

## [54] GRINDING MACHINE WITH A SAFETY HOUSING

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[58] Field of Search ..... 51/105 R, 103 C, 108 R, 51/268, 269, 272, 215, 237, 97, 134

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## [57] ABSTRACT

A grinding machine comprising a grinding assembly including at least one grinding wheel and means for supporting the grinding wheel for rotation about the axis thereof, wall means for separating the operator of the grinding machine and the grinding wheel assembly whereby in the event that the grinding wheel explodes the operator will not be endangered, the wall means including an opening, a loader assembly selectively configured for placement within the opening, the loader assembly being displaceable from a first load position to a second grinding position and including means for receiving a workpiece when the loader assembly is at the first load position, means for retaining the workpiece in the receiving means as the loader assembly is displaced between the first position and the second position, and means for blocking the wall means opening when the loader assembly is at the first and second positions and at all positions intermediate the first and second positions.

5 Claims, 4 Drawing Figures

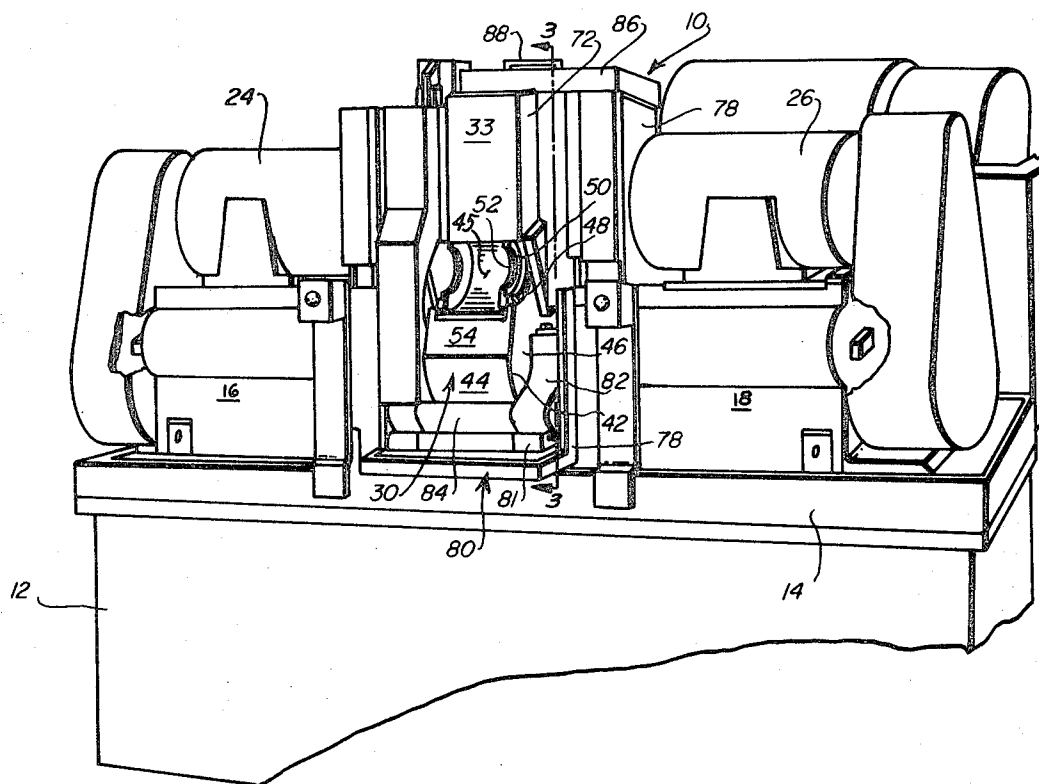


Fig. 1

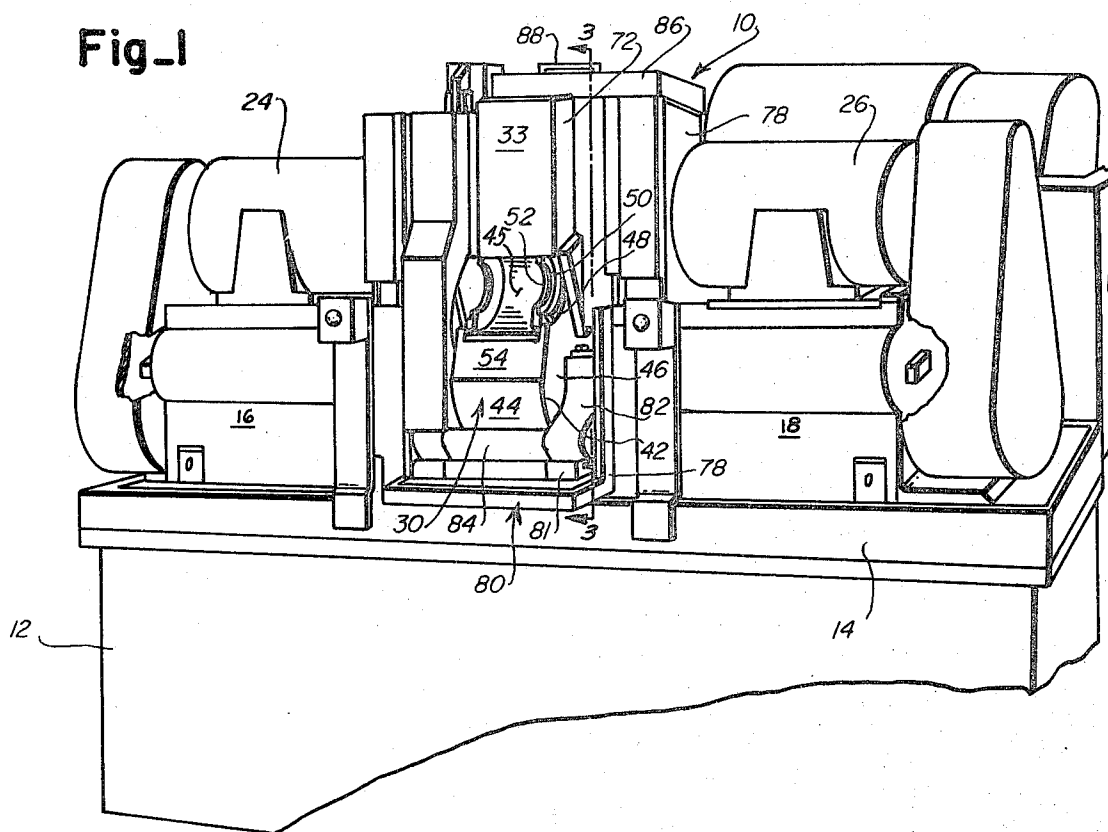
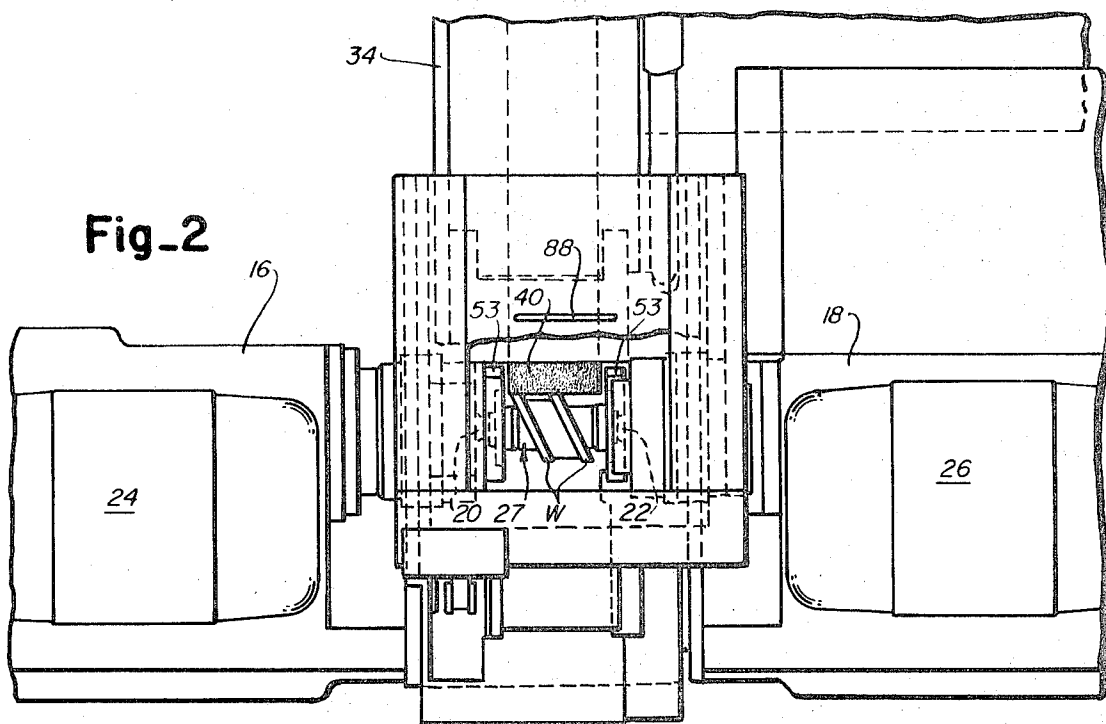


Fig. 2





## GRINDING MACHINE WITH A SAFETY HOUSING

This invention relates to grinding machines wherein stock removal is effected by a grinding wheel.

