United States Patent [19]

Gillette

[11] **3,790,095**

[45] **Feb. 5, 1974**

[54] **PULVERIZER WITH SATELLITE SPACER ASSEMBLY**

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[52] **U.S. Cl.** **241/103,** 241/107, 241/117

[51] **Int. Cl.** **B02c 15/04**

[58] **Field of Search** 241/103, 110, 107, 117, 121

[56] **References Cited**

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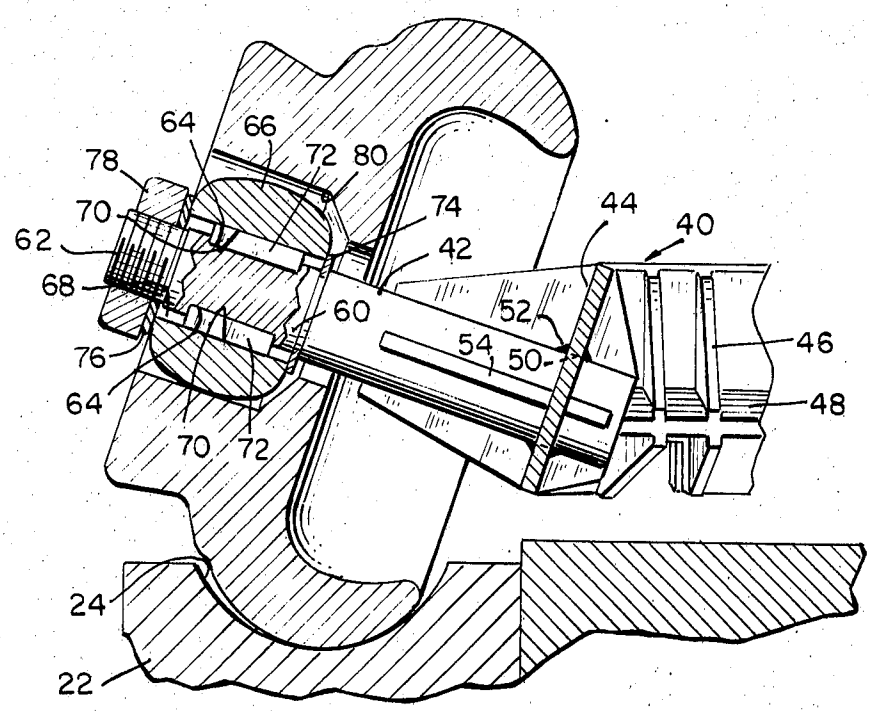
[57] **ABSTRACT**

Apparatus is provided for pulverizing raw coal feed stock into comminuted particles which can be conveyed to the combustion chamber of a furnace. A satellite spacer assembly is positioned above the pulverizer table and mounted on the pulverizer rollers such that the rollers are separated from each other to prevent skidding.

