

Oct. 26, 1943.

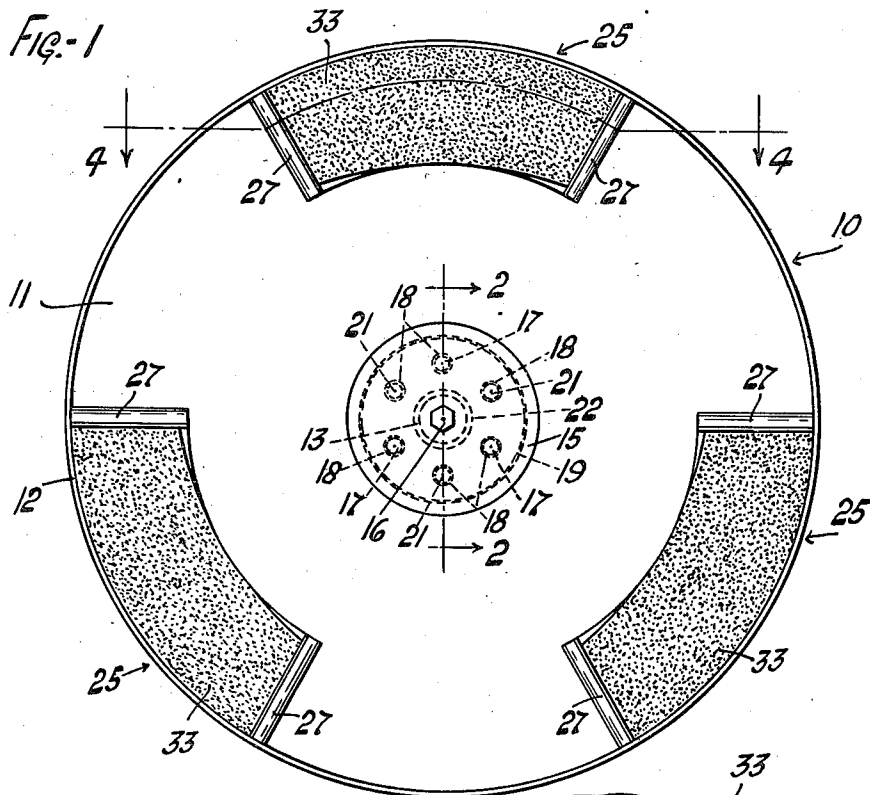
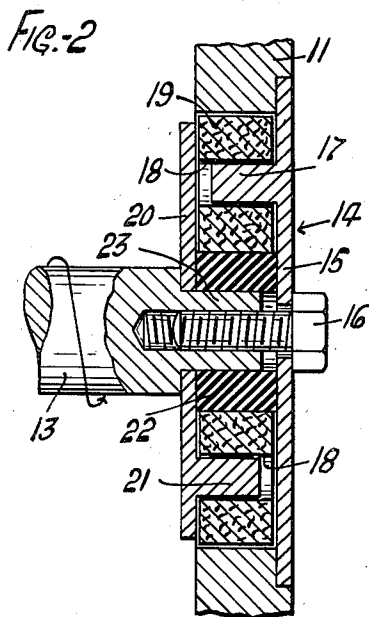
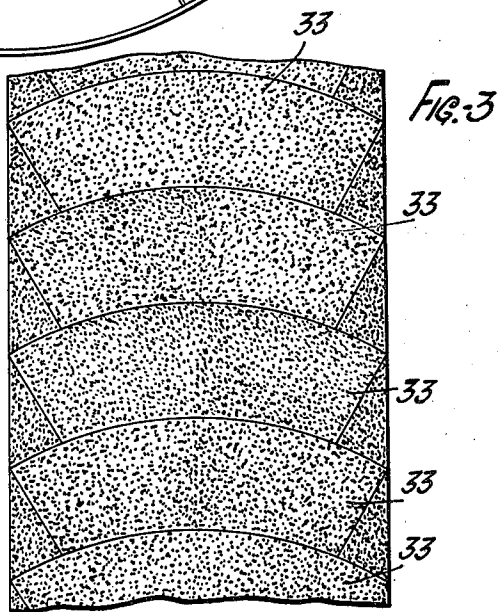
L. STETLER

2,332,676

GRINDING HEAD

Filed Aug. 4, 1940

2 Sheets-Sheet 1



INVENTOR
LOWELL STETLER
BY *Ely & Frye*
ATTORNEYS

Oct. 26, 1943.

