April 8, 1958 W. MESSINGER 2,829,842

CONE CRUSHING MECHANISM

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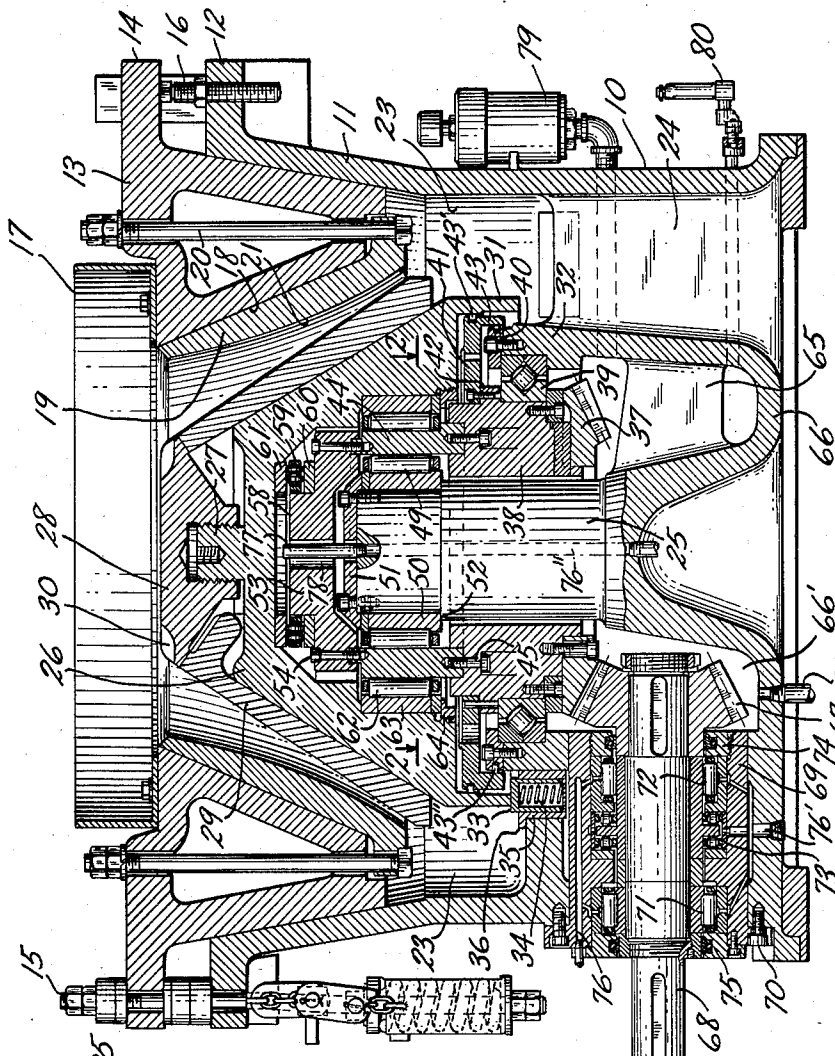

FIG. 1.

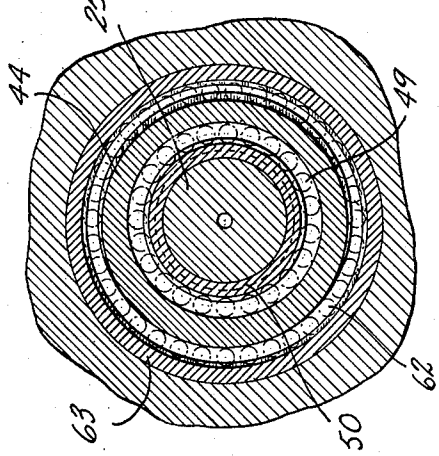

FIG. 2.

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CONE CRUSHING MECHANISM

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6 Claims. (Cl. 241—208)

The present invention relates to crushing mechanism and embodies more specifically, an improved bearing and related mounting structure by means of which a movable crushing element is mounted effectively for operation upon a central supporting structure.

