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Ota et al.

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[54] **GRINDING WHEEL GUARD DEVICE**

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[51] **Int. Cl.** **B24b 55/04**

[58] **Field of Search** .....51/268, 269, 272; 241/285 B

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[57] **ABSTRACT**

A grinding machine is provided with a grinding wheel guard pivotally mounted on the rear end of a grinding wheel head and a driving means is operatively connected to the grinding wheel guard for automatically raising the grinding wheel guard by pivotally rotating the same to the opposite side of the normal grinding position and for lowering the guard to its closed position, whereby the guard is readily displaced for permitting a worn grinding wheel to be replaced.

6 Claims, 3 Drawing Figures

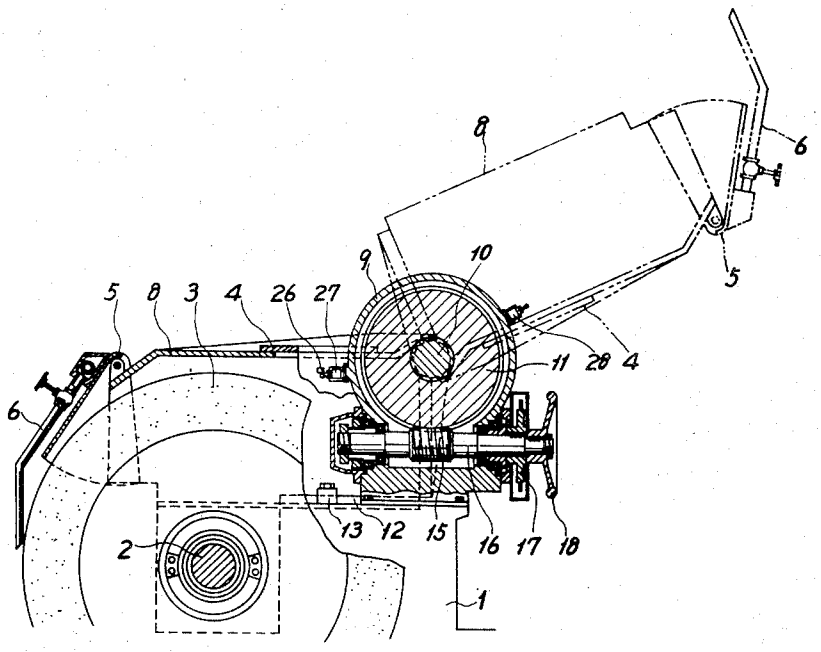


Fig. 1

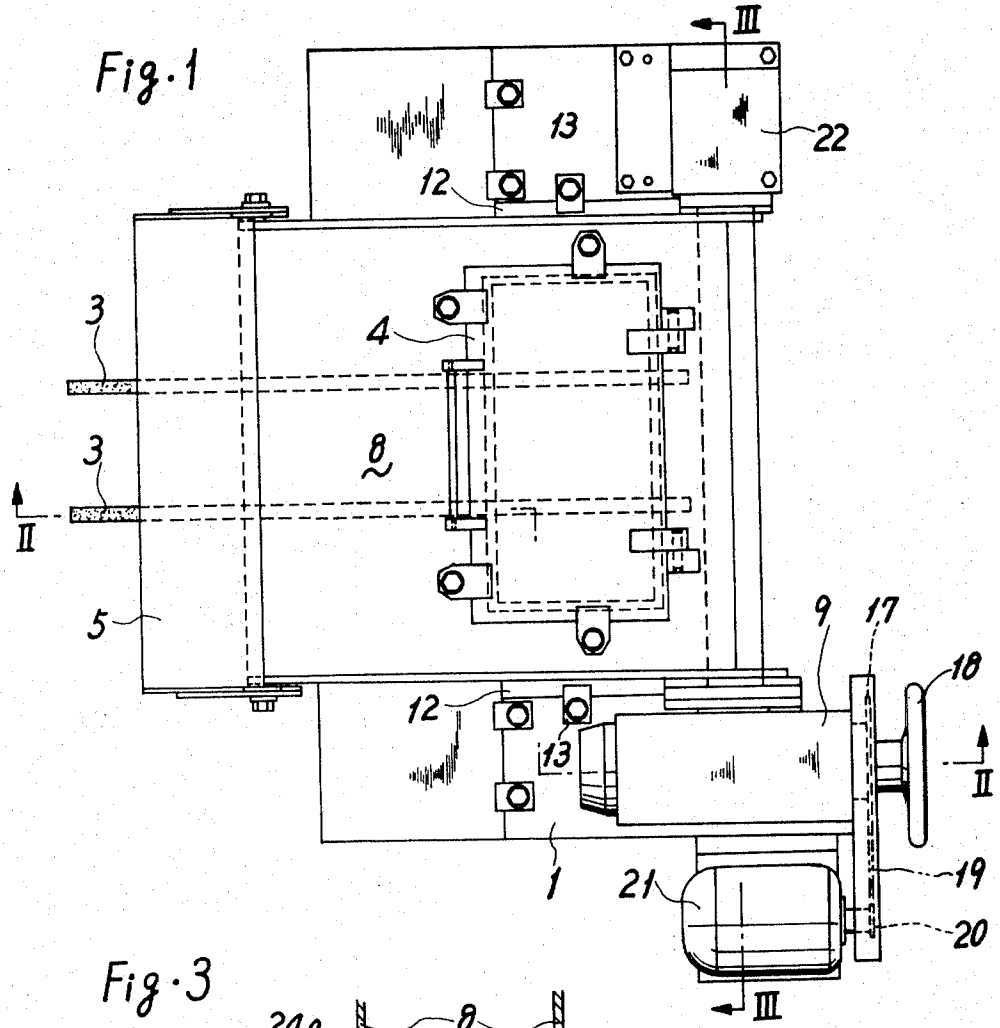
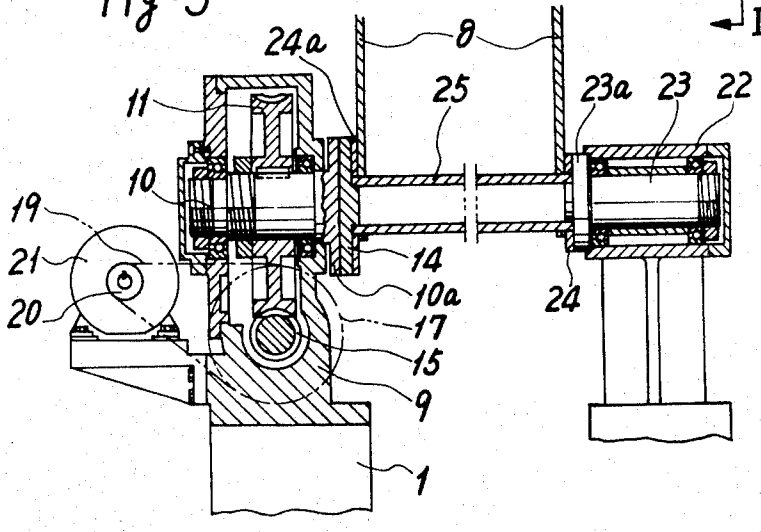


