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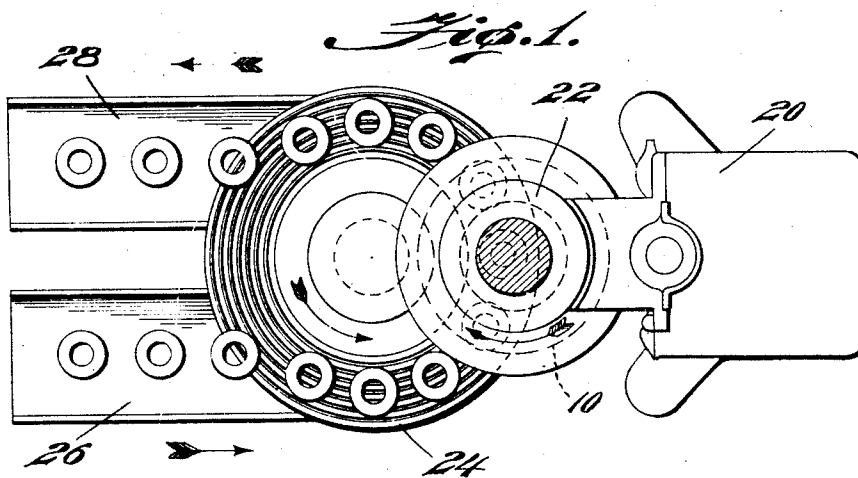
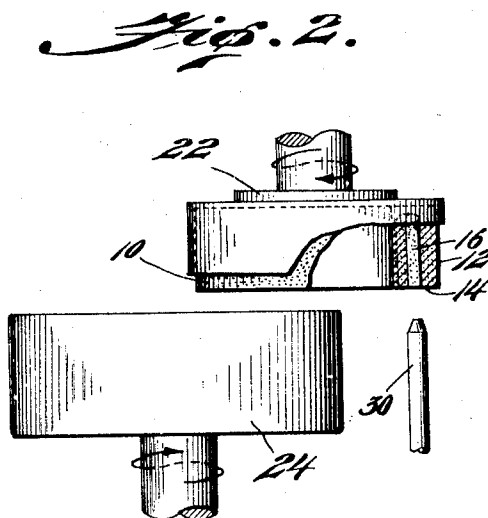
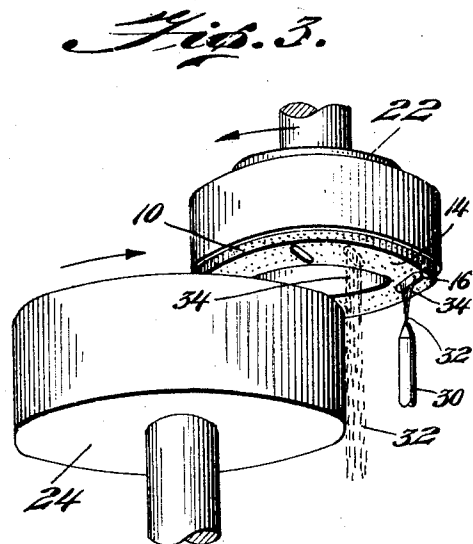
1,689,950

