Nov. 20, 1945. J. R. HALL 2,389,505

GRINDING MILL

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Fig. 1

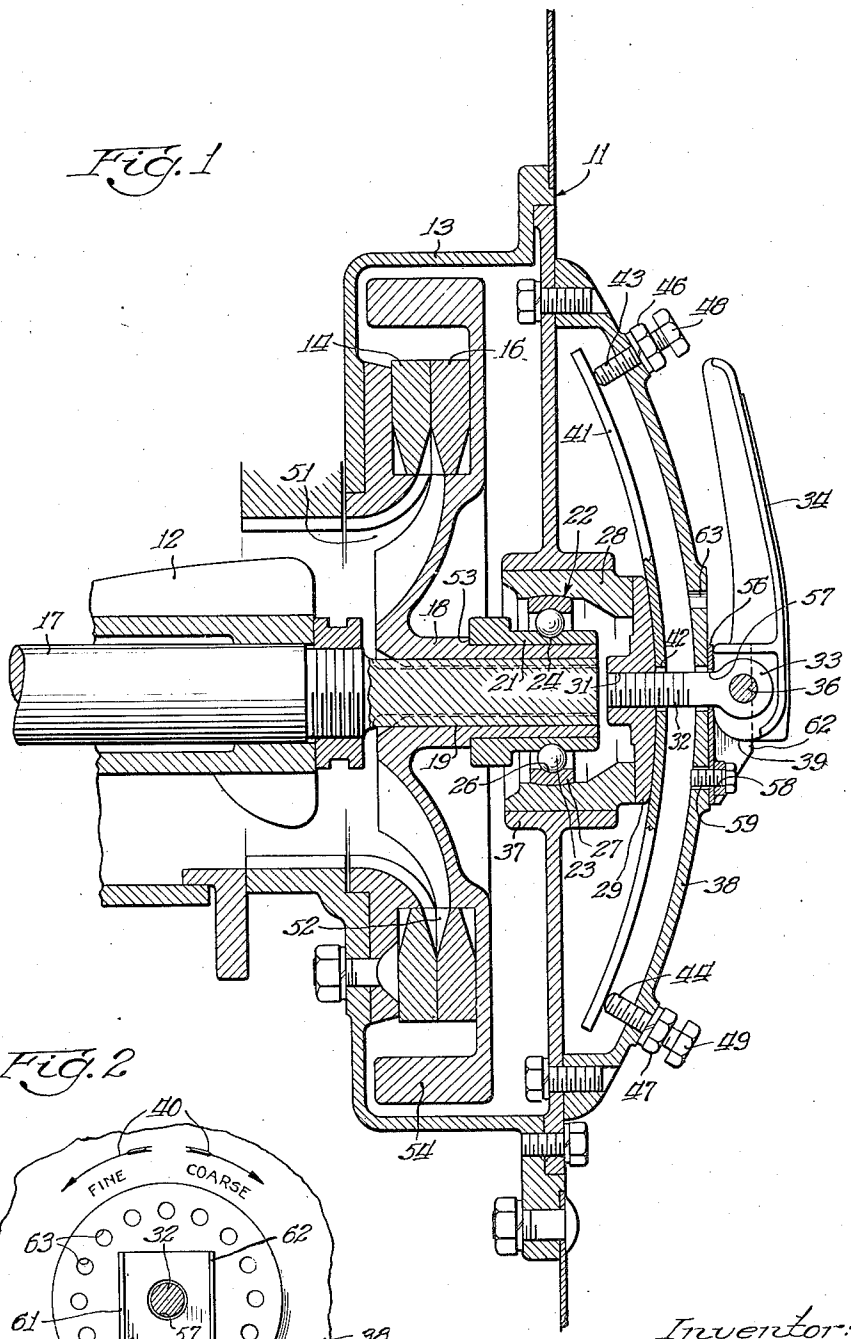


Fig. 2

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GRINDING MILL

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16 Claims. (Cl. 241—256)

This invention relates to a new and improved grinding mill and more particularly to a grinding mill of the plate type.

One of the principal objects of this invention is to provide equal pressure throughout the entire annular surface of the grinding plates.

An important object of this invention is the provision of a grinding plate adjustment means in a grinding mill.

Another and further important object of this invention is to provide a single control member for effecting a vernier adjustment of the grinding plate separation, and by a further movement of the control member to effect a full separation of the grinding plates.