An object of this invention is to provide a cone crushing mechanism having a rugged mounting structure and driving mechanism by means of which the movable crushing element may be effectively operated with respect to an outer stationary conical crushing element.

In order that the invention may be understood more precisely, reference will be made to the accompanying drawings, wherein

Figure 1 is a view in vertical section, taken through the axis of a cone crushing mechanism constructed in accordance with the present invention; and

Figure 2 is a partial view in transverse section, taken on the line 2—2 of Figure 1, and looking in the direction of the arrows.

Referring to the above drawings, and particularly to Figure 1, a cone crusher is illustrated as being formed of a casing 10 having an upper portion tapered outwardly at 11 and provided with a peripheral flange 12 by means of which a removable top ring 13 may be secured to the casing 10. The top ring 13 is formed with a peripheral flange 14, a plurality of bolts 15 being provided to secure the flanges 12 and 14 together. Adjustable stop bolts 16 are provided on one of the flanges (for example, flange 12) in order that the flanges may be properly spaced in their assembled position.

The upper ring 13 is provided with a hopper 17 by means of which material to be crushed may be fed into the region between the crusher elements presently to be described. The inner surface 18 of the ring 13 is tapered downwardly and outwardly in order to receive a lining 19 secured in position by means of bolts 20. The inner surface of the lining 19 may be convexly curved as illustrated at 21, and the material of the lining is selected to have high abrasive qualities.

Beneath the upper ring 13 the casing 10 is formed with an annular channel 23 into which crushed material falls and from which it is discharged through a discharge duct 24. The casing 10 is further formed with a central pedestal 25 upon which a movable cone head or crushing element 26 is supported by bearing structure presently to be described. The cone head 26 is formed with a threaded stud 27 upon which a nut 28 is secured in order to position a conical liner 29 properly with respect to the cone 26, spaced recesses 30 being formed in the nut 28 to enable it to be turned upon the threaded stud 27.

The cone head 26 is also formed with a peripheral skirt 31 at its lower extremity, this skirt overlapping a stationary cylindrical wall 32 formed on the casing 10, the wall 32 in part serving to define the channel 23 and the discharge duct leading from the channel. To restrain the tendency of the cone head 26 to spin, one or more brake shoes 33 are provided, this shoe being shown in the form of a plug urged against the lower rim of the skirt 31 by

means of a coil spring 34 received within a fitting 35 that is mounted in the bottom of the channel 23.

The central cone 26 is mounted upon the pedestal 25 by means of driving mechanism and bearings now to be described. Driving mechanism for the cone crusher includes a ring gear 37 which is secured to an annular mounting member 38 that is mounted within the wall 32 formed on the casing 12 by means of X-type bearing 39, such as illustrated in my United States Letters Patent No. 2,430,359, dated November 4, 1947, for "Antifriction Thrust Bearing." An understanding of this bearing will show that its rollers alternate in orientation such that the direction of the axes of consecutive rollers is oppositely inclined at 45 degrees. Such structure provides effective bearing adjustment and likewise serves adequately to resist both axial and radial thrusts. The bearing 39 is secured in position by means of a ring 40 which is secured to the top edge of the wall 32 and provides an effective adjustable mounting for the bearing. A sealing plate 41 is secured to a peripheral flange 42 (formed on the annular mounting member 38) and is formed with an eccentric walled skirt 43.

The superimposed roller bearings, as well as the X-type bearing 39, are sealed by means of snap ring seals 43′ and 43″ between the outer cylindrical surface of the skirt 43 and the skirt 31 and the inner cylindrical surface of the skirt 43 and the ring 40, respectively. The outer cylindrical surface of the skirt 43 is concentric to the outer cylindrical surface of an eccentric bearing sleeve or portion 44 on the annular member 39, while the inner cylindrical surface of the skirt 43 is concentric to the inner cylindrical surface of the eccentric bearing sleeve 44. The snap ring seal 43′ hugs the inner surface of the skirt 31 while the ring 43″ hugs the inner surface of the skirt 43. As a result, the outer ring 43′ rotates with the cone head while the inner ring 43″ revolves at the same speed as the annular mounting member 38. There is no lateral (horizontal) swishing of the seal rings, these rings having different axes of rotation displaced the same amount as the eccentricity of the actuating eccentric bearing sleeve or middle race 44 of the duplex roller bearing.