L. STETLER

2,332,676

GRINDING HEAD

Filed Aug. 4, 1940

2 Sheets-Sheet 2

Fig. 4

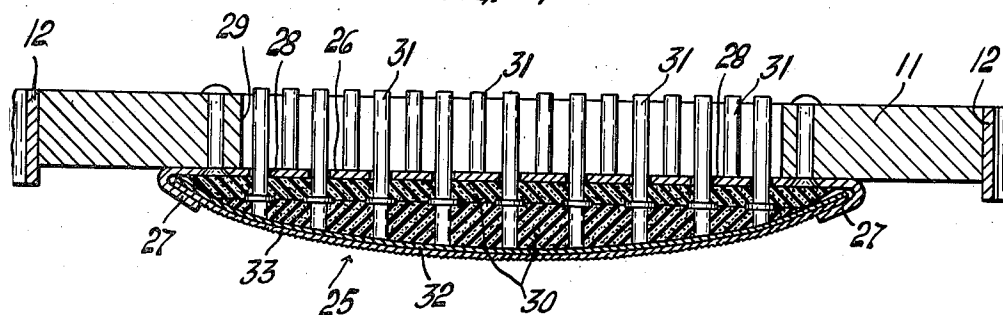
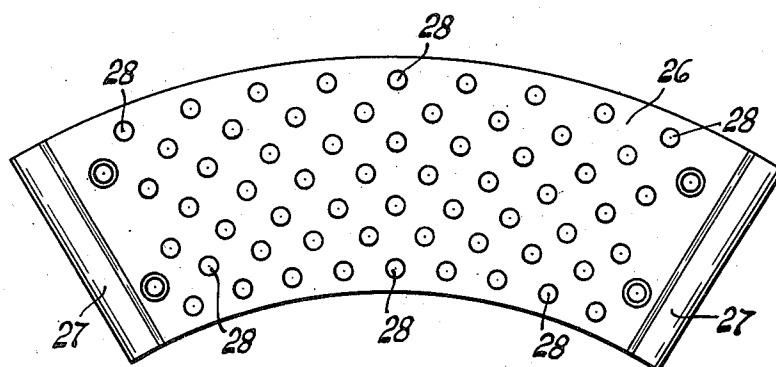


Fig. 5



INVENTOR
LOWELL STETLER

BY

Ely & Frye

ATTORNEYS

UNITED STATES PATENT OFFICE

2,332,676

GRINDING HEAD

Lowell Stettler, Cleveland, Ohio, assignor, by
mesne assignments, to Samuel T. Haas, Cleve-
land, Ohio

Application August 4, 1940, Serial No. 351,333

10 Claims. (Cl. 51—197)

This invention relates to a grinding head, and, more particularly, to a grinding head adapted to grind off a given depth of material from all portions of an undulating surface, such as, for example, the warped surface of a slate blackboard. A grinding head made according to this invention is especially adapted for performing the preliminary grinding operation in my method of dressing slate described in my co-pending application No. 345,737.

Grinding heads, heretofore, have not been completely satisfactory in that they tended to grind off only the high spots when applied to warped surfaces and also tended to scarify the surface being ground. In the grinding heads used heretofore, abrasive sheets, such as sandpaper, were not generally used successfully because the grinding heads wore out the sheets very quickly, the sheets were secured to the grinding head with difficulty, and the manner of cutting the abrasive sheeting to fit the grinding heads was wasteful.

It is an object of this invention to provide a grinding head which will grind the required amount of material off the low spots as well as off the high spots of a warped surface by providing three resilient "sled" shaped grinding sectors located at the periphery of a light grinding disk floatingly mounted on the driving shaft. It is also an object of this invention to provide a grinding head which will not score the surface being ground by suitably locating and proportioning the grinding sectors and also by providing means to conduct heat rapidly away from the abrasive surfaces. In the preferred embodiment of my invention particles of grit loosened from the abrasive sheeting will not be scratched into the surface being ground.