4 Claims, 3 Drawing Figures



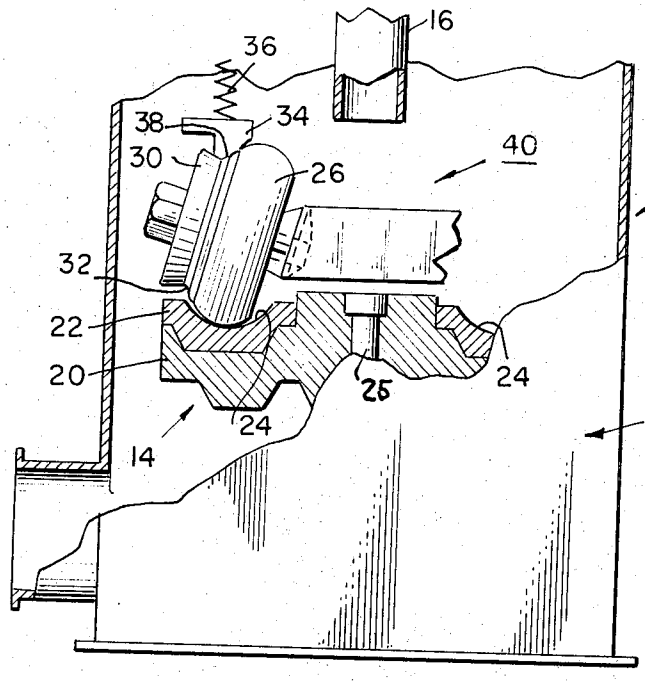

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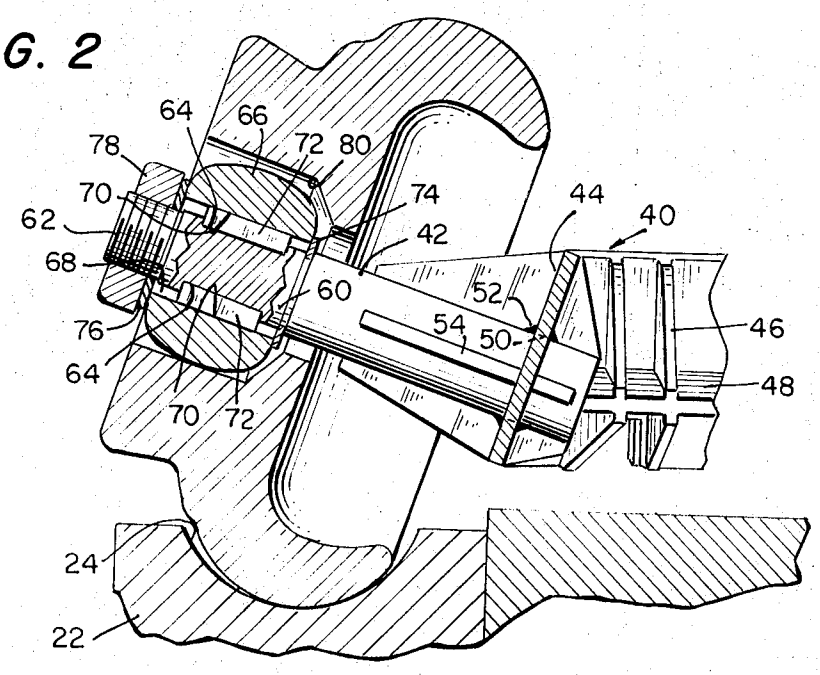
FIG. 1

FIG. 2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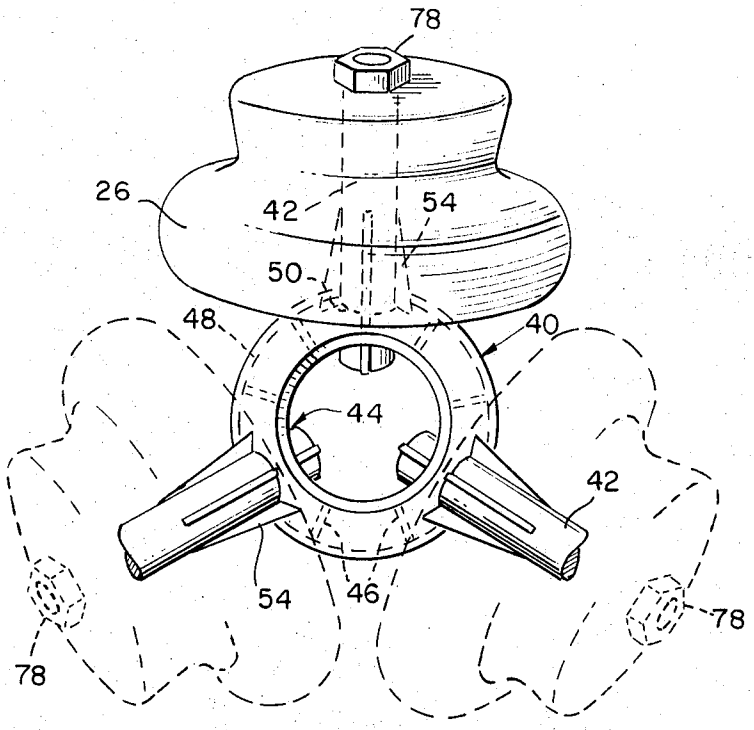

FIG. 3

PULVERIZER WITH SATELLITE SPACER ASSEMBLY

BACKGROUND OF THE INVENTION

In connection with the operation of relatively large coal fired furnaces which are used in vapor generating systems in the utility industry for production of electricity, it is necessary to supply finely powdered coal to the combustion chamber of the furnace. The raw coal feed stock is usually reduced to comminuted particles in a pulverizer apparatus which generally consists of a rotating grinding table on which there is formed a grinding surface, and relatively heavy rollers are journaled within the apparatus and maintained in contact with the grinding surface by a thrust ring.

