Oct. 18, 1955 J. L. BALLASH 2,720,733

GRINDING WHEEL

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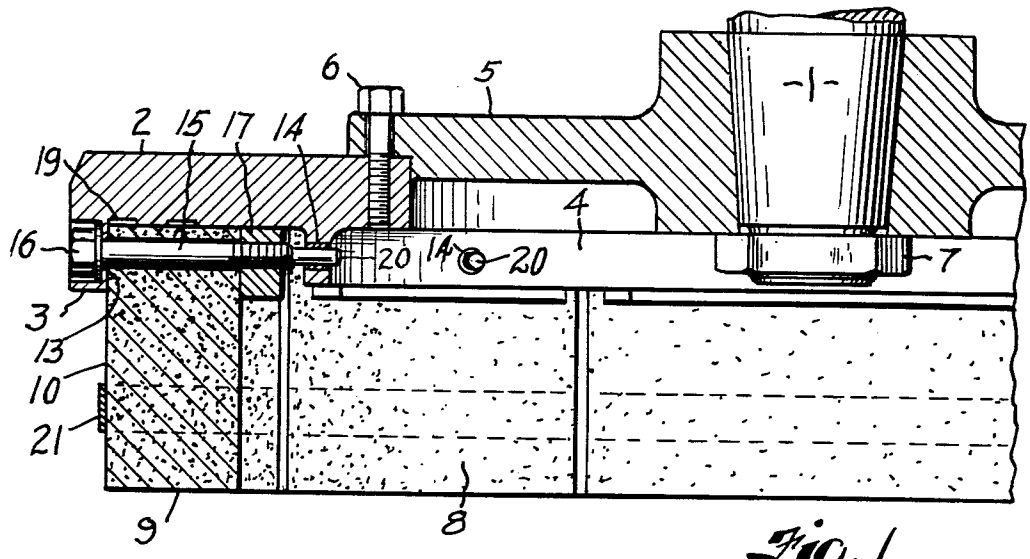


Fig. 1

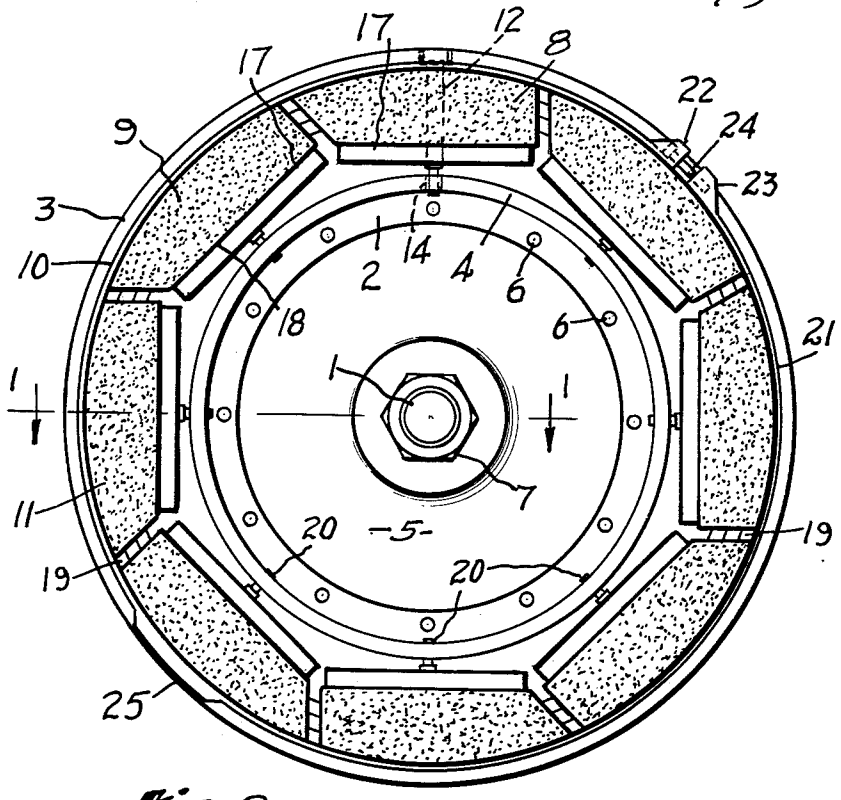


Fig. 2

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GRINDING WHEEL

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This invention relates as indicated to a novel grinding wheel construction, and more particularly to an improved chuck for securing abrasive segments thereto.