It is a further object of this invention to provide a grinding head which will prolong the life of the abrasive sheeting employed by rapidly conducting the heat away from the abrasive sheeting. It is another object of this invention to provide a grinding head which will permit the abrasive sheeting to be quickly and conveniently secured thereto. It is a still further object of this invention to provide a grinding head which will permit the sectors of abrasive sheeting to be cut economically and conveniently.

Other and further objects and advantages of this invention will be apparent from the following specification, claims, and drawings in which:

Fig. 1 is a front elevation of the grinding head.

Fig. 2 is a fragmentary detail section taken along the line 2—2 of Fig. 1.

Fig. 3 is a detail showing the manner of cutting abrasive sectors from an abrasive sheeting.

Fig. 4 is a fragmentary detail section taken along the line 4—4 of Fig. 1.

Fig. 5 is a detail elevation of a sector plate shown in section in Fig. 4.

In the drawings, in which like reference characters refer to like parts, 11 represents the disk of the grinding head 10. In order to obtain the required rigidity and strength with minimum weight, the disk 11 is preferably made of ply wood reinforced by the rim 12.

The grinding head 10 is driven by the driving shaft 13 through a hub 14 which permits the disk 11 to float with an angular movement which is substantially centered on the axis of the driving shaft 13. The hub 14 is comprised of a disk plate 15 which is received and suitably secured, by a force fit, for example, in the face of the disk 11 and is removably secured to the shaft 13 by the stud bolt 16. The disk plate 15 carries the evenly spaced integral driving pins 17 which are loosely engaged in three of the six holes 18 of the fiber driving ring 19. A shaft plate 20, carried by the shaft 13, is provided with three evenly spaced integral driving pins 21 which are loosely received in the remaining holes 18 of the driving ring 19. A live rubber bushing 22 is fitted between the shaft pilot 23 and the bore of the driving ring 19 and is partly compressed between the plates 15 and 20. The bushing 22 tends to maintain the disk 11 at right angles to the shaft 13 but due to the loose fit between the driving pins 17 and 21 and the holes 18 of the driving ring, the disk 11 can be "wobbled" as it is driven by the shaft 13.

Evenly spaced about the periphery of the disk 11 are three grinding sectors 25, the arcuate length of each preferably being approximately one-sixth of the circumference of the disk 11. By so spacing and arranging the sectors 25 on the angularly movable disk 11, the grinding sectors 25 are sure, within the limits of the wobble permitted by the hub 14, to engage all portions of a warped surface to be ground. Also, by providing ample space between the sectors 25, the surface being ground is less likely to become overheated. The radial width of the sectors 25 is preferably less than one-third of the radius of the disk 11. By so proportioning the width of the sectors, there is no tendency to score the surface being ground due to the differential peripheral speeds between radially spaced portions of the abrasive, and, further, particles of abrasive which may break off the sectors will be quickly thrown off by

centrifugal force and will not be scratched into the surface of the material being ground.

As shown in Fig. 4, each abrasive sector 25 is comprised of a sector plate 26 secured at its radially extending edges to the disk 11. As shown in Figs. 4 and 5, the radially extending side edges of each sector plate 26 are provided with acute angular flanges 27 which extend over the side margin of the plate. Between its side margins the plate 26 is provided with a plurality of pin holes 28. An opening 29 is cut through the disk 11 beneath the pin holes 28.

A resilient pad 30 of sponge rubber or the like is located between the flanges 27, the central portion of the pad 30 being raised well above the flanges 27, from which central portion the pad slopes toward the flanges so that the pad 30 is "sled" shaped through its longitudinal section. A plurality of pins 31 are embedded in the pad 30 and extend from the curved upper surface of the pad through the pin holes 28 and opening 29.

A metallic spring plate 32, preferably of thin gauge spring brass or spring steel, is fitted over the pad 30, the ends of the spring plate being engaged in the flanges 27 to secure the plate in position.