W. B. LEONARD, 2D

GRINDING MACHINE, GRINDING WHEEL, AND METHOD OF COOLING THE SAME

Filed Sept. 6, 1927

2 Sheets-Sheet 1



Inventor
Walter B. Leonard
By Thomas A. Jewell Jr.
Attorney

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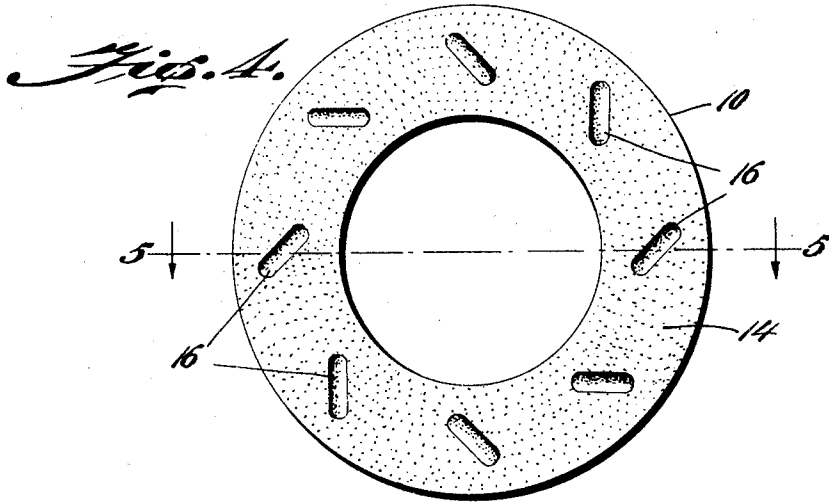
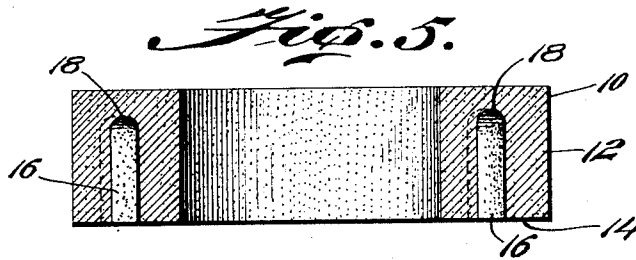
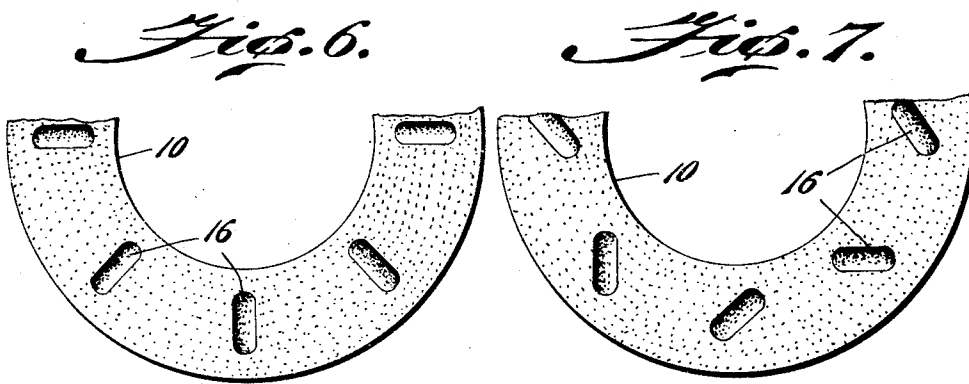
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W. B. LEONARD, 2D

GRINDING MACHINE, GRINDING WHEEL, AND METHOD OF COOLING THE SAME

Filed Sept. 6, 1927

2 Sheets-Sheet 2



Inventor
Walter B. Leonard 2nd.
By Thomas A. Jencks Jr.
Attorney

UNITED STATES PATENT OFFICE.

WALTER B. LEONARD, 2d, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO AMERICAN EMERY WHEEL WORKS, OF PROVIDENCE, RHODE ISLAND, A CORPORATION OF RHODE ISLAND.

GRINDING MACHINE, GRINDING WHEEL, AND METHOD OF COOLING THE SAME.

Application filed September 6, 1927. Serial No. 217,822.

My invention relates to grinders, particularly to a type comprising a substantially cylindrical wall of abrasive material having a substantially annular grinding face on the lower end thereof, commonly known in the trade as a cylinder surface grinding wheel.

My invention is generally similar in objects to the type of grinders shown and described in Patent #1,600,054 granted Sept. 14, 1926, to David D. McLaughlin and myself to provide better lubrication for the grinding face and to cool the grinding face thereof, thereby permitting the use of a wheel having a rim of greater thickness and wherein the wheel itself may be made harder thus increasing the life of wheels of this type.

The type of wheel shown in Patent #1,600,054 was an improvement on the type of so-called cylinder wheel employed on machines for surface grinding designed to grind off less than .05" in a substantial period of time in a plurality of passes. Recently grinding machines employing a so-called automatic continuous system of grinding have come on the market of the general type described in Patent #1,599,374 issued Sept. 7, 1926, to Harold F. Skillings designed to cut off up to .40" in a single pass of the grinder and particularly adapted for continuous automatic feed of small articles, such as ball races, valve tappets and pistons etc. across the grinding face thereof, thus having the amount of feed tremendously increased over the amount of feed for which the type of machine that the grinder of my former patent was used and as the depth of feed is so great, it is obvious that the machines and the grinding wheels have to be constructed much stronger and that the type of wheel shown in my former patent as it is not inherently as strong as the type of wheel shown in the present application could not be readily employed therein. In the type of machines in which my former invention was employed the width of the rim in contact with the work was in general considerably smaller than the area of unit work being ground, whereas as explained in the so-called automatic type of grinding machines designed primarily to grind the surface of a continuous stream of small objects, the unit of each object being ground is normally much smaller than the width of rim in contact with the work and if the type of the wheel shown in

my former patent were used in the machine of this type the small objects would tend to catch in the grooves as the grinder came into contact therewith and tend to tear it.

