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GYRATORY ECCENTRIC BEARING

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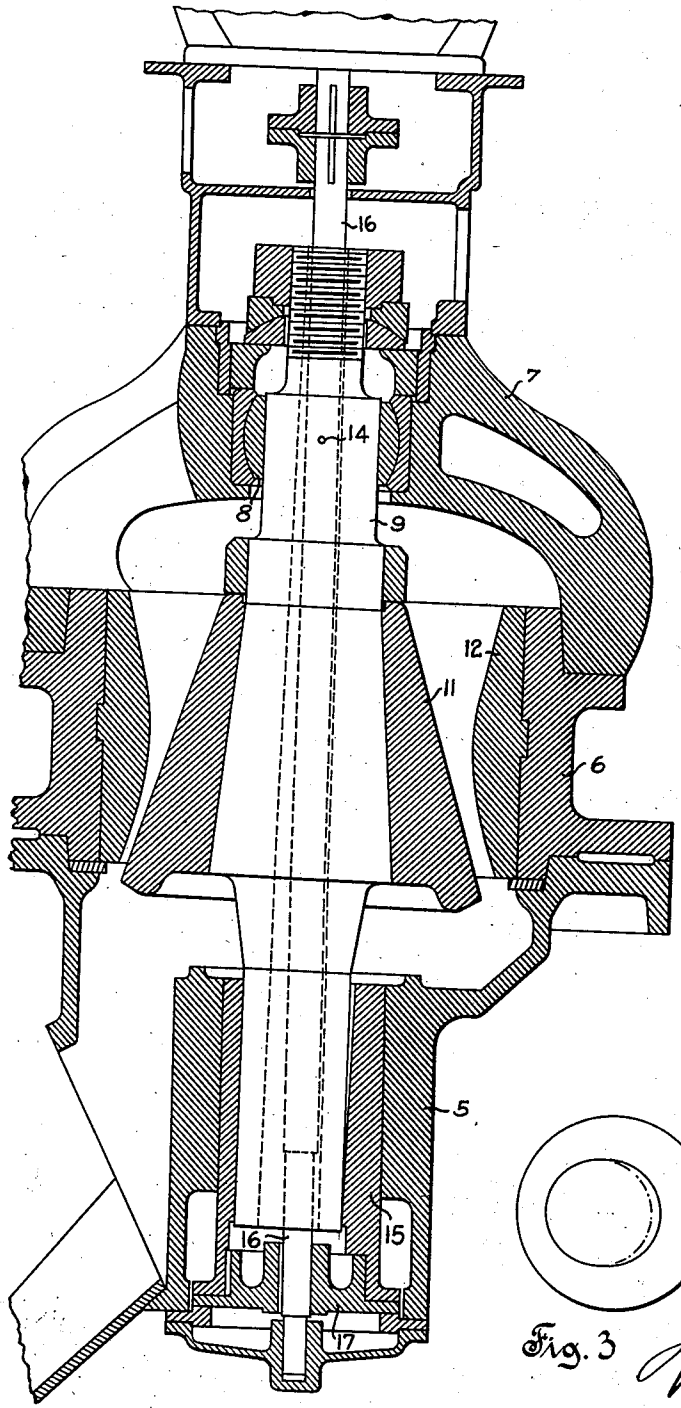


Fig. 1

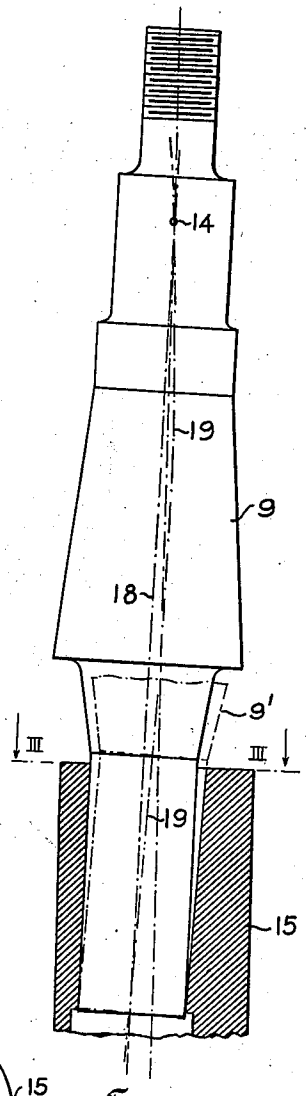


Fig. 2

Fig. 3

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GYRATORY ECCENTRIC BEARING

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13 Claims. (Cl. 308—62)

This invention comprises a novel eccentric bearing member for a gyratory crusher in which provision is made for the deflection of the crusher shaft in operation under load.