Other and further important objects will become apparent from the disclosures in the following specification and accompanying drawing, in which:

Figure 1 shows a vertical sectional view of a grinding mill; and

Figure 2 is a detail of a front view of the device shown in Figure 1.

As shown in the drawing, the reference numeral 11 indicates generally a housing for the grinding mill with portions of the entrance for the material to be ground omitted, as they form no part of the present invention. A grinding mill of this type employs a hopper, not shown, for the entrance of feed or the like, and at the base of the hopper is positioned an auger 12, which extends from the hopper to the section 13 of the housing, which section encloses the grinding plates 14 and 16. The plate 14 is stationarily fixed within the casing 13, whereas the plate 16 is rotatable and adjustable toward and away from the plate 14, depending on the fineness of grind required.

The auger or worm 12 is driven by the drive shaft 17, which also imparts rotation to the plate 16. The drive for this plate 16 is accomplished through its hub 18, which is keyed to an extension 19 of the shaft 17.

Surrounding the hub 18 of the plate 16 is the inner race 21 of a bearing 22. The bearing 22 is preferably of the ball type and is equipped with an annular series of balls 23, which are alined within an annular groove 24 in the inner race 21 and within the groove 26 of an outer race 27. This outer race 27 is supplemented by a superimposed sleeve 28 which extends in a rightward direction where it abuts the disk-like member 29. This disk member 29 has a central aperture 31, which is threaded for reception of the threaded bolt 32. The bolt 32 may be of numerous forms, but as shown is of the eye type at 33, wherein it is affixed to a control handle 34 by means of a cross-shaft 36 extending through the eye of the bolt 32. It is quite evident, therefore, that rotation of this control handle 34 will cause rotation of the eye bolt 32 which will cause an axial movement of the plate 16 with respect to the plate 14 through sliding movement of the ball bearing 22 within a circular bearing 37 within the housing 11. A bowed leaf spring 41 maintains the plate 16 in as close relationship with the plate 14 as is permitted by the position of the disk 29 through the bearing inner race 21 contacting a shoulder 53 in the hub 18. The threads on the eye bolt 32 are rather small, and it is possible to effect a vernier adjustment of the plate 16 in its relation to the stationary plate. Rotation of the eye bolt 32 in a clockwise direction, as viewed in Figure 2, will tend to draw the disk 29 toward the housing 38 whereupon the spring 41 will be limited in its range of movement. There is no positive withdrawing of the plate 16 from its place closely adjacent the plate 14, but the spring 41 can no longer hold them close together, and it will be understood that when material is being ground, such material will cause the plates to separate their maximum distance as allowed by the position of disk 29. Conversely, when the eye bolt is rotated counterclockwise, as viewed in Figure 2, the disk 29 will be separated a greater distance from the housing 38 and thereby permit the spring to force the plate 16 closer to the plate 14 as previously explained. Further, the face of the auxiliary housing 38 may be calibrated so that a definite rotational movement of the handle 34 will automatically bring about a predetermined separation of the plates 14 and 16. This calibration may be in fractions of an inch or may possibly just state "fine" or "course," as shown in Figure 2, depending upon the direction of rotation. The arrows 40 indicate the proper direction of rotation to accomplish such fine or coarse grinding.

The control handle 34 has an eccentric periphery or cam at 39 about the connecting shaft 36. Movement, therefore, of the control handle 34 in a clockwise direction, as viewed in Figure 1 of the drawing, will cause an immediate and full release of the adjustable plate 16 by pulling of the leaf spring 41 by the disc 29 against the housing 38. This is a safety feature when it is desired to quickly release the spring tension on the grinding plates 14 and 16. It is possible that there may be occasions when it is desired that grinding of the material may be stopped immediately, and it is at

that time that the control handle 34 is swung through its second range of movement.