Sectors 33 of abrasive sheeting corresponding in configuration to the shape of the grinding sectors 25 are cut from a sheet of suitable abrasive sheeting, such as sandpaper, in the manner shown in Fig. 3. Because the arcuate shape of the abrasive sectors 33 permit the patterns to be nested, the amount of waste sheeting is very small and the cost of the sectors is reduced to a minimum. The abrasive sectors 33 are secured in the grinding sectors 25 by simply slipping the ends of the sheets between the ends of the spring plate 32 and the flanges 27. Although the abrasive sectors 33 are thus only frictionally engaged in the grinding sectors and, consequently, may be readily removed and replaced, the abrasive sectors do not become dislodged under load. It is believed that the reason for the abrasive sectors being effectively secured during use is that the pressure on the grinding sector 25, which distorts the spring plate 32, causes the spring plates to edge the abrasive sectors 33 into the flanges 27.

In use, the "wobble" in the hub 14 permits the grinding head 10 to accommodate itself to the larger undulations of a warped surface, so that all three of the grinding sectors 25 are engaged as the grinding head 10 is simultaneously rotated and translated over the surface being ground. The spring plates 32, supported by the resilient pads 30, permit the individual grinding sectors 25 to accommodate the minor variations in the surface being ground. The "sled" shape of the grinding sectors 25 permit them to pass over and grind down sudden changes in the surface being ground, such as cracks, hard veins, and the like.

The grinding sectors 25 prolong the life of the abrasive sheeting to a marked degree. During the grinding operation, the heat generated tends to soften the glue or resin in which the abrasive grit is embedded, so that particles of grit become loosened from the sheeting. Thus, the sheet becomes worn out and the loose grit scores the surface being ground. In the grinding sectors 25, however, the heat generated in the abrasive sectors 33 is rapidly conducted to the spring plate 32 from which it is dissipated by the pins 31 through the substantially non-conduct-

ing pad 30 to the sector plate 26 and to the air in the opening 29. The temperature of the abrasive sector 33 may thus be maintained below the softening point of adhesive in which the grit is embedded without having to slow the grinding head 10 below an effective grinding speed. Thus, scoring is reduced and the abrasive sheeting need be discarded only when the grit is worn down and not because the grit is lost.

Having disclosed a preferred embodiment of this invention, it is not to be understood that this invention is limited to the specific embodiment disclosed, either in whole or in part, but is limited only by the appended claims.

What is claimed is:

1. In a grinding head of the class described, a disk, a drive shaft, a disk plate secured to said disk, driving pins on said disk plate, a shaft plate mounted on said shaft, driving pins on said shaft plate, a driving ring loosely engaged between said disk plate and said shaft plate adapted to receive said driving pins loosely, a resilient bushing supporting said disk and permitting said disk to wobble when driven by said shaft, three grinding sectors equally spaced about the periphery of said disk, each of said grinding sectors comprising a perforated sector plate extending over an opening in said disk, acute angular flanges extending along the radial edges of said sector plate, a resilient pad mounted on said sector plate, the central portion of said pad extending above said flanges and the marginal portions being sloped toward said flanges, a spring plate extending over said pad, a sector of abrasive sheeting supported by said spring plate and secured in said flanges, and pins extending through said pad from said spring plate to said sector plate.

2. In a grinding head, the combination of a disk, a drive shaft, a disk plate secured to said disk, a shaft plate secured to said shaft, loose coupling means connecting said shaft plate to said disk plate to permit said disk plate to wobble within the limit of looseness of said coupling when driven by said shaft, and a resilient bushing supporting said disk on said shaft, three equally spaced grinding sectors disposed about the periphery of said disk, each of said sectors comprising a resilient arcuate pad having a raised central portion and sloping marginal portions, a spring plate extending over said pad, a sector of abrasive sheeting, and flanges permitting said sector of abrasive sheeting to be secured between said spring plate and said flanges.

