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GRINDING WHEEL

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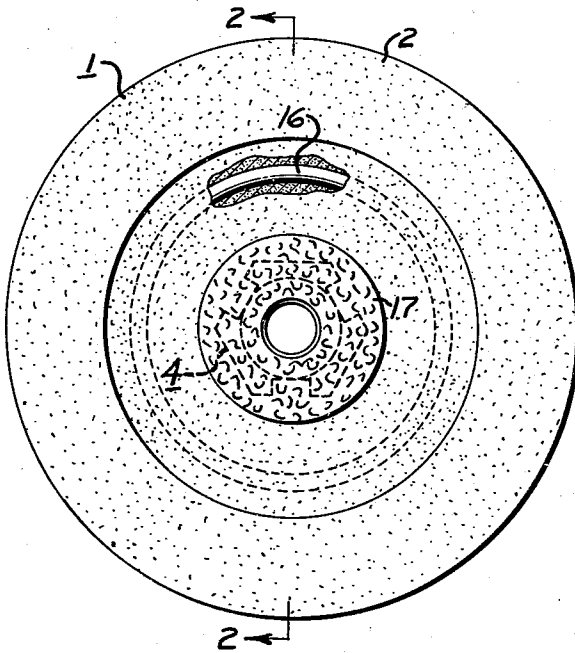


Fig. 1.

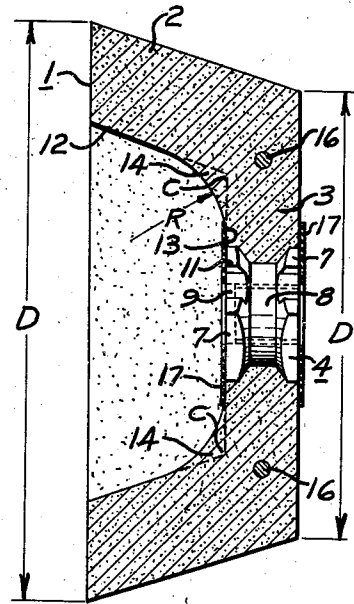
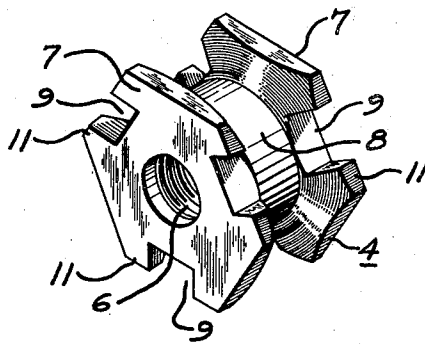


Fig. 2.

Fig. 3.



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GRINDING WHEEL

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7 Claims. (Cl. 51-209)

My invention relates to grinding wheels, and more particularly to relatively small cup-type grinding wheels adapted to be rotated at relatively high speeds and which are adapted for employment in portable grinding apparatus.

Wheels of this character generally comprise a rear wall, and an annular rim about and extending forwardly from such wall. It has heretofore been the practice to provide a relatively sharp corner or small radius at the location where the inner face of the rim joins the inner face of the wall; and as a result, when the wheel was rotating, breakage would sometimes occur at such location under the action of centrifugal force, which, in addition to rendering the wheel useless prior to its wearing out, presented a hazard to workmen. Also, it has heretofore been the custom to provide in the rear wall a ring insert of a relatively soft metal, such as lead, adapted to provide a fastening member for attachment on the shaft or arbor of the grinding apparatus. Such soft metal insert would on occasions work loose from the wall or from the arbor, which also resulted in the grinding wheel having to be discarded before wearing out and in the creation of a hazard to workmen.

My invention is designed to overcome these difficulties and has as its objects, among others, the provision of an improved grinding wheel constructed to withstand to a greater extent, breakage at the location pointed out, and in which improved means is provided which will not become loose, for attachment of the wheel to the arbor or shaft of the grinding apparatus. Other objects of the invention will become apparent from a perusal of the following description thereof.

In general, the cup-type grinding wheel of my invention is provided, at the location where the inner face of the rim joins the inner face of the rear wall in which the arbor of the grinding apparatus is attachable, with a corner filleted to a substantial degree, to thus provide an extra thickness of reinforcing material at the location where breakage is most apt to occur under the action of centrifugal force as the wheel rotates. Preferably, a rounded corner is provided which is formed on a relatively large radius, to thus avoid any sharp points.