Fig. 3



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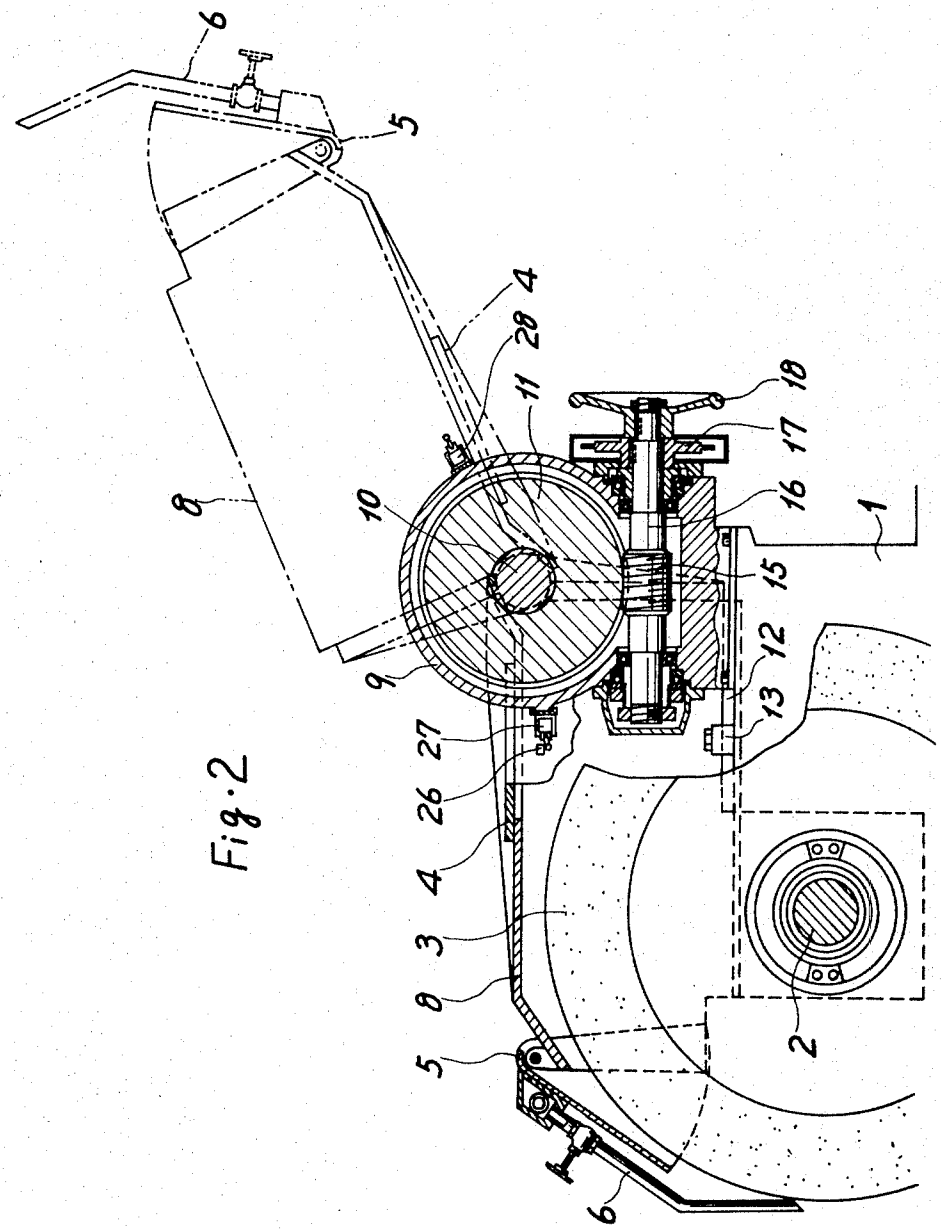

Fig. 2

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GRINDING WHEEL GUARD DEVICE

BACKGROUND OF THE INVENTION

The present invention relates generally to grinding machines and more particularly to a grinding wheel guard device for a grinding machine which is automatically upwardly opened to be disposed on the opposite side of the normal grinding position for permitting a worn grinding wheel to be exchanged and is subsequently automatically lowered to a closed position.

Heretofore, conventional multi-wheel grinding machines for grinding such elements as, for example, a crankshaft by means of a plurality of grinding wheels having relatively large diameters have been provided with relatively large size grinding wheel guards to prevent scattering of pieces of broken grinding wheels, such as may occur when a grinding wheel is broken, and to prevent splashing of coolant fluid used in most grinding operations. In such grinding machines, when it becomes necessary to exchange one or more of the grinding wheels for another or a new one, the former cumbersome grinding wheel guards must be manually removed from the original guarding position by means of lifting the same upwardly, using a crane or the like. It should also be understood that these operations have been extremely dangerous because of the size of the guards and the complexity of the lifting operation, and that a great amount of time was required to complete the operation.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a new and improved grinding wheel guard device in which the grinding wheel guard is easily removed from its normal guarding position, namely the guard is automatically upwardly opened to be disposed on the opposite side of the normal grinding position, and is readily closed thereafter, for permitting access to the grinding wheel area whereby a wheel may be dressed or exchanged.

Another object of the present invention is to provide a grinding wheel guard which has improved safety characteristics in its operation and is simple in construction, yet is highly effective and reliable in performance.

A still further object of the present invention is to provide a grinding wheel guard which may automatically be quickly and safely displaced from and returned to its normal grinding wheel guarding position.

The foregoing and other objects are realized by the present invention which is embodied in a grinding wheel guard for use in a grinding machine which is pivotally mounted on the rear end of the grinding wheel head. A reversible motor is drivingly connected with the grinding wheel guard for rotating the guard upwardly about its pivot axis to position it on the opposite side of the normal grinding position for permitting the grinding wheels normally covered thereby to be dressed or exchanged, and for returning the guard to its original closed, or guarding, position when a grinding operation is being carried out.