3. In a grinding head, the combination of a disk, a drive shaft, a disk plate secured to said disk, a shaft plate secured to said shaft, loose coupling means connecting said shaft plate to said disk plate to permit said disk plate to wobble within the limit of looseness of said coupling when driven by said shaft, and a resilient bushing supporting said disk on said shaft, three equally spaced grinding sectors disposed about the periphery of said disk, each of said sectors comprising a sector plate, a spring plate extending across said sector plate and engaged thereon so that the central portion of said spring plate is raised above the marginal portions of said plate, a sector of abrasive sheeting supported by said spring plate, and means permitting said sector of abrasive sheeting to be removably secured to said disk.

4. In a grinding head, a driving shaft, a disk, a driving connection between said shaft and said disk permitting said disk to wobble when driven

by said shaft, three grinding sectors equally spaced about the periphery of said disk, the arcuate length of each grinding sector being not more than the arcuate spacing between adjacent grinding sectors and the radial depth of each grinding sector being not more than one-third of the radius of said disk, and each grinding sector comprising an arcuate sector of abrasive sheeting, a spring plate supporting said sector of abrasive sheeting, the central portion of said spring plate being elevated above the marginal portions thereof, and means for removably securing said sector of abrasive sheeting to said disk.

5. In a grinding head, a driving shaft, a disk, a driving connection between said shaft and said disk permitting said disk to wobble when driven by said shaft, three grinding sectors equally spaced about the periphery of said disk, the radial depth of each grinding sector being not more than one-third of the radius of said disk, and each grinding sector comprising an arcuate sector of abrasive sheeting, a spring plate supporting said sector of abrasive sheeting, the central portion of said spring plate being elevated above the marginal portions thereof, means for removably securing said sector of abrasive sheeting to said disk, and means for conducting away and dissipating the heat conducted from said section of abrasive sheeting to said spring plate.

6. In a grinding head, a disk, three equally spaced arcuate sectors disposed adjacent the periphery of said disk, the arcuate length of each grinding sector being not more than the spacing between adjacent grinding sectors and the radial depth of each sector being not more than one-third of the radius of said disk, each grinding sector being comprised of an arcuate sector of abrasive sheeting, resilient means for supporting said sector of abrasive sheeting so that its central portion, with respect to its arcuate length, is elevated above its marginal portion, means for securing said sector of abrasive sheeting to said disk, and means for dissipating the heat generated by said sheeting.

7. In a grinding sector for a grinding head, a resilient rubber pad having arcuate sides and ends radially disposed with respect to the arcuate

sides, said pad having a raised central portion and a marginal portion sloping toward an end of the pad, a spring plate extending over said pad, a sector of abrasive sheeting supported by said spring plate, means for securing said sector of abrasive sheeting and causing said spring plate to conform to the profile of said pad, and means for dissipating the heat generated by said sector of abrasive sheeting through said pad.

8. In a grinding sector for a grinding head, a resilient rubber pad having arcuate sides and ends radially disposed with respect to the arcuate sides, said pad having a raised central portion and a marginal portion sloping toward an end of the pad, a sector of abrasive sheeting, means for securing said sector of abrasive sheeting and causing said sector of abrasive sheeting to conform to the profile of said pad, and means for dissipating the heat generated by said sector of abrasive sheeting through said pad.

9. In a grinding sector for a grinding head, a resilient spring plate having an arcuate outer side and ends radially disposed to said side, a sector of abrasive sheeting supported by said spring plate, means springing said spring plate so that the central portion thereof, with respect to its outer side, is elevated and a marginal portion thereof slopes toward an end of the spring plate, said means also permitting said sector of abrasive sheeting to be removably secured in a heat-conducting relationship to said spring plate.

10. A grinding sector for a grinding head comprising a disk, a perforated sector plate extending over an opening in said disk, acute angular flanges extending along the radial edges of said sector plate, a resilient pad mounted on said sector plate, the central portion of said pad extending above said flanges and the marginal portions being sloped toward said flanges, a spring plate extending over said pad, a sector of abrasive sheeting supported by said spring plate and secured in said flanges, and pins extending through said pad from said spring plate to said sector plate.

LOWELL STETLER.