invention shown in Fig. 2 the wheel 23 has a cylindrical periphery 24 and a central bore 25. It is mounted upon a spindle 26 and is held in place against a supporting flange 30 by means of a nut 31 and a washer 32 mounted upon the screwthreaded reduced end 34 of spindle. The supporting flange is preferably an integral part of the spindle and a suitable packing means 35 is placed between this flange and the adjacent face of the wheel. A sleeve 36 of packing material may also be provided in the bore 25 of the wheel for contact with the spindle. A reinforcing ring 40 is arranged in clamping relation with the periphery of the wheel and it is preferably screwthreaded to the outer rim of the supporting flange 30. While this form of invention is designed especially for grinding operations of the face of the wheel, a small portion of the periphery thereof may be exposed for peripheral grinding.

In the form of invention of Fig. 4, I have shown a modified means for holding the reinforcing ring 28 upon the periphery of the wheel. The reinforcing ring in this form is held in place upon the periphery by being first heated and then shrunk thereon. Suitable packing means 28 may be employed in this form to assure close gripping contact of the ring with the wheel surface. The wheel is held against the flange 37 by means of a nut and washer similar to that of Fig. 2.

In the form of invention shown in Figs. 5 and 6, the wheel 41 is annular in form and is supported by discs 42 and 43, one arranged on each side of the wheel. Each disc is formed with a shoulder 44 for the centralization and support of the wheel. The discs are mounted upon a spindle 45 carried by a shaft 46 by which the wheel is rotated. The wheel is provided with oppositely disposed inclined surfaces 50, and the discs are formed with surfaces 51 of corresponding angle for engagement with the inclined surfaces of the wheel, suitable packing means 52 being disposed between the adjacent surfaces of the wheel and discs. The discs 42 and 43 are forced together in firm clamping contact with the engaged surfaces of the wheel by means of a nut 53 which is screwthreaded to the reduced end 54 of the spindle 45, and which engages a washer 55 disposed between the nut and the outer surface of the disc 42. In the modification shown in Fig. 5, the wheel is formed with a substantially flat periphery 56 for peripheral grinding, while in the form of Fig. 6, the inclined surfaces meet and join in a V-shaped point 60, as illustration of one of the various forms which may be given to the wheel periphery.

Referring now to the form of invention shown in Figs. 7 and 8, 61 is the shaft which is formed with a longitudinal passageway 62 and which is supported by anti-friction bearings 63 mounted in a bearing block 64. The shaft carries a wheel flange 65 which is preferably made integral therewith, and dust rings 66 are provided between the bearing and the back face of the flange to protect the bearing against particles of foreign matter.

The wheel 67 of this form of invention is annular in form and is provided with an inner cylindrical periphery 70 which is supported by an annular ring 71 formed on the flange 65. The outer face of this ring is positioned inwardly from the face 72 of the wheel 67 so as to provide a circularly shaped space 73. The wheel is formed with a tapered periphery 74, having its larger diameter adjacent the flange 65. The inner periphery 70, the back face 75, and the outer tapered periphery 74 of the wheel are preferably covered with a plastic facing 76 which permits a more accurate fitting of the wheel to the surfaces of the adjacent metallic parts. Mounted about the wheel is a reinforcing ring 80 which is screwthreaded to the outer periphery of the flange 65 and which is provided with a pilot portion 81 between the screwthreaded part and a lip 82 formed on the ring for centralizing the ring. The inner surface or bore 83 of the ring is, obviously, tapered to fit the facing 76 on the outer periphery 74 of the wheel. In order to adjust the ring 80 so as to firmly clasp the wheel in position, the periphery of the ring is formed with a number of flattened surfaces 84 whereby a suitable wrench may be applied thereto.

As hereinbefore pointed out, the wheel of my device is rotated at very high speed, and it is, therefore, preferably to provide an automatic balancing device. For illustrating purposes, I have shown such a device which comprises an outer member 85 and an inner member 86 having provided between them a series of balancing balls 90. The outer member of the balancing device may be screwthreaded to the inner periphery of the ring 71 of the flange, and the inner member is rotatably mounted upon a sleeve 91 carried by the shaft and extending into the inner member. The sleeve is formed with a central aperture 92 which communicates with the longitudinal passageway 62 of the shaft 61, and it is supplied with a suitable grinding liquid through a liquid pipe 94 which passes through a suitable stuffing box 95 carried by the shaft. The inner member 86 of the balancing device is connected to the flange by a series of helical springs 96 which serve to engage the parts of the balancing device.