The bowed leaf spring 41 backs up the disk member 29 and exerts a pressure thereon to maintain the plates 14 and 16 in yielding relationship. This spring 41 has a central aperture, as shown at 42, for passage of the eye bolt 32. Adjustment of the tension of the spring 41 is obtained by adjustment bolts in the housing shown at 43 and 44 at the extreme ends of the spring 41. The bolts 43 and 44 are equipped with lock nuts 46 and 47 and bolt heads 48 and 49. It is obvious that increased pressure on the spring 41 will necessarily entail a greater pressure between the plates before they will yield, and likewise a reduced pressure on the spring 41 permits separation of the plates 14 and 16 upon some lesser application of force. It is entirely possible that a stone or the like may gain entrance to these plates 14 and 16 at their wide annular mouth 51 and proceed inwardly toward the restricted throat portion 52, whereupon it is either necessary that the plates yield in a separation movement or that the plates be broken. This leaf spring 41 permits yielding of the grinding plates to the point where the spring will contact the housing 38. The leaf spring 41 provides a symmetrical application of pressure upon the disk-like member 29, which in turn transmits force to the supplemental outer race 28 and down through the bearing 22 to the inner race 21 which abuts the shoulder 53 in the plate hub 18.

A fan 54 is integral with the plate 16 and concentric therewith. This fan 54 acts to carry the ground material exiting from the outer peripheries of the plates 14 and 16 to an elevator or the like, not shown, whereupon it is fed to some receptacle.

A U-shaped bracket 56 has an aperture 57 for passage of the eye bolt 32 and a second threaded aperture at 58 for the insertion of a lock pin 59. The sides of the U bracket 61 and 62 enclose the control handle 34 and prevent turning of the handle separately from the U bracket. A series of holes 63, positioned in a circle concentric with the eye bolt 32 in the face of the housing 38, is adapted to receive the lock pin 59. It will be apparent that the bracket 56 may be set at any position in the holes 63, and that, therefore, the control handle 34 can likewise be set and fixed at any desired position. In this manner the plate separation may be adjusted, and once adjusted it cannot become maladjusted by slipping or unwarranted handling.

It is obvious, of course, that numerous changes and details of construction could be made, and it is intended that the scope of the invention be determined only by the appended claims.

What is claimed is:

1. In a grinding mill having a housing, a driving shaft in said housing, a pair of grinding plates, one of said plates having a splined hub engaging a splined portion on said driving shaft, a bearing for said driving shaft slidably mounted in said housing and cooperatively engaging said hub, and a flat spring adjustably mounted in said housing and adapted to exert pressure against the outer end of said bearing.

2. In a grinding mill having a housing, a driving shaft in said housing, a pair of grinding plates, one of said plates having a splined hub engaging a splined portion on said driving shaft, a bearing for said driving shaft slidably mounted in said housing and cooperatively engaging said hub, and a flat spring adjustably mounted in said housing and adapted to exert an end pressure against said bearing, said bearing in turn effecting an end pressure on said plates.

3. In a grinding mill, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft superposing said hub and engaging a shoulder on the inner side of said hub, and a leaf spring engaging said bearing on the outer side, whereby force is transmitted through the bearing and hub shoulder to the plates.

4. In a grinding mill, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft superposing said hub and at its inner end engaging a shoulder on said hub, a leaf spring engaging the outer side of said bearing, and means for equally adjusting the tension on said leaf spring.

5. In a grinding mill, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft superposing said hub and at its inner end engaging a shoulder on said hub, a leaf spring engaging the outer side of said bearing, means for equally adjusting the tension on said leaf spring, and means for limiting movement of said spring.

6. In a grinding mill, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft superposing said hub and at its inner end engaging a shoulder on said hub, a leaf spring engaging the outer side of said bearing, means for equally adjusting the tension on said leaf spring, means for limiting movement of said spring, said means comprising a disc positioned between said bearing and said spring, and a stud threadedly engaging a central aperture in said disc and further means for adjustably holding said stud.

7. In a grinding mill, a housing, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft journaled against a shoulder on said hub, a disc adjacent the other side of said bearing, a spring holding said disc against said bearing, means for limiting movement of said disc in following the sliding bearing, said means comprising a threaded bolt engaging said disc, and a holding member for the bolt outside said housing.

8. In a grinding mill, a housing, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft journaled against a shoulder on said hub, a disc adjacent the other side of said bearing, a spring holding said disc against said bearing, means for limiting movement of said disc in following the sliding bearing, said means comprising a threaded bolt engaging said disc, and a holding member for the bolt outside said housing, said holding member being in the form of a rotatable handle.

9. In a grinding mill, a housing, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft journaled against a shoulder on said hub, a disc adjacent the other side of said bearing, a spring holding said disc against said bearing, means for limiting movement of said disc in following the sliding bearing, said means comprising a threaded bolt engaging said disc, and a holding member for the bolt outside said housing, said holding member

being in the form of a rotatable handle and additionally hinged for outward movement from said housing.