There has recently developed a major problem in connection with the pulverizing of coal feed stocks containing particles which cannot easily be pulverized by the apparatus, such as iron pyrite and the like. These relatively hard constituents are more commonly found in many types of coal which are being mined today. The hard particles often prevent the pulverizing apparatus from functioning efficiently, in that skidding action is translated to the rollers. In accordance with the present invention, skidding of the rollers has been alleviated by providing a satellite spacer assembly with radially extending, fixed shafts for rotatably mounting the pulverizer rollers.

By eliminating the vertical center shaft structure which heretofore has been used for mounting roller spacer devices, it is possible to have the entire center of the pulverizer open for coal flow without any major obstruction thereto. This also results in eliminating the obstruction to the coal flow around the grinding surfaces. The elimination of the center support for the spacer means results in a pulverizer structure having a much simpler design than heretofore has been possible, thereby achieving better performance and easier maintenance. Further, the satellite spacer of the present invention has only one major wear part, which is the spherical bearing block that can easily be removed for replacement purposes. Also, there is less frictional drag on the pulverizer rollers by providing a satellite spacer having individual shafts for rotatably mounting the rollers. A still further advantage is achieved by inhibiting grinding roller yaw or the swing about the vertical axis of the pulverizer. The instant invention also results in better capacity for the pulverizer through better air flow by removal of the center obstructions. This better air flow lowers the retention time of particles on the grinding table thereby alleviating one of the major causes of pulverizer skidding.

SUMMARY OF THE INVENTION

In accordance with an illustrative embodiment demonstrating features and advantages of the present invention, there is provided an apparatus for pulverizing material into comminuted particles including a housing and a table having a grinding surface mounted in the housing for rotation. Means are provided for rotating the table and for introducing the material into the housing in contact with the grinding surface. A plurality of rollers are mounted for rotation about their respective axes and each of the rollers has a peripheral grinding face maintained in contact with the grinding surface, and a thrust ring is mounted in contact with the rollers.

Positioned above the table is a spacer center yoke spaced apart from the table and a plurality of shafts fixed to the center yoke which radially extend outwardly for supporting the center yoke and rotatably mounting the rollers. In this manner, the rollers are separated from each other and are prevented from skidding.

BRIEF DESCRIPTION OF THE DRAWINGS

The above brief description as well as further objects, features, and advantages of the present invention will be more fully appreciated by referring to the following description of a presently preferred but nonetheless illustrative embodiment in accordance with the present invention when taken in connection with the accompanying drawings, wherein:

FIG. 1 is a front sectional view of a portion of a pulverizing apparatus embodying features of the present invention;

FIG. 2 is an enlarged sectional view of part of the satellite spacer assembly, showing an enlarged portion of the spacer hub; and

FIG. 3 is an enlarged plan view of the rollers and satellite spacer assembly to better show the mounting arrangement for the pulverizer rollers.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a pulverizing apparatus is shown which is generally designated by the reference numeral **10.** The pulverizing apparatus **10** includes a steel housing **12** which is mounted at ground level for enclosing a rotatably mounted grinding unit **14.** Raw coal feed stock is introduced into the housing **12** through a conduit system **16** which is generally positioned above the grinding unit **14.**

The grinding unit **14** includes a table **20** on which there is mounted a removable grinding ring **22** formed with an annular groove **24.** The table **20** is mounted for rotation on a support shaft **25** and is powered by an electric motor which has not been shown in the drawings for the sake of simplicity.

A plurality of spaced-apart pulverizingg rollers **26,** preferably three in number, are mounted for rotation about their respective axes. Each of the rollers **26** has a peripheral grinding face which is maintained in contact with the outer grinding surface of annular groove **24.** The rollers **26** are also formed with a bearing collar **30** which has an annular groove **32.** A thrust ring **34** is mounted in housing **12** above the pulverizing rollers **26,** and load is applied by means of compression springs **36.** The thrust ring **34** is integrally formed with an annular lip **38** which is configurated in accordance with the outer periphery of annular groove **32** in order to achieve smooth mating contact.

In accordance with the present invention, a satellite spacer assembly **40** is positioned above the grinding ring **22** by means of radially extending shafts **42** on which the rollers **26** are rotatably mounted. The satellite spacer assembly **40** includes an annular yoke section **44** having vertically oriented supports **46** which are integrally formed with a horizontally positioned support ring plate **48.** As best shown in FIGS. **2** and **3,** yoke section **44** is formed with through bores **50** for receiving the shafts **42** which are maintained in a fixed position by the welds **52** and gusset plates **54.** It should be noted that the yoke section **44** is formed with a frus-

toconical configuration for the purpose of mounting the shafts **42** at an acute angle to the vertical, central axis of the yoke section **44**. Also, this frustoconical configuration allows for the location of the supports **46** and **48** along the inner surface of the yoke section **44** for improved structural strength, as well as minimizing the obstructions in the center of the pulverizing apparatus **10**, thereby obtaining a more efficient flow of pulverized coal and air.