It is an object of this invention to provide means for permitting deflection of a gyrated shaft under load.

It is a further object of this invention to provide an eccentric bearing for gyratory crushers and similar apparatus in which the bearing surface between the crusher shaft and the actuating or thick side of the eccentric bearing increases as the load on the crusher increases.

A further object of this invention is to reduce the wear and increase the efficiency of gyratory apparatus actuated by an eccentric bearing.

Other objects will become obvious from the following description. Reference is made to the accompanying drawing in which:

Fig. 1 is a vertical sectional view through a well known type of gyratory crusher in which an eccentric, made in accordance with the present invention, is incorporated.

Fig. 2 is a fragmental sectional view of the crusher shaft and part of the eccentric of Fig. 1, with the shaft shown in unstressed condition in full lines and a partial view of the shaft in deflected position being shown in dot and dash lines.

Fig. 3 is a plan view of the upper surface of the eccentric bearing of Figs. 1 and 2.

In the crusher of Fig. 1 an eccentric housing and integral bottom shell 5 supports to top shell 6 on which is mounted a spider 7 which is provided with suitable suspension bearing means generally indicated by numeral 8 and supporting main crusher shaft 9 in a manner familiar to those skilled in the art. Main shaft 9 carries a hard alloy head or mantle 11 which cooperates with relatively stationary concave 12 for crushing stone therebetween. Main shaft 9 is gyrated about some point 14 by means of eccentric bearing 15, the eccentric bearing in this case being driven by a motor shaft 16 passing through a bore in main shaft 9 and being connected to drive the eccentric bearing by some such means as connecting plate 17. It is obvious that, the driving means being no part of the present invention, any other known method of driving the eccentric bearing may be utilized. The eccentric bearing of this machine is equally applicable to other known types of gyratory crushers and similar apparatus.

In hitherto known crushers, the eccentric bearing was bored to provide an opening to make a close sliding fit with the lower part of the main shaft of the crusher. This is an undesirable construction. When the shaft is gyrated to the left as in Fig. 1 any stone being crushed in the left side of the crushing chamber would deflect the shaft so that its axis instead of being a straight line as shown at 18, Fig. 2, would take the form of a curve somewhat as shown in exaggerated form at 19 in Fig. 2. No shaft of practical size can be made sufficiently rigid to prevent such deformation or deflection under the tremendous pressures which are required to crush stone.

Such shaft deflection in the standard type of eccentric bearing would have the effect of exerting tremendous pressure at the top of the bore at the thick side of the eccentric bearing, with little if any pressure on the remaining bearing surface between the shaft and the thick side of the eccentric bearing. Therefore it is clear that in such a construction the effective bearing surface is least when the pressure is greatest. This results in an increase in friction which sometimes causes binding of the shaft in the eccentric bearing. Other results of this tendency of the shaft to deflect within a bore which is made to fit it in only one position are: destruction of the babbitt of the eccentric, particularly near the top of the bore, since these bearing surfaces are never intended to sustain so great a unit pressure; and overheating and waste of power, owing to friction losses at points of great pressure.

To overcome these disadvantages applicants have constructed an eccentric as described below. The eccentric 15 is bored in the usual way to make a sliding fit with the shaft, the axis of the bore being coincident with the axis 18 of the shaft as shown in Fig. 2. This bore is indicated by a dot and dash line in Fig. 3. After the bore is completed, another bore is made in the eccentric bearing, this latter bore being at a slight angle with the first bore. As shown in Figs. 2 and 3, the second bore, which is of the same diameter as the first, coincides with the first bore at the bottom of the eccentric bearing, but is offset slightly ($\frac{1}{32}$ of an inch in a practical embodiment) toward the thick side of the eccentric bearing at the top thereof.

The resulting structure, as best shown in Fig. 2, eliminates the above mentioned difficulties. At no load, as when the crusher is running idle, the shaft will fit in the bore as shown in solid lines, with only the bottom of the thick side of the eccentric bearing contacting the shaft to urge it to the left. As load is gradually applied, the

shaft becomes deflected, and a larger area of the thick side of the eccentric bearing contacts the shaft to take up the increased pressure. Finally at full load the shaft assumes a curvature such that its axis is substantially as shown in exaggerated form at 19. Under these conditions, the lower end of the shaft 9 as shown in dot and dash lines at 9' bears against the full area of the thick side of the eccentric bearing.