Conventionally, a workpiece is rotatively driven at a rapid rate and a grinding wheel, which is also rotatively driven at a rapid rate, is displaced into abrasive engagement with the rotating workpiece to effect stock removal. If the workpiece has flaws therein, such abrasive engagement may rip off chips from the workpiece and these chips are randomly projected at a rapid velocity. Additionally, where the grinding wheel is defective or where the velocity of the grinding wheel is extremely high, the grinding wheel may explode. The safety of the machine operator is accordingly threatened whenever such chips or portions are released.

Operation of such grinding machines requires continuous concentration and occasionally when an operator has a mental lapse his arms or hands are allowed to stray into the grinding zone. Serious accidents are the occasional results of such mental lapses.

It is, accordingly, an object of the present invention to provide a grinding machine wherein a continuous wall will be established intermediate the grinding wheel and the machine operator throughout the grinding cycle.

It is a further object of the present invention to provide a grinding machine wherein the fragments of an exploded grinding wheel or the chips of a chipped workpiece will be completely contained within the machine.

Among the advantages of the present invention is the provision of a grinding machine wherein the hands of the operator, where the machine is operated manually, cannot be inadvertently located within the grinding zone whereby accidents involving the extremities will be prevented.

Another advantage of the present invention is the provision of a grinding machine wherein the operator or any other person who may be in the immediate vicinity of the grinding machine will be protected in the event of grinding wheel explosion or the like.

Other objects and advantages of the present invention will become apparent from the following portion of this specification and from the accompanying drawing which illustrates, in accordance with the mandate of the patent statutes, a presently preferred embodiment incorporating the teachings of the invention.

Referring to the drawing:

FIG. 1 is an oblique elevational view of a high speed grinding machine made in accordance with the teachings of the present invention;

FIG. 2 is a plan view partially broken away illustrating a portion of the grinding machine illustrated in FIG. 1;

FIG. 3 is a view of the grinding machine illustrated in FIG. 1 taken along the lines 3—3 thereof with the loader assembly in the grinding position; and

FIG. 4 is a partial view of the grinding machine illustrated in FIG. 3 with the loader assembly in the load-unload position.

Referring to the drawing, and initially to FIGS. 1 and 2, a plunge type grinding machine 10 is illustrated. The grinding machine includes a base 12, a stationary work table 14 which is mounted on the base, left and right-hand headstocks 16, 18 which are supported by the work table and which include left and right-hand work

centers 20, 22, a pair of motors 24, 26 for rotatably driving an arbor assembly 27 which supports a pair of workpieces W and which has been forcefully engaged by the work centers, a grinding wheel assembly 28 (FIG. 3), a loader assembly 30, a motor or cylinder 32 for controlling the displacement of the loader assembly, a loader assembly housing 33 and a grinding wheel assembly housing 34 having side, top and rear walls selectively dimensioned for displacement into the armor plated loader assembly housing 34 and adapted to be maintained in overlapping relation therewith during the grinding cycle whereby the grinding wheel assembly will be completely encased by the cooperating housings. The housing are constructed from heavy rolled steel (armor) plate having a thickness (1 in.) sufficient to prevent passage therethrough of high speed fragments from an exploding grinding wheel or the like.

The grinding wheel assembly (FIG. 3) includes a grinding wheel support 36, a grinding wheel fender or hood 38, and at least one grinding wheel 40 which is supported for rotation about the axis of the grinding wheel and which is selectively, transversely displaceable towards and away from the arbor assembly 27.

The loader assembly 30 has a substantially drum-shaped casing 42 having cylindrical sides 44 which are integrally joined to opposing, parallel, planar end plates 46. The drum-shaped casing is of welded construction and the sides and ends thereof are also constructed from heavy rolled steel plate, with at least one circular opening or pocket 45 formed therein. Coaxial channels 48 are defined in the end plates and inserts 50 are secured thereto by bolts or the like (not shown). The end plates are sufficiently separated so that when the arbor assembly 27 which carries the workpieces is placed within the inserts, the ends of the arbor assembly will be inset from the outer surfaces of the end plates. Additionally, the inserts are selectively configured so that they will retain the received arbor assembly in the desired position. Upwardly projecting insert flanges 52 preferably slidably engage the inside surfaces of the arbor assembly ends to prevent axial displacement of the received arbor assembly. Safety brackets 53 are secured to the base member and are selectively located to effectively capture the loader assembly inserts 50 when the loader assembly is rotated to the grinding position. Accordingly, should the work centers become disassociated from the arbor assembly during the grinding operation, the arbor assembly cannot be driven against the grinding wheel.

A portion of the cylindrical drum continuous with the channels is replaced by a planar inwardly inclined portion 54 so that the grinding wheel hood can be adjusted without interfering with the drum while the drum is in the grinding position.