In preparing a type of wheel suitable for use in continuous automatic grinding and on other types of grinding machines I have evolved a new system of cooling a grinding surface adapted for cooling rotating grinding surface moving in cycles relative to work and contacting the work during a portion of only of said cycle which comprises forming pockets: preferably enclosed axial vertical pockets in said grinding surface and ramming preferably vertically pistons of coolant into said pockets substantially at the beginning of the uncontacting portions of said cycle and so regulating the size of the object and grinder and the speed conditions thereof that the pistons of coolant drop by gravity before the actual grinding portion of said cycle begins. Further objects of my invention therefore are to provide a wheel and so modify existing grinding machines that it may be capable of carrying out this invention and I therefore provide, I believe, for the first time a novel combination of grinding wheel and other means attached to the grinding machine for this purpose.

Further objects of my invention therefore are to provide a grinder for use in surface grinding work of the general cylindrical type comprising a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof having enclosed coolant receiving pockets extending part way across said face and enclosed by the side wall of said grinder and extending upwards a substantial distance within said wall. I preferably construct these pockets substantially elliptical in section so that the pistons of coolant may have a chance to slide around therein and better remove the work detritus therefrom and preferably terminate the pockets in rounded upper ends so that none of the detritus may be caught in corners of the upper ends thereof. As it is well known the arch or dome shape construction is much stronger architecturally than upper ends with corners would be.

In actual practice a certain amount of detritus gathers in front of the revolving

pockets on the grinding face and work. I therefore preferably arrange the elliptical pockets on the grinding surface obliquely to the radius preferably inclined outwardly from the inside of the face towards the outside in the direction of rotation of said face so as to function as one side of a snow plow in forcing the detritus outwards and if these pockets are placed obliquely in the direction just explained, it is apparent that they will function in combination with the centrifugal force of the rotating wheel to aid in throwing the detritus to the outside. If however, these pockets are arranged obliquely in the opposite direction it is apparent that they will function as the side of a snow plow forcing the material towards the center of the grinding face when as it is then free of the pockets it may be forced outwardly from the center or dropped through the central holes of the grinder. If desired the elliptical pockets may be arranged radially across the grinding surface in which case the snow plow action is lost, but the pockets function as successfully as coolants. I have discovered that in practice, however, if the pockets are arranged obliquely to the radius it largely increases the grinding action of the grinder.

These and such other objects of my invention as may hereinafter appear will be best understood from the description of the accompanying drawings.

In the drawings, Fig. 1 is a diagrammatic plan view of a machine adapted for use in a continuous automatic grinding with my invention attached.

Fig. 2 is a side elevation showing the relative positions of the grinding wheel, work holding chuck and coolant supply.

Fig. 3 is a diagrammatic perspective view taken from underneath of the same elements shown in Fig. 2.

Fig. 4 is a reverse plan view of a grinder constructed in accordance with my invention.

Fig. 5 is a sectional view thereof taken along the line 5—5 of Fig. 4.

Fig. 6 is a reverse plan view of a modified form of my invention wherein the elliptical pockets are arranged radially across the grinding face.

Fig. 7 is a reverse plan view of an additional modified form of my invention wherein the pockets are arranged obliquely alternately on the grinding face.

In the drawings, wherein like characters of reference indicate like parts throughout, 10 generally indicates a grinder for use in surface grinding comprising a cylindrical ring of substantial depth having a wall 12 of inherently abrasive material having an annular grinding face 14 on the lower end thereof having the enclosed pockets 16 preferably substantially elliptical in section extending part way across said face 14 preferably obliquely to the radius as shown in Figs. 4,

5 and 7 enclosed by the side wall 12 thereof extending upwards a substantial distance within said wall 12 and terminating in the rounded ends 18 or if desired extending completely to the top.