BRIEF DESCRIPTION OF THE DRAWINGS

Various other objects, features and attendant advantages of the present invention will be more fully appreciated as the same becomes better understood from the following detailed description of a preferred embodiment thereof when considered in connection with the accompanying drawings, in which like reference numerals designate like or corresponding parts in the several views, and wherein:

FIG. 1 is a plan view of a grinding wheel guard device constructed in accordance with the teachings of the present invention;

FIG. 2 is a sectional view taken along line II—II of FIG. 1; and

FIG. 3 is a sectional view taken along the line III—III of FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

Now, with reference to the accompanying drawings, a preferred embodiment of the present invention will be explained.

In FIG. 2, a grinding wheel spindle 2, having a plurality of grinding wheels 3 supported thereon in predetermined spaced relation, is rotatably mounted on a grinding wheel head 1. A grinding wheel guard or cover 8 is secured to the grinding wheel head 1 by means of clamping fixtures 13 passing through side plates 12 which are integrally formed on or suitably attached to opposite sides of the grinding wheel guard 8. An opening having a cover plate 4 pivotally disposed thereover is provided on the upper part of the grinding wheel guard 8 for adjusting a dressing device and the like positioned therebelow. At the left end of the grinding wheel guard 8 as viewed in FIG. 2, or the front portion thereof, there is pivotally mounted a coolant cover 5 having a coolant nozzle 6 thereon for supplying a cooling fluid between the grinding wheels 3 and a workpiece, not shown.

A gear box 9 is provided on one side of the grinding wheel head 1, as shown in FIG. 1. In FIG. 3, a shaft 10 is shown being rotatably journaled on bearing supports in the gear box 9. The shaft 10 has a flange 10a on one end thereof which projects from the grinding wheel guard side of the gear box 9 and is secured to a disc member 14 attached to the adjacent side of the grinding wheel guard 8 through a plate 24a. The other end of the shaft 10 is secured to the bearing means in the usual manner by a nut for preventing axial movement of the shaft 10.

A worm wheel 11 is concentrically keyed to the shaft 10. Rotatably mounted on the gear box 9 through suitable bearing means, as shown in FIG. 2, and aligned perpendicular to the shaft 10 and positioned therebelow is a worm shaft 16 having a worm 15 formed on the middle portion thereof which operatively engages the worm wheel 11. A sprocket 17 and a hand wheel 18 are keyed to the shaft 16 at one end thereof, being positioned adjacent each other and providing means for manually opening and closing the grinding wheel guard 8 in the manner set forth hereinbelow.

The sprocket 17 is operatively connected with a sprocket 20 mounted on an output shaft of a driving motor 21, as shown in FIG. 3, through a continuous drive chain 19 for driving the shaft 16. A casing 22 is fixedly mounted on the side of the grinding wheel head 1 opposite that on which the gear box 9 is disposed. A shaft 23 is rotatably mounted in the casing 22 through suitable bearing means. A flange 23a integrally formed

on the shaft 23 is secured to the adjacent side of the grinding wheel guard 8 through a plate 24. Furthermore, a hollow shaft 25 is secured on the upper and rear portion of the grinding wheel guard 8, being arranged parallel to the axes of the grinding wheels 3. The disc plate 14 and the flange 23*a* are fixedly secured on respective sides of the hollow shaft 25 and the shafts 10 and 23 are coaxially aligned with the hollow shaft 25. Thus, the grinding wheel guard 8 can be pivotally moved about the axis of the hollow shaft 25, or in other words, the grinding wheel guard 8 can be opened upwardly and rearwardly away from a normal grinding position and shut by operation of the driving motor 21 or by manually turning the hand wheel 18. Limit switches 28 and 27 are secured on the gear box 9 with a predetermined space established therebetween for recognizing completion of the opening and closing movements, respectively, of the grinding wheel guard 8 by means of engagement therewith of a dog plate 26 mounted on the grinding wheel guard 8.

The operation of the aforedescribed preferred embodiment of the present invention will now be explained.

When the grinding wheels 3 have been worn to a predetermined minimum diameter whereby an exchange with new grinding wheels is required, or when the grinding wheels 3 are dressed, the clamping fixtures 13 are released and removed. Thus, the grinding wheel guard 8 is free from its usual clamped condition on the grinding wheel head 1. Next, the driving motor 21 is actuated to rotate the worm 15 on the shaft 16 through the sprockets 17 and 20 and the continuous drive chain 19. In consequence, the worm wheel 11 mounted on the shaft 10 is rotated through the meshing engagement of the worm 15 and the worm wheel 11, whereby the grinding wheel guard 8 is upwardly rotated or opened about the axis of the hollow shaft 25 by means of rotation of the shaft 10 which is integrally connected with the hollow shaft 25 until it has been retracted to its upper or fully open position which is opposite of the usual grinding position, as shown in FIG. 2 by the dotted line illustration.