In addition, instead of employing a soft metal insert in the wall for attachment of the wheel to the arbor of the grinding apparatus, I provide a fastening or securing member, in the form of a nut of relatively hard metal, such as steel. Such nut is provided with at least one flange

adapted to engage the rear wall of the wheel to thus preclude axial displacement of the body of the wheel relative to the nut; and to preclude relative turning movement between the body of the wheel and the nut, the flange is provided with at least one notch or recess in which material in the body of the wheel engages. Thus, the fastening member is securely held in the body of the wheel to provide good driving engagement therewith by virtue of such notch or recess, and will not become loose prior to wearing out of the body of the wheel. Such fastening member after the body of the wheel is worn out, may be removed and employed in another wheel, which results in economy.

Reference is now made to the drawing for a more detailed description of the invention in which:

Fig. 1 is an elevational view looking at the front of the wheel of my invention, with portions of the structure broken away to illustrate more clearly the construction. The view is drawn to about three-quarters full scale.

Fig. 2 is a vertical section taken in a plane indicated by line 2-2 in Fig. 1.

Fig. 3 is a perspective view of the fastening member of my invention.

Relatively small cup-type high-speed grinding wheels of the size illustrated by the drawing are often called upon to operate at speeds between 5000 R. P. M. and 6000 R. P. M., and comprise a cupped body 1 having axially extending integral annular rim 2 and radially extending integral rear wall 3, made of any suitable abrasive material, such as silicon carbide or aluminum oxide, and any suitable binding material therefor, such as "Bakelite" cement, molded by any suitable method about hub or fastening member 4, such as by first packing sufficient material about the fastening member and then molding the balance of the wheel about the packed material; the entire molded assembly then being fired in a furnace. Fastening member 4 of my invention is adapted for attachment to the arbor or shaft of a grinding apparatus (not shown), and is in the form of a nut of relatively hard metal, such as steel, having threads 6 for threaded connection on such arbor. It is provided with axially and relatively widely spaced apart radially extending end flanges 7 forming a relatively wide annular recess or groove 8 therebetween. As a result, when the body 1 is formed about the fastening member 4, the material can be initially readily packed in such relatively wide groove 8, and axial displacement between the fastening

member and the body can not occur. Although spaced flanges 7 are preferred for best results, a single flange intermediate the ends of the nut and adapted to have material in the body engage each side thereof, may be employed with satisfactory results.

To preclude relative turning between the body 1 and the fastening member 4 and thereby provide good driving engagement, the flanges 7 are each formed with preferably a plurality of recesses 9 leaving projecting lugs 11 at the side of the recesses. As a result, when the material of body 1 is molded onto the nut, the material engages in such recesses 9, and the lugs 11 become embedded in the material. Although, I preferably employ a plurality of recesses 9 in each of the flanges for best results, only one recess 9 may be formed in a flange. The described construction causes the fastening member 4 to remain secure in the body 1 of the wheel for the life thereof; and when such body 1 becomes completely worn out, the fastening member 4 may be removed and used in the production of another wheel, thus resulting in economy. Although the fastening member 4 of my invention is shown in a cup-type grinding wheel, it is obvious that it may be employed in any other type of grinding wheel.

In cup-type grinding wheels, rim 2 and rear wall 3 are each of substantially uniform thickness; and heretofore the corner C, where the inner face 12 of rim 2 joints the inner face 13 of rear wall 3, was formed relatively sharp or only with a slight curvature, as is indicated by the dotted lines in Fig. 2. Such corner is subject to great centrifugal force when the wheel operates, and breakage would sometimes occur diagonally across such corner. To preclude such breakage, I reinforce such corner by forming, during molding a substantial fillet of material 14. Although the fillet may be formed flat, I preferably provide a rounded corner formed on a relatively large radius R, to avoid any sharp angles which would weaken the structure. The outside diameter D of the wheel illustrated is about 6" (six inches) at its widest part, and the outside diameter D' at its narrowest part about 4 3/4" (four and three quarter inches); the thickness of the rim 2 is about 1" (one inch) and the thickness of the rear wall 3 about 3/4" (three quarters of an inch). In a wheel of such dimensions, I preferably provide radius R of about 1" (one inch). Such radius may be correspondingly shorter for smaller size wheels, and larger for larger size wheels. Also, with respect to the particular wheel chosen for the purposes of illustration, it may be even made less than 1" (one inch) or greater; it being merely important to provide sufficient extra thickness of material 14 at the filleted corner to reinforce the structure sufficiently at this vulnerable location.

