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2,397,849

ROTARY GRINDER

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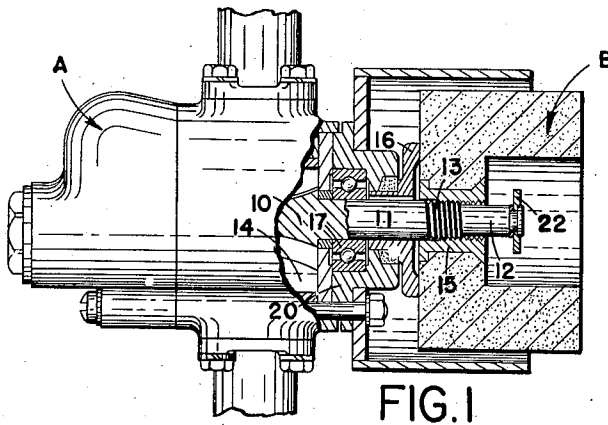


FIG. 1

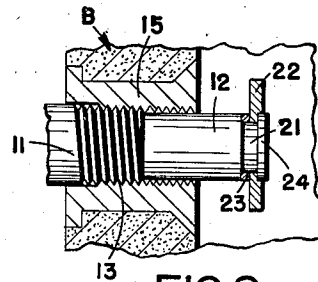


FIG. 2

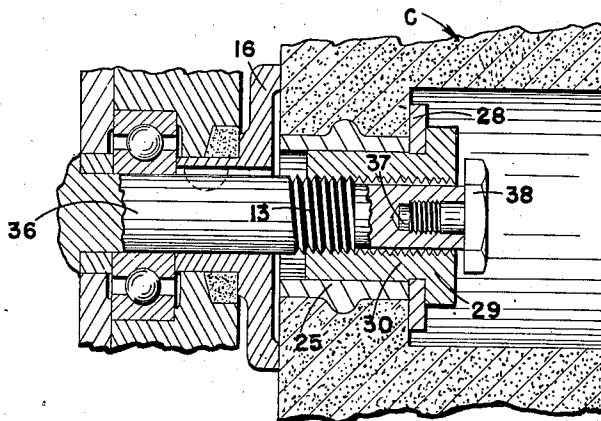


FIG. 6

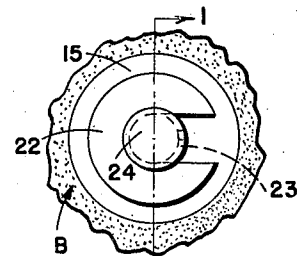


FIG. 3

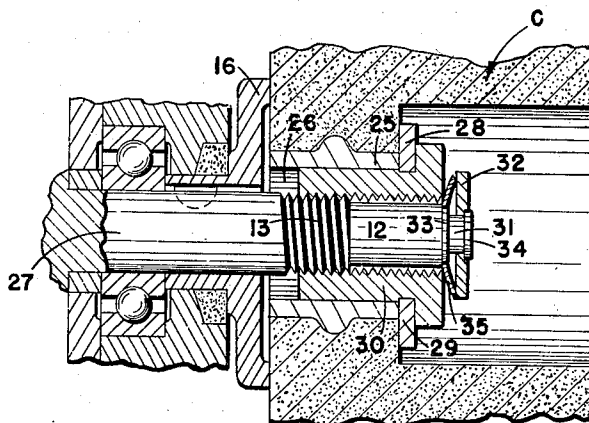


FIG. 4

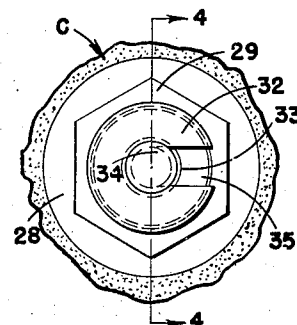


FIG. 5

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ROTARY GRINDER

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6 Claims. (Cl. 51—168)

The present invention relates to machine tools and, more particularly, grinders and the like having a member or tool which during operation rotates at high speed.