While my invention may be used in any suitable type of grinding machine, as stated it is preferably designed for use on so called automatic vertical continuous surface grinders employing the so-called automatic system as more particularly described in Patent #1,599,374 aforesaid, reference to which is hereby made for further details of the machine. As shown in Fig. 1 said machine has the usual support 20 including a suitable revolving wheel chuck 22 for holding the rotating wheel 10 of my invention which as hitherto stated is designed to be substituted for the plain cylinder type of grinders now used thereon. In this continuous system of grinding preferably a revolving magnetic chuck 24 for holding a plurality of small pieces of work is employed on which the work pieces are placed at one point carried past the grinder and removed at another point all within a cycle of rotation of said grinder, the work being continuously fed on to said revolving chuck 24 through the inlet apron 26 and removed from said chuck through the outlet apron 28. As shown diagrammatically in Figs. 2 and 3 it is thus obvious that the rotating grinding surface 14 moves in cycles relative to the continuous stream of work and contacts the work during a portion only of said cycle.

As stated hitherto, my invention includes a novel method of lubricating grinding surfaces moving in cycles relative to the work and includes as said novel method, forming pockets in said grinding surface and ramming pistons of coolant into the pockets substantially at the beginning of the uncontacting portion of said cycle and so regulating the size of the objects and speed thereof that the pistons drop by gravity before the grinding cycle begins. I therefore provide the coolant supply means 30 preferably projecting vertically upwards immediately underneath said pockets adjacent the point near where the grinding surface first leaves the work adapted to force the coolant 32 as ramming pistons 34 into these pockets at this point which pistons 34 may drop from said pockets 16 before the grinding surface adjacent thereto again contacts the work. As stated hitherto my invention includes providing a novel combination of this type of grinder with a grinding machine modified to function therewith by arranging the grinding wheel and work in this definite relationship and providing the coolant supply 30 at the proper place.

As stated hitherto I preferably construct the pockets 16 substantially elliptical in shape so that the pistons 34 will have a chance to move around in the pockets 16 and substan-

tially cleanse them and remove all detritus therefrom. As stated hitherto in order to provide a strong construction and to prevent the detritus from sticking in corners, I preferably terminate the pockets 16 in the rounded upper ends 18.

As also stated hitherto in order that the pockets 16 may function as the wall of a snow plow, preferably in combination with the centrifugal force produced by the rotary grinder, I preferably arrange them across the grinding face obliquely to the radius preferably inclined outwardly from the inside outward in the direction of rotation of the grinder, though if desired the pockets 16 may be arranged radially as shown in Fig. 6 in which case they will function just as well for cooling and lubricating purposes but will lack the snow plow action for removing the detritus and the shearing action where the pockets are arranged obliquely to the radius. In Fig. 7 I have shown a further modified form of the invention in which the pockets are arranged alternately obliquely in different directions.

It is thus obvious that I have provided a novel type of grinder, a novel method of cooling grinding surfaces and a novel combination between a specific novel type of grinder and a modified type of grinding machine, which accomplishes the results explained in detail hitherto, which broadly speaking includes the provision of an integral grinding wheel as a substitute for types of wheels formerly used in continuous automatic grinding of longer life and greater strength and which has the advantages over the cylinder wheels in general, particularly where cooling and lubricating are concerned similar to those of the device patented by me in Patent #1,600,054.

It is understood that my invention is not limited to the specific grinder or apparatus shown or methods described and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What I claim is:

1. In a grinding machine, in combination, a rotating surface grinder comprising a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof and having enclosed pockets substantially elliptical in section extending part way across the annular grinding face thereof obliquely to the radial enclosed by the side wall thereof extending upwards a substantial distance within the wall thereof and terminating in rounded upper ends, means for moving work arcuately across a portion only of said rotating annular grinding face and means to project a stream of coolant substantially vertically upwardly into said pockets adjacent the point of departure of said grinding face from the work, whereby cooling pistons of

coolant may be rammed into said pockets after the grinding face leaves the work and dropped out before said pockets again reach the work.

2. In a grinding machine, in combination, a rotating surface grinder comprising a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof and having enclosed pockets extending part way across the annular grinding face thereof enclosed by the side wall thereof extending upwards a substantial distance within the wall thereof, means for moving work arcuately across a portion only of said rotating annular grinding face and means to project a stream of coolant substantially vertically upwardly into said pockets adjacent the point of departure of said grinding face from the work, whereby cooling pistons of coolant may be rammed into said pockets after the grinding face leaves the work and dropped out before said pockets again reach the work.