When the limit switch 28 is actuated by engagement of the dog 26 therewith and the full opening of the grinding wheel guard 8 is recognized, the operation of the driving motor 21 is halted and the pivotal movement of the grinding wheel guard 8 is likewise stopped. In this condition, the grinding wheel spindle 2 having the worn grinding wheels 3 thereon is replaced with another spindle 2 having new grinding wheels thereon. Upon the completion of the replacement of exchange of the grinding wheel spindles, the driving motor 21 is reversely rotated for pivotally moving the grinding wheel guard 8 to the original position thereof, or for shutting the grinding wheel guard 8, through reverse rotation of the worm wheel 11. When the grinding wheel guard 8 has returned to its original position wherein the limit switch 27 is actuated by the dog plate 26, rotation of the driving motor 21 is stopped in response to recognition of the returning movement of the grinding wheel guard 8. Then, the side plates 12 of the grinding wheel guard 8 are secured on the grinding wheel head 1 by means of the clamping fixtures 13, and the operation of the grinding wheel guard 8 is fully completed.

In the event the driving motor 21 is not operative because of some problem therewith, or because of failure of the electric power supply, the hand wheel 18 may be utilized for manually opening and shutting the grinding wheel guard 8.

It should now be apparent that the present invention provides an improved grinding wheel guard device wherein the grinding wheel guard is pivotally mounted on the rear end of a grinding wheel head and may be upwardly rotated to be disposed on the opposite side of the normal grinding position by a suitable powered driving means, whereby the grinding wheel guard is automatically opened. Accordingly, when a spindle which has grinding wheels thereon is to be exchanged with another such spindle, or the dressing device and the like of the apparatus is to be adjusted, the grinding wheel guard is automatically retracted or opened from its original position to another position where the grinding wheel guard does not obstruct the aforedescribed operation without using a conventional crane or the like. Moreover, as a worm and worm wheel mechanism is used in the grinding wheel guard device, the grinding wheel guard may be stopped in any position during the operation of opening or shutting the same, even if the driving means fails to rotate because of trouble therewith or because of an electric power supply failure. Thus, it should be understood that the grinding wheel guard device according to the present invention is extremely reliable and offers safety features not previously afforded by former guards.

While the invention has been described by means of a specific embodiment, it should be understood that the novel characteristics of the invention may be incorporated in other structural forms without departing from the spirit and scope of the invention as defined in the following claims.

What is claimed as new and desired to be secured by letters patent of the united states is:

1. A grinding wheel guard device for a grinding machine characterized by a grinding wheel head rotatably supporting at least one grinding wheel, comprising:

a first shaft member rotatably mounted on said grinding wheel head;

a grinding wheel guard secured to said first shaft member; and

drive means mounted on said grinding wheel head being operably connected with said first shaft member for moving said grinding wheel guard relative to said grinding wheel head;

said drive means comprising a worm wheel keyed to said first shaft member, a second shaft member rotatably mounted on said grinding wheel head and a worm gear disposed on said second shaft member for rotation therewith being operably engaged with said worm wheel for causing said first shaft member supporting said grinding wheel guard to rotate, whereby pivotable movement of said grinding wheel guard relative to said grinding wheel head is effected.

2. A grinding wheel guard device for a grinding machine as set forth in claim 1, wherein said drive means further comprises a hand wheel keyed to said second shaft member for manually moving said grinding wheel guard.

3. A grinding wheel guard device for a grinding machine as set forth in claim 1, wherein said drive means further comprises a reversible motor operatively connected with said second shaft for automatically moving said grinding wheel guard to selectively open or close said grinding wheel guard on said grinding wheel head.

4. A grinding wheel guard device for a grinding machine as set forth in claim 3, further comprising a hand wheel keyed to said second shaft member for manually moving said grinding wheel guard.

5. A grinding wheel guard device for a grinding machine as set forth in claim 3, further comprising limit switches at preselected positions on said grinding wheel head in the path of movement of said grinding wheel guard, and

means on said grinding wheel guard for engaging said limit switches.

6. A grinding wheel guard device for a grinding machine as set forth in claim 4, further comprising releasable clamping means for securing said grinding wheel guard in said closed position.

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