The principal object of the invention is the provision of a novel and improved machine comprising a spindle or rotor having a grinding wheel or some other comparatively frangible member having a high moment of inertia and during operation has a high value of kinetic energy, secured thereto in such a manner that it is fixedly connected to the spindle during normal operation of the machine, but may rotate relative to the spindle without becoming wholly detached therefrom in the event the spindle is abruptly stopped, for example, upon failure of some part of the driving mechanism, thus avoiding subjecting the member to excessive strains and possible failure.

Another object of the invention is the provision of a novel and improved device of the character referred to which will be simple and inexpensive in construction, reliable in operation, and which will permit ready replacement of the grinding wheel or member employed.

The invention resides in certain constructions and combinations and arrangements of parts and further objects and advantages thereof will be apparent from the following description of the preferred embodiment described with reference to the accompanying drawing forming a part of this specification in which

Fig. 1 is a fragmentary view of a portable grinder embodying the present invention with the spindle end thereof shown in section approximately on the line 1—1 of Fig. 3;

Fig. 2 is a fragmentary enlarged view of a portion of Fig. 1;

Fig. 3 is a fragmentary end view of Fig. 1 looking from the right;

Fig. 4 is a fragmentary sectional view approximately on the line 4—4 of Fig. 5 with portions in elevation of the spindle end of a grinder similar to that shown in the preceding figures but of modified construction;

Fig. 5 is a fragmentary end view of Fig. 4 looking from the right; and

Fig. 6 is a view similar to Fig. 4 but showing a further modified construction.

The invention is particularly applicable to pressure fluid operated grinders and is herein shown and described as embodied in a No. 1400 Cleco portable grinder manufactured by The Cleveland Pneumatic Tool Company. Except for the manner in which the grinding wheel proper is connected to the spindle, the grinder is of com-

mercial construction and is not herein shown and described in detail. Suffice it to say that it comprises a slidable vane-type motor of the general type shown in U. S. Patent to Paul Van Sittert, No. 2,149,645, issued March 7, 1939.

Referring to the drawing, the grinder is designated generally by the reference character A and comprises a rotor 10 formed integral with the spindle 11, which spindle in the present instance is longer than the spindle of the commercial grinder referred to and has a smooth portion 12 to the right of a threaded portion 13. In addition to the rotor 10, the motor comprises radial vanes or blades 14 slidably supported within the rotor and through the medium of which the rotor is driven by the pressure fluid, preferably compressed air.

The grinding wheel proper, designated generally by the reference character B, has a threaded bushing 15 firmly bonded in its center and through the medium of which the grinding wheel is detachably secured to the spindle 11. The grinding wheel or, more specifically, the bushing 15 is threaded onto the threaded portion 13 of the spindle until its inner or left-hand face abuts the right-hand side of a hub washer 16 keyed to the spindle. The left-hand reduced end of the hub washer 16 engages the right-hand side of the inner race 17 of an antifriction bearing through the medium of which the spindle is rotatably supported in a member 20 which forms a part of the housing proper. The grinding wheel is threaded onto the spindle against its normal direction of rotation, with the result that during operation the wheel is firmly pressed against the hub washer and the hub washer in turn firmly pressed against the inner race of the antifriction bearing.

The outer end 12 of the spindle, which end is of slightly less diameter than the root diameter of the threaded portion 13, is undercut to form a groove 21 adapted to receive a C-shaped washer 22 and a split snap ring 23. The outer or right-hand face of the washer 22 is counterbored to the diameter of the end of the spindle and to a depth such that the remaining thickness of the washer 22 and the snap ring 23 will be accommodated in the groove 21. After the grinding wheel has been threaded onto the spindle, the snap ring, which is of a size to be flush with the adjacent surface of the spindle, is slipped onto the end of the spindle and to the left of the groove 21. The C-shaped washer 22 is then placed on the end of the spindle, with the head-like end 24 of the spindle resting in the counterbore, after which the snap ring 23

is snapped into position in the groove 21 behind the washer. The snap ring maintains the end of the spindle in the counterbore in the washer and locks the washer onto the spindle.