In Ballash et al. Patent 2,023,041 there is shown and described a form of segmental surface grinding wheel chuck which has met with commercial acceptance. A special problem is, however, encountered when relatively large diameter grinding wheels, as for example wheels six feet in diameter and more using segmental chucks, are driven at high speeds. The action of centrifugal force exerts a strong effect upon the individual abrasive segments and one or more of the latter may break loose and be thrown outwardly. This difficulty is enhanced by the fact that it has not usually been found commercially practicable to interlock the individual abrasive segments when the latter are of large size, weighing for example 25 pounds or more each. While a reinforcing strap or band may be clamped about the outer periphery of the assembly, principal reliance must nevertheless be placed on the segment securing means of the chuck itself which necessarily engages such segments in a region near one side face of the latter so that the larger portion of the segment will be exposed to perform useful work as it is gradually worn down. There has been an increasing demand for segmental grinding wheels of such large sizes particularly for the grinding of the cylinder blocks of diesel locomotive engines which are often as much as 14 feet long, and the surface grinding machine may be powered with a 150 horsepower motor, for example. It has been found that it is possible to grind such a cylinder block with a grinding machine of this type in about one-third the time that would be required to mill the same.

It is accordingly a principal object of my invention to provide a novel grinding wheel chuck adapted firmly to mount and secure individual abrasive sections in a manner to withstand the effect of centrifugal force even when the chuck is of large diameter, the segments heavy and spaced from one another, and the chuck is driven at very high speeds.

Another object is to provide such chuck wherein the segment securing means is adapted to accommodate a wide variety of segment thicknesses, and such segments may be removed and interchanged with ease and rapidity.

Other objects of the invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention then comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In said annexed drawing:

Fig. 1 is a radial sectional view taken on the line 1—1 on Fig. 2 of my new chuck assembly; and

Fig. 2 is a face or plan view of the chuck and abrasive segments secured therein.

Referring now more particularly to said drawing, the grinding chucks to which this invention relates will ordinarily be mounted on a horizontal spindle 1 of a grinding machine so that the working face of the grinding wheel will lie in a vertical plane. The chuck proper comprises an annular steel casting 2 having an outer peripheral flange 3 and an inner annular rib or flange 4 radially spaced therefrom. Chuck 2 may be mounted on spindle 1 of the grinding machine by means of an adapter 5 secured thereto by means of screws 6 and keyed to the end of spindle 1 on which it is held by nut 7.

A wide variety of abrasive segments 8 may be employed, ordinarily having flat working surfaces 9 and arcuate outer peripheral surfaces 10 so that the assembled segments when mounted in the chuck define a complete circle.

As previously indicated, especially in the larger sizes of grinding wheels, such segments will ordinarily be of the "gap" type, being somewhat spaced apart when mounted in the chuck and accordingly adapted for a degree of individual movement and adjustment. A number of segment shapes are known to those skilled in the art and are commercially employed, and the present invention is not limited to the employment of any special sizes or shape of segment. It is ordinarily preferred, however, that the leading edges 11 of the segments (the wheel of Fig. 2 being considered as intended for clockwise rotation) be non-radial and extending at a leading angle generally as shown. The shape of the segments may desirably be further modified in other respects in a manner and for the reasons set forth below.

Each segment is molded with a radial opening 12 extending therethrough adjacent one side face of the same midway between the ends of the segment. Outer flange 3 and inner flange or rib 4 of the chuck are pierced with aligned openings 13 and 14 respectively aligned with such holes 12 of the individual segments and through which a screw 15 is inserted, the holes 13 in flange 3 being countersunk to receive the heads 16 of such screws. Straight-faced clamping bars 17 are threadedly engaged by the threaded portions of such screws 16 so that turning of the latter serves to draw the bars into tight clamping engagement with the straight flat inner faces 18 of the segments, countersunk openings 13 being large enough to receive a socket wrench for the purpose of turning the heads 16 of screws 15. The face of chuck 2 adjacent flange 3 is desirably relieved as at 19 to ensure that the corners of the segments may be drawn snugly against the accurately machined inner face of flange 3, thereby accurately positioning and firmly supporting such segments. The radially inner end portions 20 of screws 15 extend through bushed openings 14 in inner flange 4 to withstand the outward swinging moment imposed on screw 15 when the heavy abrasive segments are subjected to the action of centrifugal force due to high speed rotation of the wheel. The inner side faces of such segments are accordingly held firmly against the chuck as well as the segments being gripped tightly between flange 3 and clamping bars 17. While the inner peripheral faces of the segments and the opposed faces of the clamping bars may be arcuate if desired, I much prefer that both such faces be flat as shown, affording an excellent support and being relatively inexpensive of manufacture.