As additional reinforcement, I preferably mold the wheel about a metal ring 16 in rear wall 3, adjacent corner C. Such ring not only reinforces wall 3 and corner C, but also precludes material from working away from fastening member 4 under the action of centrifugal force, to thereby cooperate in maintaining the fastening member 4 secure. Prior to the molding, ring 16 is preferably coated with a suitable adhesive material, such as "Bakelite" cement, to secure a better bond between it and the abrasive material surrounding the ring.

With respect to prior wheels of substantially

the same size as the wheel illustrated but in which the improvements of my invention were not employed, breakage would occur at the locations discussed above when such wheel was operated at around 5000 R. P. M. With the improvements of my invention, the same size wheel made with same materials and the same way may now be operated at around 6000 R. P. M. without breakage. Thus, my invention results in at least an increase in strength of about 20% (twenty percent).

Usually when the wheel is secured to the arbor or shaft, metal washers or flanges are pulled up against the faces of wall 3. To prevent slippage of the flanges and the abrasive from chipping, the wheel is provided with the usual blotter washers 17, of any suitable fibrous material such as matted paper, adhesively united to the faces of wall 3 about nut 4.

I, therefore, claim as my invention:

1. A cup-type grinding wheel comprising a radially extending wall, an annular rim about and projecting in an axial direction from said wall, and a hard metal integral hub member having internal screw threads for connection to an arbor, embedded in and integrally molded with said wall; said hub member having relatively widely spaced apart radially extending preformed end flanges which are peripherally recessed and which have their outer faces substantially flush with the faces of said wall, material of said wall being packed in said recesses and the spacing between said flanges forming a relatively wide annular groove in which material of said wall is also packed.

2. A grinding wheel comprising a body portion, and a non-resilient fastening member secured rigidly in said body portion provided with spaced radially extending preformed flanges engaging said body portion, the spacing between said flanges forming an annular groove in which material of said body portion is packed, and said flanges having recesses in the periphery thereof in which material is also packed.

3. A grinding wheel comprising a body portion, and a hard metal nut rigidly embedded in said body portion adapted for threaded engagement with an arbor, said nut having spaced radially extending preformed flanges engaging said body portion, the spacing between said flanges forming an annular groove in which material of said body portions packed, and said flanges having recesses in the periphery thereof in which material is also packed.

4. A hard metal nut adapted to be threaded onto an arbor of a grinding apparatus and be rigidly secured in the body of a grinding wheel, having spaced radially extending preformed end flanges for engagement with said body, the spacing between said flanges forming an annular groove in which material of said grinding wheel is adapted to be packed, and said flanges having recesses in the periphery thereof in which material is also adapted to be packed.

5. A grinding wheel comprising a body portion, a non-resilient fastening member rigidly embedded in and integrally molded with said body portion provided with spaced preformed flanges engaging said body portion, said flanges having recesses in the periphery thereof in which material of said body portion is packed, and a reinforcing ring embedded in said body portion about said fastening member.

6. A cup-type grinding wheel comprising a radially extending wall, an axially extending an-

nular rim about said wall, a non-resilient fastening member secured rigidly in said wall provided with spaced radially extending preformed flanges engaging said wall, the spacing between said flanges forming an annular groove in which material of said wall is packed, said flanges having recesses in the periphery thereof in which material is also packed, and a reenforcing ring embedded in said wall about said fastening member adjacent the corner where the inner face of said rim joins the inner face of said wall; said corner being filleted a substantial degree to provide sufficient material for reenforcing the structure.

7. A cup-type grinding wheel comprising a 15

radially extending wall, an axially extending annular rim about said wall, a non-resilient fastening member secured rigidly in said wall provided with spaced radially extending preformed flanges engaging said wall, the spacing between said flanges forming an annular groove in which material of said wall is packed, said flanges having recesses in the periphery thereof in which material is also packed, and a reenforcing ring embedded in said wall about said fastening member adjacent the corner where the inner face of said rim joins the inner face of said wall; said corner being rounded about a relatively large radius to reenforce the structure.

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