3. In a grinding machine, in combination, a rotating surface grinder comprising a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof and having pockets extending across the annular grinding face thereof extending upwards a substantial distance of the wall thereof, means for moving work arcuately across a portion only of said rotating annular grinding face and means to project a stream of coolant into said pockets adjacent the point of departure of said grinding face from the work, whereby cooling pistons of coolant may be rammed into said pockets after the grinding face leaves the work and dropped out before said pockets again reach the work.

4. In a grinding machine, in combination, a rotating surface grinder comprising a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof and having enclosed pockets extending part way across the annular grinding face thereof enclosed by the side wall thereof extending upwards a substantial distance within the wall thereof, means for moving work across a portion only of said rotating annular grinding face and means to project a stream of coolant into said pockets adjacent the point of departure of said grinding face from the work, whereby cooling pistons of coolant may be rammed into said pockets after the grinding face leaves the work and dropped out before said pockets again reach the work.

5. In a grinding machine, in combination, a rotating surface grinder comprising a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof and having pockets substantially elliptical in section extending across the annular grind-

ing face thereof extending upwards a substantial distance within the wall thereof and terminating in rounded upper ends, means for moving work arcuately across a portion only of said rotating annular grinding face and means to project a stream of coolant into said pockets adjacent the point of departure of said grinding face from the work, whereby cooling pistons of coolant may be rammed into said pockets after the grinding face leaves the work and dropped out before said pockets again reach the work.

6. In a grinding machine, in combination, a rotating surface grinder comprising a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof and having pockets extending across the annular grinding face thereof obliquely to the radial extending upwards a substantial distance within the wall thereof, means for moving work arcuately across a portion only of said rotating annular grinding face and means to project a stream of coolant into said pockets adjacent the point of departure of said grinding face from the work, whereby cooling pistons of coolant may be rammed into said pockets after the grinding face leaves the work and dropped out before said pockets again reach the work.

7. In a grinding machine, in combination, a rotating surface grinder comprising a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof and having pockets extending across the annular grinding face thereof extending upwards a substantial distance within the wall thereof, means for moving work arcuately across a portion only of said rotating annular grinding face and means to project a stream of coolant substantially vertically upwardly into said pockets adjacent the point of departure of said grinding face from the work whereby cooling pistons of coolant may be rammed into said pockets after the grinding face leaves the work and dropped out before said pockets again reach the work.

8. The method of lubricating a rotating grinding surface moving in cycles relative to work and contacting the work during a portion only of said cycle, which comprises, forming axially vertical pockets in said grinding surface and vertically ramming pistons of coolant into said pockets substantially at the beginning of the uncontacting portion of said cycle, the speed conditions being such that the pistons are dropped out before the grinding portion of said cycle begins.

9. The method of lubricating rotating grinding surface moving in cycles relative to work and contacting the work during the portion only of said cycle, which comprises, forming pockets in said grinding surface and ramming pistons of coolant into said pockets substantially at the beginning of the uncontacting portion of said cycle, the speed conditions being such that the pistons are dropped out before the grinding portion of said cycle begins.

10. A grinder for use in surface grinding, comprising, a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof having enclosed pockets substantially elliptical in section extending part way across said surface obliquely to the radial enclosed by the side wall extending upwards a substantial distance within said wall and terminating in rounded upper ends.

11. A grinder for use in surface grinding, comprising, a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof having enclosed pockets extending part way across said surface enclosed by the side wall extending upwards a substantial distance within said wall.

12. A grinder for use in surface grinding, comprising, a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof having enclosed pockets substantially elliptical in section extending part way across said surface enclosed by the side wall extending upwards a substantial distance within said wall.

13. A grinder for use in surface grinding, comprising, a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof having enclosed pockets extending part way across said surface obliquely to the radial enclosed by the side wall extending upwards a substantial distance within said wall.

14. A grinder for use in surface grinding, comprising, a cylindrical ring of substantial depth having a wall of inherently abrasive material having an annular grinding face on one end thereof having enclosed pockets extending part way across said surface enclosed by the side wall extending upwards a substantial distance within said wall and terminating in rounded upper ends.

In testimony whereof I affix my signature.

WALTER B. LEONARD, 2ND.