The eccentric bearing sleeve 44 is secured to the annular mounting member 38 by means of bolts 45 to form an annular mounting unit, these bolts being received within counter-bores formed in the annular mounting member 38, the bores preferably being filled with type metal after the bolts have been secured in position. In addition to the bolts 45, the annular mounting member 38 and eccentric bearing sleeve 44 may be keyed together.

Between the eccentric bearing sleeve 44 and the pedestal 25 a plurality of rollers 49 is provided, these rollers being of conventional form and mounted in a suitable carrier, all in accordance with standard practice. The rollers 49 engage an inner race 50 carried by the upper extremity of the pedestal 25, a retaining cap 51 being secured to the upper extremity of the pedestal in order to secure the inner race in the position illustrated and abutting against a shoulder 52 formed by a reduced upper extremity on the pedestal 25.

A cap 53 is secured to the upper edge of the eccentric bearing sleeve 44 by means of a plurality of bolts 54.

The cap 53 is formed with an upper extremity 58 of reduced diameter and about which a vertical thrust bearing 59 is received. The lower race 60 of the bearing 59 is carried by the reduced upper extremity of the cap 53, and the upper race 61 of the bearing 59 is carried by the inner cone member 26. In this fashion the bearing 59 transmits load forces developed in a direction parallel to the axis of the pedestal 25 between the cone member 26 and the cap 53 and related driving elements comprising eccentric bearing sleeve 44 and annular mounting member 38. These forces are thus transmitted

to the inner wall 32 of the casing 10 by means of X-type bearing 39. In order that forces developed by the cone 26 transverse to the direction of the axis of the pedestal 25 may be effectively transmitted to the pedestal, an outer series of rollers 62 is provided about the eccentric bearing sleeve 44, these rollers engaging an outer race 63 that is mounted within the inner cone 26 by means of a mounting ring 64.

Reinforcing webs 65 may be provided between the pedestal 25 and the inner wall 32 of the casing 10, the bottom of the casing being closed by means of a bottom web 66 that extends between the pedestal 25 and the wall 32 in order to provide a chamber 66' within which a driving pinion 67 may be received. The driving pinion 67 is mounted upon a horizontally extending drive shaft 68 that is journaled within a mounting sleeve 69 secured within the casing 10 by means of bolts 70. The sleeve 69 is provided with spaced radial bearings 71 and 72 and a thrust bearing 73, all in accordance with conventional practice. The bearings 71, 72 and 73 are sealed between the shaft assembly and sleeve 69 by means of end sealing rings 74 and 75. Lubrication of the bearings is accomplished through ducts 76 and 76'.

In order that the bearings for the central cone 26 may be effectively lubricated, the pedestal 25 is formed with an axial bore 76'', the upper extremity of which carries a tube 77 that is received within an enlarged bore 78 formed in the cap 53. Lubricant introduced into the bore 76 thus is directed above the cap 53 and to the rollers of bearing 59, and thence downwardly to the outer series of bearing rollers 62. The lubricant from the tube 77 also flows downwardly through the bore 78 and is directed to the inner row of rollers 49 and from thence downwardly between the pedestal 25 and the annular mounting member 38 to be received within the chamber 66'. The lubricant from the bearing rollers 62 passes downwardly and exteriorly of the annular mounting member 38 to lubricate the X-type bearing 39 and, from bearing 39, passes into the chamber 66'.

Supplemental lubricant may be supplied to the chamber 66' by conventional mechanism indicated at 79, and gauge mechanism 80 may also be provided as well as a drain pipe 81.