As previously mentioned, a steel band or strap 21 may encircle the segments in a region spaced from the working faces 9 further to support such segments against the action of centrifugal force, such band being secured in place by means of lugs 22 and 23 joined by screw 24 with an appropriate diametrically opposite counterweight 25. Such reinforcing band may be progressively shifted toward the chuck as the grinding wheel wears back in use and will eventually be removed entirely. Reinforcing means

of this general type are well known in the art and form no part of the present invention.

It will now be seen that I have provided a novel form of grinding wheel chuck wherein abrasive segments are securely mounted and held against the action of centrifugal force by clamping means which is extremely rigid yet readily permits disassembly and removal of the segments. A source of danger and damage is accordingly removed, especially in the case of very large size grinding wheels, and the adjustment and replacement of the segments is facilitated.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims or the equivalent of such be employed.

I therefore particularly point out and distinctly claim as my invention:

1. A chuck for a segmental grinding wheel comprising an annular steel casting having an outer axially projecting peripheral flange, the surface of said casting being slightly relieved adjacent the inner corner thereof, a concentric annular flange spaced radially inwardly of said peripheral flange and projecting in the same direction, said casting having bolt holes therethrough adjacent its inner periphery in a region radially inwardly of said inner annular flange for attachment to a suitable adapter or like support, said outer peripheral flange having a series of circumferentially spaced radial apertures therethrough and said inner annular flange having a series of aligned apertures therethrough, bushings in said latter apertures, screws inserted in such respective sets of aligned openings and fitted for free rotation about their axes therein, said screws being threaded in a region intermediate said flanges and spaced from said outer peripheral flange, and individual straight clamping bars threadedly engaging such threaded regions of said screws adapted to bear against the radially inner surfaces of respective abrasive segments with said screws passing through apertures therein to clamp such segments firmly against said outer peripheral flange and resist the action of centrifugal force through the anchoring of the inner ends of said screws in such bushed apertures of said inner annular flange.

2. A chuck for a segmental grinding wheel comprising an annular casting having an outer axially projecting peripheral flange, a concentric annular flange spaced radially inwardly of said peripheral flange and projecting in the same direction, said outer and inner flanges having a series of circumferentially spaced radially aligned apertures therethrough, screws fitted in such respective sets of aligned apertures for free rotation therein and withdrawal therefrom, said screws being threaded in a region intermediate said flanges and spaced from said outer peripheral flange, and individual straight clamping bars threadedly engaging such threaded regions of said screws adapted to bear against the radially inner surfaces of respective abrasive segments with said screws passing through apertures therein to clamp such segments firmly against said outer peripheral flange and resist the action of centrifugal force through the anchoring of the inner ends of said screws in such apertures of said inner annular flange.

3. A chuck for a segmental grinding wheel comprising an annulus having an outer axially projecting concentric flange, radially inwardly located supporting means protruding from said annulus in the same direction as said flange, said flange and supporting means having a series of circumferentially spaced radially aligned apertures therethrough, screws fitted in such respective sets of aligned apertures for free rotation therein and withdrawal outwardly therefrom, said screws being threaded in a region intermediate said flange and supporting means and passing through radial apertures in corresponding abrasive segments, and individual clamping members threadedly engaging said respective screws adapted to bear against the radially inner surfaces of such corresponding abrasive segments to clamp such segments firmly against said outer flange and resist the action of centrifugal force through the anchoring of the inner ends of said screws in such apertures of said supporting means.

4. An abrasive device comprising a segmental grinding wheel having a body member adapted to be mounted for high speed rotation about its axis, radially spaced inner and outer supporting means projecting generally axially from one side face thereof, a plurality of circumferentially spaced radial screw members mounted in both said supporting means, abrasive segments having holes therethrough through which said respective screw members pass intermediate said spaced supporting means with said segments bearing firmly against said body member, and vise-like clamping members threadedly engaging said screw members and bearing against the inner sides of said segments to hold the latter firmly against said outer supporting means.

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