A fluid distributing disc 100 is screwthreaded into a recess 101 formed in the forward face of the inner balancing member 86 and provides a space 102 between this inner face and the bottom of the recess. The balancing disc is formed with a number of inclined radially disposed apertures 103 which serve to carry fluid from the space 102 to the face of the disc where centrifugal action causes the fluid to be thrown outwardly into contact with the exposed portion of the inner periphery 70 of the wheel whence it is conducted to the grinding surface 72 thereof.

From the foregoing, it will be obvious that the inner surfaces of the reinforcing rings 16, 40 and 80 and the inclined surfaces of the discs 42 and 43, come into intimate gripping contact with the packing means which covers a large portion of the peripheral surface of each of the grinding wheels and thereby reinforce the wheels against forces tending to rupture or break them while being rotated at the unusually high surface speeds necessary in carrying out my invention.

While the packing means for each surface may be separate and in contact with the surface being treated, these packings may be molded in one integral member and thereafter assembled onto the wheel, or the packing may be molded about or pressed onto the surfaces of the wheel and thereby be united to the wheel. Obviously, these and other modifications of the device may be made without departing from the spirit of my invention or the scope of the appended claims, and I do not, therefore, wish to be limited to the details herein shown and described, the forms described being merely preferred embodiments of the invention.

What I claim is:

1. A grinding device, comprising a grinding wheel, a shaft having a longitudinal passageway formed therein, means carried by the shaft for supporting the wheel, the

wheel having a tapered outer periphery and an inner cylindrical periphery, a ring member supported by the shaft and extending over a major portion of the outer periphery of the wheel for clamping engagement with the tapered surface thereof, the supporting means extending over only a portion of the inner periphery of the wheel, thereby exposing a portion thereof, means for supplying fluid to the exposed surface of the inner periphery of the wheel, comprising a distributing plate carried by the supporting means and formed with a plurality of apertures opening into the outer face of the plate and being in open communication with the passageway of the shaft, whereby when rotated, fluid will be directed against the exposed portion of the inner periphery of the wheel.

2. A grinding device, comprising a grinding wheel, a shaft for mounting said wheel, a flange carried by said shaft, said grinding wheel having an outer tapered periphery and an inner cylindrical periphery, said flange having wheel-supporting means engageable with the inner periphery of said wheel and extending over only a portion of the inner periphery thereof, a continuous reinforcing ring member supported by said flange and having a tapered wheel engaging portion extending over the major portion of the outer tapered periphery of said wheel, and means for supplying fluid to the exposed surface of the wheel.

3. A grinding device, comprising a grinding wheel, a shaft for mounting said wheel, a flange carried by said shaft, said grinding wheel having an outer tapered periphery and an inner cylindrical periphery, said flange having screwthreads on its outer periphery and having wheel-supporting means engageable with the inner periphery of said wheel and extending over only a portion of the inner periphery thereof, a continuous reinforcing ring having an unbroken integral peripheral portion of tapered shape for rigid clamping engagement with the major part of the tapered periphery of said wheel, and means for supplying fluid to the exposed surface of said wheel.

4. A grinding device, comprising a shaft having an integral flange, a concentric wheel supporting hub carried by said flange, an annular grinding wheel supported by said flange and said hub, said wheel having the major portion of its outer periphery substantially of cone-frustum shape and having its inner periphery of such diameter as to fit onto said hub, said flange being arranged adjacent to the side face of the wheel having the major diameter, said flange having a diameter substantially equal to the major diameter of said wheel, and a continuous reinforcing ring carried by said flange and having an unbroken wheel-engaging peripheral portion, said wheel-engaging portion having an internal peripheral surface of cone-frustum shape for rigid clamping engagement with the major portion of the cone-frustum shaped periphery of said wheel.