As shown, the left-hand end of the bushing 15 is counterbored slightly and the length of the unthreaded portion 12 of the spindle is such that without removing the washer 22 the grinding wheel can be unscrewed from the threaded portion of the spindle until the cooperating threads of the bushing 15 and the spindle 11 are wholly disengaged; in other words, the normal distance between the right-hand end of the bushing 15 and the adjacent side of the washer 22 is greater than the length of the engaged threads between the spindle 11 and the bushing 15. When unscrewed from the threaded portion 13 of the spindle, the grinding wheel is free to turn on the smooth portion 12 of the spindle but is held thereon by the washer 22. In operation, should the spindle abruptly stop, as would be the case in the event a worn rotor blade 14 slipped out of its slot in the rotor 10 and became jammed in the expansion chamber of the cylinder or housing, the grinding wheel acts like a flywheel and continues to rotate, thus avoiding the formation of excessive strains therein and possible rupture or fragmentation of the wheel. The continued rotation of the grinding wheel after the spindle has stopped unscrews the same from the threaded portion of the spindle after which it is free to spin or rotate on the spindle.

The grinders shown in Figs. 4 to 6 are similar in construction to the grinder shown in Figs. 1 to 3 except as hereinafter noted and the duplicate parts are designated by the same reference characters. Referring to Fig. 4, the grinding wheel C shown therein does not have a threaded bushing bonded in the center thereof but a bushing 25 having merely a straight hole 36 extending therethrough and is secured to the spindle 27 similar to the spindle 11 except for the construction of its right-hand end by being clamped between the right-hand face of the hub washer 16 and a washer 28 interposed between the right-hand end of the bushing 25 and an outwardly extending hexagonal flange 29 on the right-hand end of an internally threaded bushing 30 screwed onto the threaded portion 13 of the spindle 27.

In the present embodiment, the end of the spindle 27 is formed as shown in the drawing and comprises a groove 31, the width of which is about twice that of the C-shaped washer 32 similar to the washer 22 but adapted to fit a smaller sized shaft since the groove 31 is deeper than the groove 21. Intermediate the smooth portion 12 of the spindle and the groove 31 is a portion or shoulder 33, the diameter of which is less than that of the portion 12 of the spindle but larger than the diameter of the headed end 34 to the right of the groove 31. After the grinding wheel C has been securely clamped in position by the threaded bushing 30, a dish spring washer 35 having a circular opening in the center is positioned on the shoulder portion 33 of the spindle, thereafter the C-shaped washer 32 is assembled on the end of the spindle with the head 34 positioned in the counterbore in the right-hand facing of the washer 32. The resiliency of the washer 35 permits the washer 32 to be assembled on the spindle without difficulty and allows the bushing 30 to back off of the threads 13 of the spindle far enough to unclamp or free the grinding wheel C when the spindle is abruptly stopped. After the grinding wheel

C is unclamped by the backing off of the bushing 30, it is free to rotate on the bushing but is retained in assembled relation upon the spindle.

The construction shown in Fig. 6 is a modification of that shown in Fig. 4 to the extent that the right-hand end of the spindle 36, corresponding with the spindles 11 and 27 of the preceding figures, has a smooth exterior but is drilled and tapped as at 37 to receive a cap screw 38, the enlarged hexagonal head of which prevents the bushing 30 from becoming disassembled with the spindle 36. Clearance between the right-hand end of the bushing 30 and the adjacent side of the head of the screw 38 allows the bushing 30 to be backed off the threaded portion 13 of the spindle an amount sufficient to release the grinding wheel C in the event the spindle is abruptly stopped. The threads of the cap screw 38 and the threaded aperture in the end of the spindle 20 are opposite to those between the bushing 30 and the spindle 36 or, in other words, the direction of the threads is the same as the direction of rotation of the grinding wheel, with the result that when the head of the cap screw 38 is engaged by the flange 29 of the bushing 30 as the bushing is unscrewed from the portion 13 of the spindle, the tendency is to tighten the screw 38 rather than loosen the same.