The drum-shaped casing 42 is rotatively mounted to a shaft 56 which is supported by the grinding machine base and may be rotatively displaced from a first load-unload position (FIG. 4) to a second grinding position (FIG. 3) by means of a drum control mechanism 32. The drum control mechanism (FIG. 3) includes a selectively operable fluid cylinder 58 which includes a piston head 60 and a piston rod 62. The piston rod is operatively engaged with an arm member 64 which is pivotally mounted to a projecting stud 66 on one end plate of the drum-shaped casing. A clevis bracket 68 is secured to the top of the cylinder and is pivotally mounted on an appropriate housing bracket 70.

The loader housing 34 includes a vertically stepped upper front panel 72 having a cylindrical bottom portion 74 (FIGS. 3 and 4), wing-like elements 76 secured to the side of the front panel at the bottom thereof, side plates 78, a base 80, which is secured to the grinding machine base 12 by means of clamps 81 and includes sides 82, a central portion 84 and a top portion 86 including a slidable viewing door 88 to enable the operator to view the grinding zone during the set up operation. A switch 89 is provided on the loader assembly housing top wall 86 and is closed by a lug 90 which is integral with the viewing door whenever the viewing door is opened, to actuate the grinding machine controls 92 to reduce the speed of the grinding wheel to half-speed whereby danger due to the explosion of the grinding wheel will be minimized.

As seen in FIGS. 1 and 3, the central base portion 84 is spaced below the peripheral surface of the drum-shaped casing 42 and cooperates with side portions 82 having a front 94 and rear upwardly projecting portions 96. Similarly, the cylindrical housing portion 74 spans the periphery of the cylindrical drum and has downwardly projecting front 98 and rear 100 portions. The drum-shaped casing is accordingly effectively surrounded by the loader housing and cannot be radially displaced in the event of machine malfunction such as wheel blow up.

As can be appreciated, the machine operator can never pass his hands nor can projectiles pass through the opening in the front wall of the housing since the drum-shaped loader assembly casing continuously blocks this opening as the casing is rotated between the load-unload and grinding positions.

In operation, an arbor assembly is placed within the inserts when the loader assembly is at the load-unload position and the cylinder piston 60 is elevated thereby rotating the loader assembly clockwise to the grinding position. Spindles of the head stocks 16, 18 are advanced until the work centers thereof forcefully engage the arbor assembly and the arbor assembly is then rotated by the head stocks. The opening 45 is shaped so that liquid coolant directed against the workpiece as best illustrated in FIG. 3 is collected in the opening to submerge the workpiece in a continuous bath of coolant during the grinding operation. The grinding wheel is then advanced at predetermined infeed rates, until the workpieces are ground to final size. The grinding wheel is then retracted and the loader assembly is rotated counterclockwise to the load-unload position where the arbor assembly with the finished workpieces can be removed.

I claim:

1. A cylindrical grinding machine comprising a pair of opposing work centers for selectively engaging and rotating a workpiece located therebetween about the axis defined by said work centers, a grinding wheel assembly including at least one grinding wheel and means for radially advancing

said grinding wheel towards a rotating workpiece whereby stock will be removed from the periphery thereof,

wall means for separating the operator of the cylindrical grinding machine and said grinding wheel whereby in the event that said grinding wheel explodes the operator will not be endangered,

said wall means including an opening therein,

a drum-shaped loader selectively configured for placement within said opening and having a cylindrical continuous casing having a single slot extending peripherally around a predetermined angular segment of said casing and extending axially from one end of said casing to the other end thereof, and

a pair of end walls each having a selectively configured opening contiguous with said casing slot for receiving and retaining a workpiece as said drum-shaped loader is rotated about the axis thereof from a load position to an advanced position where said work centers can selectively engage and rotate the retained workpiece,

means for mounting said drum-shaped loader, for rotation about the axis thereof, on said wall means within said wall means opening so that when said drum-shaped loader is rotated to said load position said cylindrical casing is located intermediate said grinding wheel and the workpiece and effectively closes said wall means opening and the operator can place a workpiece in said drum-shaped loader and so that the workpiece will be located intermediate said grinding wheel and said cylindrical casing when said loader is at said advanced position, and so that said wall means opening will be substantially closed by said cylindrical casing as said drum-shaped loader is rotated from said load position to said advanced position, and

means for rotatively displacing said drum-shaped loader from said load position to said advanced position.

2. A cylindrical grinding machine according to claim 1, wherein said end walls further comprise means for preventing the axial displacement of a workpiece received by and retained in said end walls.

3. A cylindrical grinding machine according to claim 1, further comprising means for preventing the disassociation of the workpiece and said loader end walls when said loader is at said advanced position.

4. A cylindrical grinding machine according to claim 1, wherein said wall means further includes means for preventing the radial displacement of said loader.

5. A cylindrical grinding machine according to claim 1, wherein said wall means further comprises upper and lower cylindrical portions for matingly extending, in spaced relation to the top and bottom portions of said cylindrical casing respectively.

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