5. A grinding device, comprising a shaft having an integral flange, a grinding wheel supported by said flange and having the major portion of its outer periphery substantially of cone-frustum shape, said flange being arranged adjacent to the side face of the wheel having the major diameter, said flange having a diameter substantially equal to the major diameter of said wheel, a continuous reinforcing ring carried by said flange and having an unbroken wheel-engaging peripheral portion, said wheel-engaging portion having an internal peripheral surface of cone-frustum shape for the rigid clamping engagement with the major portion of the cone-frustum shaped periphery of said wheel, and a coating of plastic material formed on the surfaces of said wheel which are in contact with said ring and said flanges.

6. A grinding device, comprising a shaft having an integral flange, a concentric wheel supporting hub carried by said flange, an annular grinding wheel supported by said flange and said hub, said wheel having an outer periphery and an inner periphery, the major portion of the outer periphery being substantially cone-frustum

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shape, said inner periphery being of substantially cylindrical shape and of such diameter as to fit onto said hub, said flange being arranged adjacent to the side face of the wheel having the major diameter, said flange having a diameter substantially equal to the major diameter of said wheel, a continuous reinforcing ring carried by said flange and having an unbroken wheel-engaging peripheral portion, said wheel-engaging portion having an internal peripheral surface of substantially cone-frustum shape for rigid clamping engagement with the major portion of the cone-frustum shaped periphery of said wheel, and a coating of plastic material formed on the inner and outer peripheries of said wheel.

7. A grinding device, comprising a shaft having an integral flange, a grinding wheel supported by the shaft and having the major portion of its outer periphery substantially of cone-frustum shape, said flange being arranged adjacent to the side face of the wheel and having a diameter at least equal to the major diameter of the wheel, said flange being formed on its periphery with clamping screwthreads and with a cylindrical pilot portion concentric with said screwthreads, said pilot portion being disposed between said flange screwthreads and the face of said wheel, and a continuous reinforcing ring having internal screwthreads mounted upon the threaded periphery of the flange and having an unbroken wheel-engaging portion, said wheel-engaging portion having an internal periphery of cone-frustum shape for rigid clamping engagement with the major portion of the cone-frustum periphery of said wheel, said ring having a cylindrical bore disposed between said ring screwthreads and the cone-frustum inner periphery of said ring for close-fitting engagement with the cylindrical pilot portion of said flange.

8. A grinding device, comprising a shaft, a grinding wheel supported by the shaft, said wheel having its peripheral surface of cone-frustum shape and arranged at an angle with the exposed working face of the wheel of more than 90°, a supporting flange carried by the shaft, said flange being formed on its periphery with a cylindrical pilot and with screwthreads concentric with said pilot, said pilot being disposed between said flange and said flange screwthreads, a continuous reinforcing ring having an unbroken wheel-engaging portion formed with a cone-frustum shaped bore mounted upon the flange for rigid clamping engagement with the major portion of the wheel periphery, said ring having a cylindrical bore for close-fitting engagement with said pilot and with internal screwthreads for engagement with the screwthreads of the flange, the cylindrical bore of said ring being disposed between said ring screwthreads and the cone-frustum shaped bore thereof, whereby the ring may be brought into rigid clamping engagement with the periphery of the wheel.

9. A grinding device, comprising a grinding wheel, a shaft for mounting said wheel, a flange carried by said

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shaft, said grinding wheel having an outer periphery of cone-frustum shape and an inner cylindrical periphery, said flange being in supporting relation to the adjacent face of said wheel and having wheel-supporting means engageable with the inner periphery thereof, said supporting means extending over only a portion of the inner periphery thereof, and a continuous reinforcing ring member supported by said flange and having a wheel engaging surface portion of cone-frustum shape extending over the major portion of the outer cone-frustum shaped periphery of said wheel.

10. A grinding device, comprising a grinding wheel, a shaft for mounting said wheel, a flange carried by said shaft, said grinding wheel having an outer periphery of cone-frustum shape and an inner cylindrical periphery, said flange being in supporting relation to the adjacent face of said wheel and having screwthreads on its outer periphery, said flange having wheel-supporting means engageable with the inner periphery of said wheel and extending over only a portion of the inner periphery thereof, and a continuous reinforcing ring having an unbroken integral peripheral portion of cone-frustum shape for rigid clamping engagement with the major part of the tapered periphery of said wheel, said ring being formed with internal screwthreads for engagement with the screwthreads of said flange.

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