As best shown in FIG. **2**, the outer end of shaft **42** is formed with a reduced diameter section **60** which is integrally formed with stepped-down threaded end section **62**. The reduced diameter section **60** is provided with a pair of outer keyway slots **64**, and each of the outer keyway slots **64** is positioned approximately **180** degrees apart along the circumference of shaft **42**. A spherical bearing block **66**, having an internal central bore **68**, is formed with a pair of inner keyway slots **70** for mounting bearing block **66** on shaft **42**, such that the inner keyway slots **70** overlie the outer keyway slots **64** in a coextensive position. Thus, a pair of key bars **72** can be mounted in the outer keyway slots **64**, and the inner keyway slots **70** can be slid along the key bars **72** for mounting the bearing block **66** on shaft **42**. The bearing block **66** is axially positioned along shaft **42** by means of a shim washer **74**, and is secured with a thrust washer **76** which is compressed by a threaded nut **78** that is screwed onto the end section **62**.

Each of the pulverizer rollers **26** is fabricated with an internal central bearing surface **80** for receiving each of the bearing blocks **66**, such that the satellite spacer assembly **40** is supported on the rollers **26** which are in turn rotatably mounted on the shafts **42**. As shown in FIG. **2**, central bearing surface **80** is oversized, such that the bearing block **66** can be freely mounted in the bearing surface **80**. Thus, it can be appreciated that the bearing block **66** can easily be removed for the purpose of replacement as well as reversing the bearing block **66**, such that the outer end of bearing block **66** contacts the shim washer **74**. This reversing procedure increases the life of the bearing block through obtaining uniform wear.

In the operation of the pulverizing apparatus **10**, the satellite spacer assembly **40** affords a means for supporting the shafts **42** on which the rollers **26** are rotatably mounted. In this manner, rollers **26** are separated from each other and are centrally guided around the annular groove **24**. The satellite spacer assembly **40** thereby provides superior guidance for the rollers **26** with minimum drag, which accounts for reduced yaw of the rollers **26** about the shafts **42**, as well as reduced skidding of the rollers **26**.

A latitude of modification, change and substitution is intended in the foregoing disclosure and in some instances some features of the invention will be employed without a corresponding use of other features. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the spirit and scope of the invention herein.

What is claimed is:

1. Apparatus for pulverizing material into comminuted particles comprising a housing, a table having a grinding surface mounted in said housing for rotation, means for rotating said table, means for introducing said material into said housing in contact with said grinding surface, a plurality of rollers mounted for rotation about their respective axes and each of the rollers having a peripheral grinding face maintained in contact with said table, and spacer means positioned above said table including a center yoke formed with a central opening and spaced apart from said table and a plurality of shafts fixed to said center yoke which radially extend outward for rotatably mounting said rollers and supporting said center yoke on said rollers, said center yoke formed in the shape of an annulus, and said shafts mounted along the outer periphery of said annulus, and external bearing means keyed to the ends of said shafts and said rollers formed with an internal bearing surface for receiving said external bearing means, such that said rollers are separated from each other and said rollers are prevent from skidding.

2. Apparatus for pulverizing material into comminuted particles according to claim **1**, in which said annulus is formed with a frustoconical configuration such that said shafts are capable of being mounted at an acute angle to the vertical axis of said center yoke.

3. Apparatus for pulverizing material into comminuted particles according to claim **1**, in which said bearing means are formed with a spherical external configuration and said internal bearing surface is cylindrically shaped and sized for rotatably mounting said rollers.

4. Apparatus for pulverizing material into comminuted particles according to claim **1**, in which the ends of said shafts are formed with a reduced diameter section, external threads are formed on the outer extremity of said reduced diameter sections, and internally threaded nuts are threadably engaged with said external threads for removably securing said bearing means to said shafts.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,790,095 Dated February 5, 1974

Inventor(s) Robert Paul Gillette

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet insert -- [73] Assignee: Foster Wheeler Corporation, Livingston, New Jersey --.

Signed and sealed this 14th day of January 1975.

(SEAL)
Attest:

McCOY M. GIBSON JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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