In operation, the devices shown in Figs. 4 to 6 operate in a manner somewhat similar to the device shown in Figs. 1 to 3. In the event that the spindle is abruptly stopped while rotating at high speed, with either construction the grinding wheel C continues to rotate backing the bushing 30 off of the threads 13 of the spindle until the grinding wheel is unclamped and free to rotate on the exterior of the bushing. The washer 32 in the construction shown in Figs. 4 and 5 and the head of the cap screw 38 in the construction shown in Fig. 6 prevent the parts from becoming wholly disassembled and the grinding wheels from flying off the end of the spindles.

From the foregoing description of the preferred embodiments of the invention, it will be apparent that the objects heretofore enumerated and others have been accomplished and that there has been provided a grinder including simple and inexpensive means for permitting the grinding wheel to continue to rotate in the event the spindle is abruptly stopped without the grinding wheel becoming wholly disassembled from the spindle. While the preferred embodiment has been illustrated and described in considerable detail, the invention is not limited to the particular construction shown and it is my intention to hereby cover all adaptations, modifications and uses thereof which come within the practice of those skilled in the art to which the invention relates and within the spirit and scope of the appended claims.

Having thus described my invention, what I claim is:

1. A grinder of the character referred to comprising a spindle adapted to have a grinding wheel assembled therewith, means comprising a member threaded onto said spindle adjacent to one end thereof and against the normal direction of its rotation and connecting the grinding wheel to said spindle, and means for limiting the movement of said member toward the end of said spindle whereby the grinding wheel may continue to rotate but is maintained assembled with the spindle in the event the spindle stops abruptly.

2. A grinder of the character referred to com-

prising a spindle adapted to have a grinding wheel assembled therewith, means comprising a member threaded onto said spindle adjacent to one end thereof and against the normal direction of its rotation and connecting the grinding wheel to said spindle, and means forming a shoulder or flange on said spindle adjacent to the end thereof for limiting the movement of said member toward the end of said spindle and normally spaced from said member a distance greater than the engaged threads between said member and said spindle whereby the grinding wheel may continue to rotate but is maintained assembled with the spindle in the event the spindle stops abruptly.

3. A grinder of the character referred to comprising a spindle, a grinding wheel, means comprising a member threaded onto said spindle adjacent to one end thereof and against the normal direction of its rotation for connecting said grinding wheel to said spindle, and means limiting the movement of said member toward the end of said spindle whereby said grinding wheel may continue to rotate in the event the spindle stops abruptly but is maintained assembled therewith.

4. A grinder of the character referred to comprising a spindle having a threaded portion adjacent to one end thereof, a groove between said threaded portion and the end of said spindle and an unthreaded portion intermediate said threaded portion and said groove, a grinding wheel having a threaded central opening there-through positioned on said spindle with the threads thereof engaging the threads of said spindle, a washer in said groove for limiting the movement of said grinding wheel toward the

end of said spindle and spaced from said grinding wheel a distance greater than the engaged threads between said grinding wheel and said spindle whereby said grinding wheel may continue to rotate but is maintained assembled with the spindle in the event the spindle stops abruptly, and means for retaining said washer in said groove.

5. A grinder of the character referred to comprising a spindle having a threaded portion adjacent to one end thereof, a member threaded onto said threaded portion of said spindle against the normal direction of rotation of the spindle for clamping a grinding wheel to said spindle, means forming an abutment spaced from said member for limiting the movement of said member toward the end of said spindle whereby a grinding wheel connected by said member to said spindle may continue to rotate but is maintained assembled with said spindle in the event said spindle stops abruptly..

6. A grinder of the character referred to comprising a spindle having a threaded portion adjacent to one end thereof, a member threaded onto said threaded portion against the normal direction of rotation of the spindle for clamping a grinding wheel to said spindle, and a cap screw threaded into a tapped aperture in the end of said spindle for limiting the movement of said member toward the end of said spindle whereby a grinding wheel clamped to said spindle by said member may continue to rotate but is maintained assembled with said spindle in the event the spindle stops abruptly.

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