It will be seen that, with this construction, the effective bearing surface between the shaft and the thick side of the eccentric bearing increases with the load instead of decreasing as in the prior art. The tremendous unit pressures with accompanying increases in friction and generation of heat and destruction of babbitt in the eccentric bearing are thus greatly reduced or eliminated.

Actual usage has shown that eccentric bearings made in accordance with the present invention run cooler and have a longer life than do the eccentrics of the prior art; and an appreciable saving in power is effected by their use.

While this invention has been particularly described with reference to a gyratory crusher eccentric bearing, it is to be understood that it is equally applicable to any apparatus in which a shaft is gyrated by means of an eccentric bearing. It is to be understood that the principle of this invention is equally applicable to shafts which have a slightly tapered bearing surface with the eccentric, instead of the cylindrical bearing surface illustrated herein; and such bearing surfaces are included in the recitation of cylindrical surfaces in the claims.

It is claimed and desired to secure by Letters Patent:

1. An article of manufacture comprising a cylindrical member provided with a bore, said bore having a constant cross-sectional dimension in one direction, and a varying cross-sectional dimension along its length in a direction perpendicular to said first dimension.

2. An article of manufacture comprising a cylindrical member bored to provide an internal surface comprising two intersecting cylinders arranged at a slight angle to each other.

3. An article of manufacture as recited in claim 2 in which the axes of said cylinders intersect substantially at one end of said cylindrical member.

4. An eccentric bearing comprising a hollow cylindrical member, the inner surface of said bearing comprising two intersecting cylindrical surfaces the axes of which intersect at a slight angle.

5. An eccentric bearing comprising a hollow cylindrical member, the inner surface of said bearing comprising two intersecting cylindrical surfaces the axes of which intersect at a slight angle, said intersection being located substantially at one end of the bearing.

6. An eccentric bearing comprising a hollow cylindrical member, the inner surface of said bearing comprising two cylindrical surfaces the axes of which intersect at a slight angle, the axis of the outer cylindrical surface of said bearing being at a slight angle to said inner cylindrical surface axes.

7. An eccentric bearing, a shaft gyratable by said bearing and fitting within a bore in said bearing, said bore comprising two intersecting cylindrical surfaces, the axes of said surfaces intersecting at a slight angle.

8. In a gyratory crusher comprising a gyratable cylindrical shaft, an eccentric bearing for gyrating said shaft, said bearing comprising a cylindrical outer surface and an inner surface comprising two intersecting cylinders, the axes of which intersect at a slight angle, the diameters of both said cylinders being substantially equal.

9. A gyratory crusher comprising a gyratable cylindrical shaft, an eccentric bearing for gyrating said shaft comprising a cylindrical outer surface and an inner surface comprising a cylindrical surface having a close sliding fit with said shaft in its unstressed condition, and a second cylindrical surface, the axis of which makes a slight angle to the axis of said first cylindrical surface and said second surface having a close sliding fit with said shaft in its deflected condition under load.

10. A gyratory crusher comprising a gyratable cylindrical shaft, an eccentric bearing for gyrating said shaft comprising a cylindrical outer surface and an inner surface comprising a cylinder having a close sliding fit with said shaft in its unstressed condition, and a second cylinder the axis of which makes a slight angle to the axis of said first cylinder and having a close sliding fit with said shaft in its deflected condition under load, said cylindrical inner surfaces coinciding at one end of said eccentric bearing.

11. A gyratory crusher comprising a gyratable shaft subject to lateral deflection, an eccentric bearing for gyrating said shaft and provided with an eccentric bore, the inner surface of said bore comprising a first cylindrical surface slidably fitting around said shaft in its unstressed condition and a second cylindrical surface slidably fitting around said shaft in its maximum deflected position, said second cylindrical surface being on the thick side of the eccentric.

12. In combination, a gyratable deflectable cylindrical shaft and an eccentric bearing for gyrating said shaft, said bearing being provided with a tapered bore, the bottom end of the bore having a close sliding fit with said shaft, while the upper end of the bore has one cross-sectional diameter of substantially the same dimension as said shaft, the diametrical dimension at right angles thereto being substantially larger and the variation in cross-section of said bore from the bottom to the top thereof being uniform.

13. An article of manufacture comprising an eccentric bearing provided with a longitudinal bore, the cross-section of said bore near one end of said bearing comprising a circle, the cross-section of said bore near the other end of said bearing comprising an oval consisting of two coextensive semi-circles slightly removed from each other and connected by two parallel lines, the variation in cross-section of said bore being uniform along the length thereof.

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