10. In a grinding mill, a housing, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft journaled against a shoulder on said hub, a disc adjacent the other side of said bearing, a spring holding said disc against said bearing, means for limiting movement of said disc in folliwng the sliding bearing, said means comprising a threaded bolt engaging said disc, a holding member for the bolt outside said housing, said holding member being in the form of a rotatable handle and additionally hinged for outward movement from said housing, and a cam on the lower end of said member.

11. In a grinding mill, a housing, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft journaled against a shoulder on said hub, a disc adjacent the other side of said bearing, a spring holding said disc against said bearing, means for limiting movement of said disc in following the sliding bearing, said means comprising a threaded bolt engaging said disc, and a holding member for the bolt outside said housing, said holding member being in the form of a rotatable handle, means hinging said member for outward movement from said housing, a cam on the lower end of said member, whereby rotation of the member will vary the limit position of the range of spring movement and swinging of the member outwardly on its hinge will cause the cam to fully release the spring tension, and the housing being calibrated for said member rotation to permit predetermined adjustment of said plates.

12. In a grinding mill, a housing, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft journaled against a shoulder on said hub, a disc adjacent the other side of said bearing, a spring holding said disc against said bearing, means for limiting movement of said disc in following the sliding bearing, said means comprising a threaded bolt engaging said disc, and a holding member for the bolt outside said housing, said holding member being in the form of a rotatable handle, said member being hinged for outward movement from said housing, a cam on the lower end of said member, whereby rotation of the member will vary the limit position of the range of spring movement and swinging of the member outwardly on its hinge will cause the cam to fully release the spring tension, and the housing calibrated for said member rotation to permit predetermined adjustment of said plates, and means for locking said member in angular adjusted position.

13. In a grinding mill, a housing, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft journaled against a shoulder on said hub, a disc adjacent the other side of said bearing, a spring holding said disc against said bearing, means for limiting movement of said disc in following the sliding bearing, said means comprising a threaded bolt engaging said disc, and a holding member for the bolt outside said housing, said holding member in the form of a rotatable handle, said member being hinged for outward movement from said housing, and a cam on the lower end of said member, whereby rotation of the member will vary the limit position of the range of spring movement and swinging of the member outwardly on its hinge will cause the cam to fully release the spring tension, and the housing being calibrated for said member rotation to permit predetermined adjustment of said plates, said locking means comprising a U bracket having its bight portion engaging any one of a plurality of apertures formed in the housing and the member being retained against movement by the sides of the U bracket.

14. In a grinding mill, a housing, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft journaled against a shoulder on said hub, a disc adjacent the other side of said bearing, a leaf spring holding said disc against said bearing, means for limiting movement of said disc in following the sliding bearing, said means comprising a threaded eye bolt engaging said disc, and a holding member for the bolt outside said housing.

15. In a grinding mill having a housing, a driving shaft in said housing, a pair of grinding plates, one of said plates having a splined hub engaging a splined portion on said driving shaft, a bearing for said driving shaft slidably mounted in said housing and cooperatively engaging said hub, and a flat spring adjustably mounted in said housing and adapted to exert a longitudinally directed pressure against said bearing, the adjustable mounting of said spring comprising an adjusting screw in the housing at the leaf spring's extremities.

16. In a grinding mill, a housing, a driving shaft, a pair of grinding plates, one of said plates having a hub slidably keyed to said driving shaft, a bearing for said driving shaft journaled against a shoulder on said hub, a disc adjacent the other side of said bearing, a leaf spring holding said disc against said bearing, means for limiting movement of said disc in following the sliding bearing, said means comprising a threaded eye bolt engaging said disc, and a holding member for the bolt outside said housing, said holding member in the form of a rotatable handle, said member being hinged for outward movement from said housing, and a cam on the lower end of said member, whereby rotation of the member will vary the limit position of the range of spring movement and swinging of the member outwardly on its hinge will cause the cam to fully release the spring tension, and the housing calibrated for said member rotation to permit predetermined adjustment of said plates, said means for locking comprising a U bracket having its bight portion engaging any one of a plurality of apertures in the housing and the member retained against movement by the sides of the U bracket.

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