In operation, the rotation of the drive pinion 67 drives the ring gear 37 to rotate the annular mounting member 38, eccentric bearing sleeve 44 and cap 53. Rotation of the eccentric bearing sleeve 44 produces a gyrating motion of the cone 26 in a horizontal plane, this motion causing the cone 26 to revolve slowly as it engages the material that descends from the hopper 17 between the inner and outer liners 29 and 21, respectively. It will be seen that the bearing structure and driving mechanism is such that the forces developed during such operation will be effectively transmitted to the pedestal 25 without subjecting the bearing elements to injurious loading. The eccentric bearing sleeve 44 comprises the middle race of a duplex radial roller bearing that is the principal actuating element of the entire crusher machine. Its rotation causes the cone head 26 to gyrate, and the forces transmitted to the pedestal through the bearings will be transmitted in directions perpendicular to the axes of the roller bearings, thus resulting in an optimum condition of operation.

While the invention has been described with specific reference to the accompanying drawings, it is not to be limited save as defined in the appended claims.

I claim:

1. Crushing mechanism comprising a casing, an outer crushing member fixed to the casing, an inner crushing member, an annular mounting unit, means including an X-ray bearing to mount the annular mounting unit on the casing coaxially of the outer crushing member to accept thrust in all directions parallel to the axis of the outer crushing member and in all directions normal thereto, means to rotate the annular mounting member, and eccentric means forming part of the annular mounting unit to mount the inner crushing member whereby upon rotation of the annular mounting member the inner crushing member is caused to gyrate about the axis of the outer crushing member.

2. Crushing mechanism, comprising a casing, an outer crushing member fixed to the casing, an inner crushing member, a mounting pedestal on the casing coaxially of the outer member, an eccentric bearing sleeve between the pedestal and the inner member, means to rotate the sleeve, an annular mounting member, means to secure the bottom of the eccentric bearing sleeve to the annular mounting member, bearing means to mount the annular mounting member on the casing, a cap secured to the top of the eccentric bearing sleeve, and a thrust bearing between the cap and inner crushing member to accept thrust axially of the annular mounting member.

3. Crushing mechanism, comprising a casing, an outer crushing member affixed to the casing, an inner crushing member, a mounting pedestal on the casing coaxially of the outer member, an eccentric bearing sleeve between the pedestal and the inner member, means to rotate the sleeve, an annular mounting member, means securing the eccentric sleeve to the annular mounting member, bearing means to mount the annular mounting member on the casing comprising surfaces to accept forces in directions both normal and parallel to the axis of the pedestal, and an X-type bearing to mount the annular mounting ring on the casing.

4. Crushing mechanism, comprising a casing, an outer crushing member fixed to the casing, an inner crushing member, a mounting pedestal on the casing coaxially of the outer member, an eccentric bearing sleeve between the pedestal and the inner member, means to rotate the sleeve, an annular mounting member, means to secure the bottom of the eccentric bearing sleeve to the annular mounting member, bearing means to mount the annular mounting member on the casing, a cap secured to the top of the eccentric bearing sleeve, and a thrust bearing between the cap and inner member to accept thrust axially of the annular mounting member, said means to rotate the eccentric bearing sleeve comprising a ring gear on the bottom of the annular mounting member, and a driving pinion and drive shaft journaled in the casing and engaging the ring gear.

5. Crushing mechanism, comprising a casing, an outer crushing member fixed to the casing, an inner crushing member, a mounting pedestal on the casing coaxially of the outer member, an eccentric bearing sleeve between the pedestal and the inner member, means to rotate the sleeve, sealing means between the inner member and the casing comprising opposing annular surfaces on the inner member and the casing respectively, an eccentric walled skirt between the opposed surfaces having an eccentricity neutralizing the eccentricity of the eccentric bearing sleeve, and ring seals between the skirt and the opposed surfaces.

6. Crushing mechanism, according to claim 5, wherein means is provided to supply lubricant to the eccentric bearing sleeve.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,829,842 April 8, 1958

William Messinger

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 71, for "X-ray" read --X-type--.

Signed and sealed this 6th day of May 1958.

(SEAL)
Attest:
KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents