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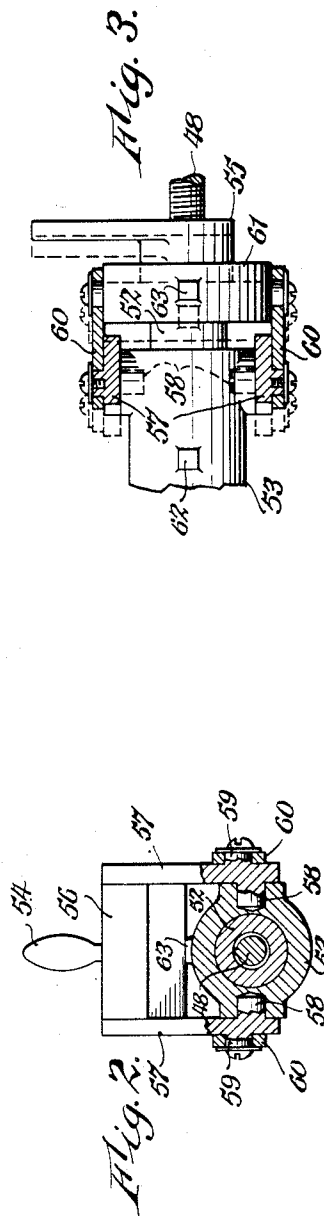
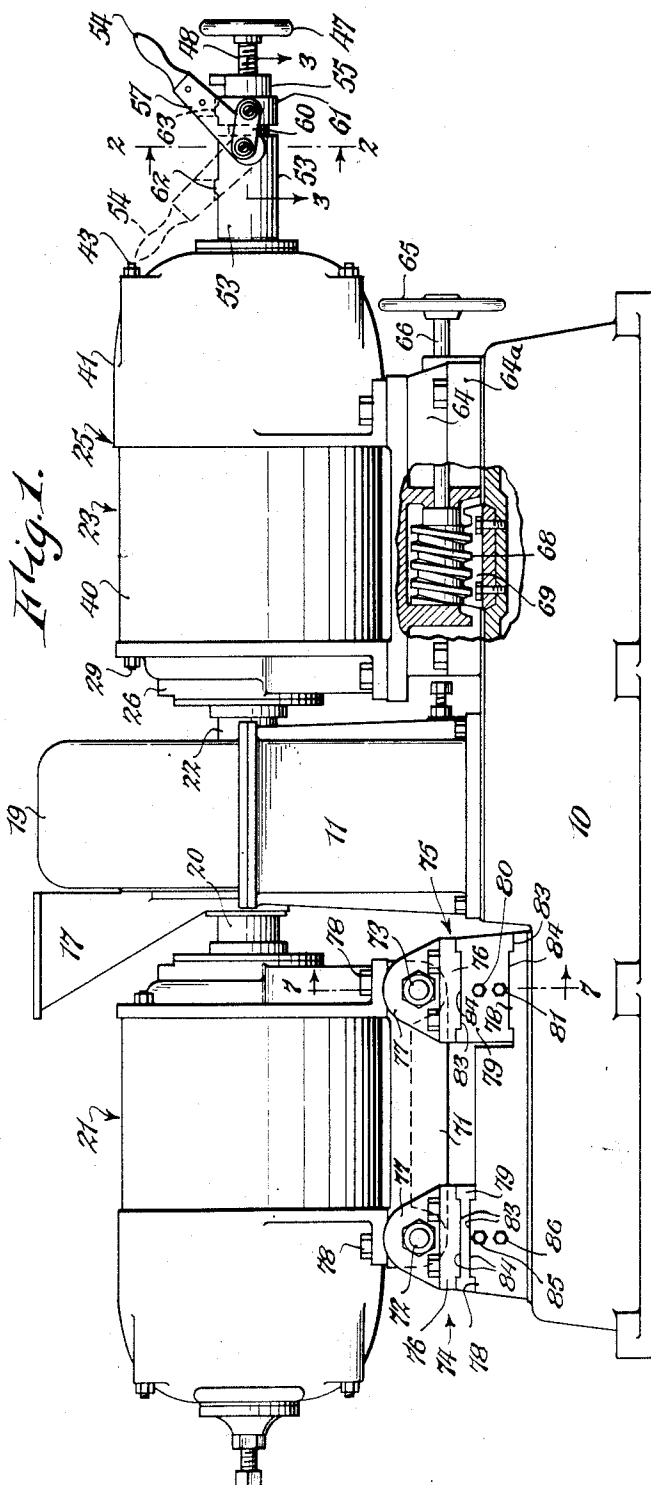
C. R. DIMM ET AL

2,216,611

ELECTRIC DRIVING MOTOR FOR ATTRITION MILLS

Filed March 3, 1938

3 Sheets-Sheet 1



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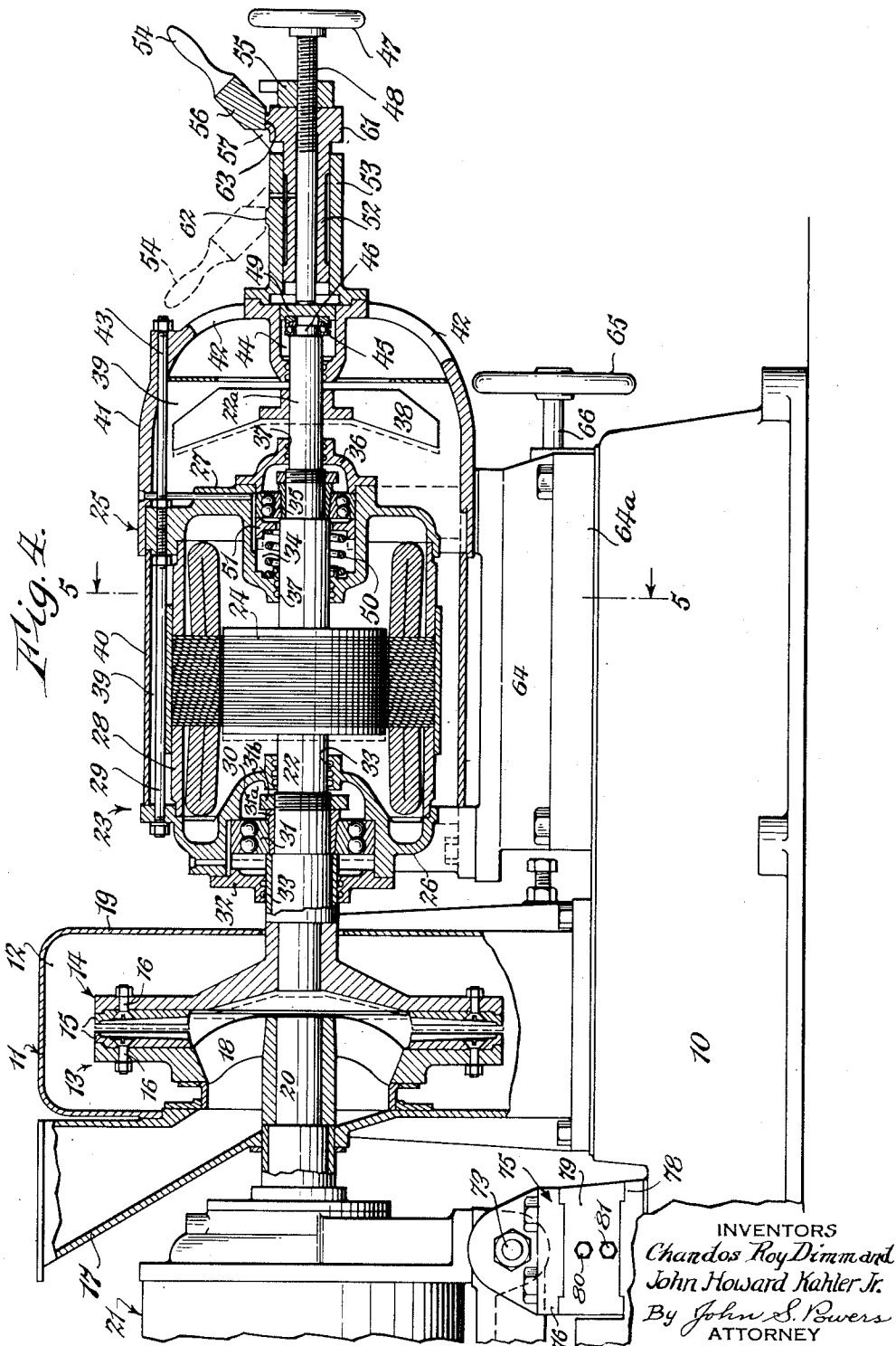
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Fig. 6.

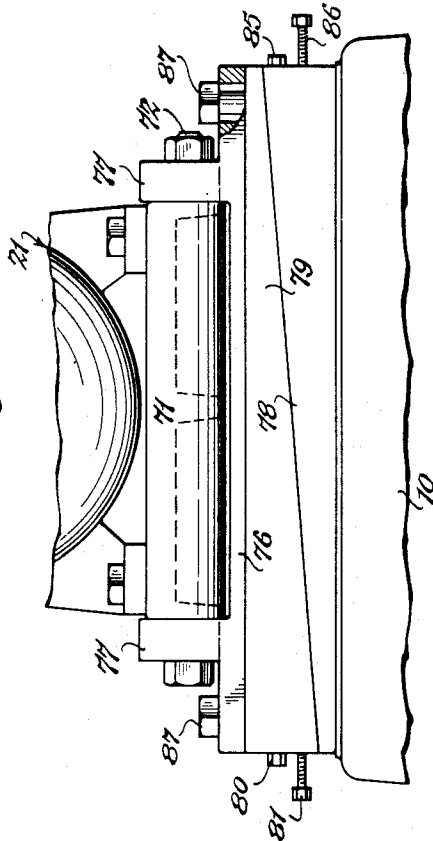


Fig. 7.

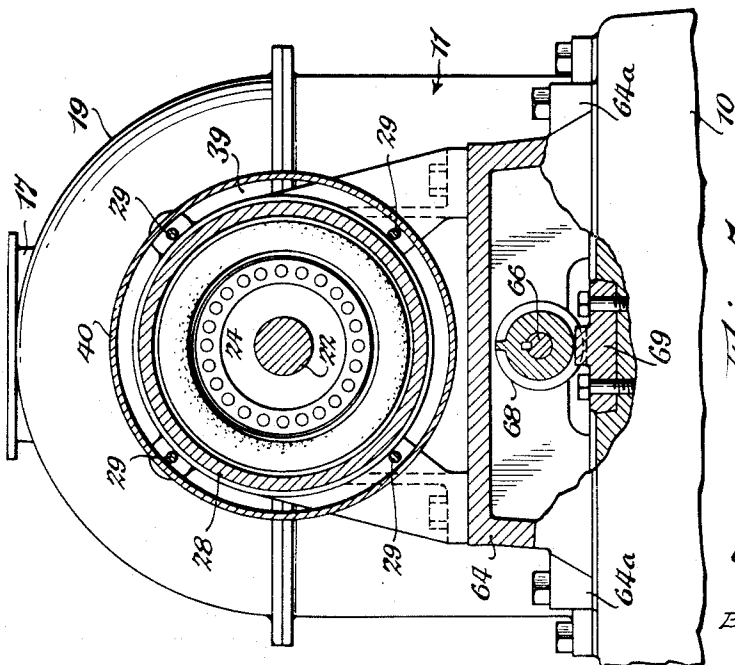
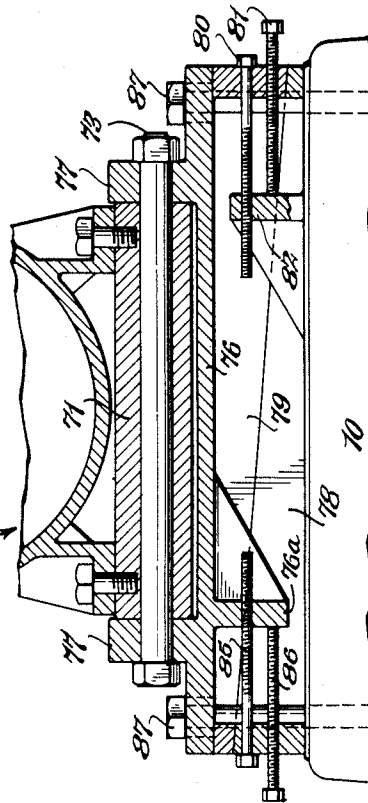


Fig. 5.

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ELECTRIC DRIVING MOTOR FOR ATTRITION MILLS

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Application March 3, 1938, Serial No. 193,692

7 Claims. (Cl. 172—36)

This invention relates to attrition mills and more particularly to a mill of the kind wherein cooperating grinding members are rotated in opposite directions by individual motors, the rotors of which are fixed to the drive shafts which carry the said members.

Heretofore, in mills of this type, it has been the practice to mount the drive shafts in bearing pedestals which are located at opposite sides of the motors, there being independent mountings provided for the housings of the motors. Such a mill has the objection that there is a tendency, owing primarily to the distance between the bearings, for the shafts to whip. This relative movement between the shafts and the motor housings and that occasioned by the adjustment of the shafts to align the grinding members renders it difficult, if not impossible, to seal the motors in such a manner as to exclude dust and other foreign materials. Apart from injury to the motor, and the attendant possibility of fire, when such materials accumulate upon the motor parts, there is, of course, the hazard of ignition of an explosive atmosphere in the vicinity.

The principal object of the present invention is to overcome the above objections, this object contemplating a mill in which the drive shafts for the grinding members are built in, and are permanent parts of, the motors.

A further object is to provide for facility in adjusting the drive shafts to align the grinding members and to provide the proper clearance between them.

A still further object is a novel design and arrangement of the parts of the mill, whereby simplicity and economy in construction are obtained.

The invention is illustrated in the accompanying drawings in which:

Figure 1 is a side elevation of a mill embodying the features of the invention.

Figure 2 is an enlarged section taken along line 2—2 of Figure 1.

Figure 3 is an enlarged section taken along line 3—3 of Figure 1.

Figure 4 is an enlarged view partially in section, of one end of the mill.

Figure 5 is a section taken along line 5—5 of Figure 4.

Figure 6 is a fragmentary view and shows one of the two tramming devices which are employed in aligning the drive shafts of the grinding members.

Figure 7 is a section through the other of the said tramming devices and is taken along line 7—7 of Figure 1.

The various parts of the mill which is illustrated are mounted upon a base 10 and include a centrally located casing 11. The latter provides a chamber 12 (Figure 4) in which oppositely rotatable grinding members 13 and 14 are arranged, the working faces being provided by discs 15 which are removably secured to the said members by bolt-and-nut fastenings 16. The material to be ground is introduced into a hopper 17. It passes through an opening 18 which is formed in the grinding member 13 and is reduced to the desired grade as it moves outwardly between the latter and the grinding member 14, access to the said members being provided by a removable hood 19. The grinding member 13 is fixed to and is driven by the shaft 20 of a motor 21 while the co-operating member 14 is fixed to and is driven by the shaft 22 of a motor 23, the rotors of the said motors being indicated at 24 and being carried by the said shafts.

In accordance with the invention the drive shafts 20 and 22 are mounted in the motor housings as permanent parts of the motors, the housing of the motor 23 being indicated at 25 and including heads 26 and 27 (Figure 4) which are secured over the ends of an inner casing 28 by tie-bolts 29. The head 26 is formed to provide a chamber 30 for accommodating an anti-friction bearing 31. The inner race-member of the latter fits over a tapered sleeve 31a, the said race-member and sleeve being secured to the shaft 22 against angular movement by a nut 31b. The chamber 30 is closed by a cap-piece 32 and is sealed by a suitable medium which is introduced into annular grooves 33 formed in the latter and the head 26. The head 27 is formed to provide a chamber 34 for accommodating an anti-friction bearing 35 which is secured to the other journal of the shaft 22 in substantially the same manner as the bearing 31. The chamber 34 is closed by a cap-piece 36 and is sealed by a suitable medium which is introduced into annular grooves 37 formed in the latter and the head 27.

The motor 23 is cooled by a fan 38 which is mounted upon an extension 22a of the shaft 22 and which is operative to force air through an annular passage 39 provided between the inner casing 28 and an outer casing 40. An end cover 41 having air inlet openings 42 formed therein fits over the said fan. It is secured to the head 27 by tie-bolts 43 and is formed with a chamber 44 for accommodating an anti-friction bearing 45 which is adapted to take up end thrust from the shaft 22, the terminal portion of the extension 22a.

sion 22a of the said shaft having a neck 46 around which the said bearing fits.

Means is provided for adjusting the grinding member 14 in order that the materials to be ground may be reduced to the desired grade. The said means includes a handwheel 47 which is carried by a threaded rod 48, the inner end of which abuts a disc 49. When the handwheel 47 is rotated in a clockwise direction it is operative through the agency of the rod 48, disc 49, thrust bearing 45 and shaft 22 to effect movement of the grinding member 14 toward the member 13, the chambers 30 and 34 being elongated to permit the bearings 31 and 35 to move with the shaft. On the other hand when the said handwheel is rotated in a counter-clockwise direction it is operative to move the rod 48 in an opposite direction to permit a spring 50 which is arranged in the chamber 34 behind a follower 51 to move the grinding member 14 away from the member 13, the movement of the follower being transmitted to the shaft through the agency of the bearing 35.

The rod 48 is carried by a sleeve 52. The latter is arranged for axial movement in the holder 53 which is mounted upon the end cover 41. The sleeve 52 is normally locked in a forward, or operative, position by a lever 54 and when locked in such position the rod 48 is operative to maintain the grinding member 14 in co-operating relation with respect to the member 13. Such relation may be varied as circumstances may require by adjustment of the handwheel 47 in the manner described, a nut 55 which is carried by the rod 48 being available to lock the said rod in its various positions of adjustment. The lever 54, however, is operative to retract the rod 48 and permit the spring 50 to move the grinding member 14 to the full-line position shown in Figure 4. For this purpose the said lever is connected by a cross-bar 56 (Figure 2) to a pair of arms 57 which are pivotally connected by pins 58 to the holder 53. The said arms carry eccentrically located pins 59 and are connected by the latter and links 60 to the head 61 of the sleeve 52. When the lever 54 occupies the dotted-line position shown in Figures 1 and 4 (which position corresponds to the operative position of the sleeve 52) the centers of the pins 59 lie in a plane slightly below a horizontal line through the centers of the pins 58. The lever, therefore, is self-locking in this position, the cross-bar 56 resting upon a stop 62 which is formed upon the holder 53. When it is desired to effect quick release of the grinding member 14, the lever 54 is moved to the full-line position, in which position the cross-bar 56 rests upon a stop 63 formed upon the head of the sleeve 52. As the lever is moved to this position the links 60 are operative to retract the said sleeve, thereby to permit the spring 50 to cause the shaft 22 to follow the rod 48 and thus move the grinding member 14 away from the member 13.

The motor 23 is mounted upon a carriage 64. The latter is movable along a guideway provided by rails 64a to effect separation of the grinding members 13 and 14 a distance which will enable the discs 15 to be removed and replaced when they break or become so worn as to be unsuitable for further use. Movement of the carriage 64 for the purpose described is accomplished by a handwheel 65 which is carried by a shaft 66. The said shaft is mounted lengthwise of the carriage and carries a worm gear 68 (Figure 1), the said gear meshing with a rack 69 which is secured to the base 10.

The motor 21 is similar to the motor 23. As the grinding member 13 always operates in substantially the same vertical plane, there is, of course, no necessity for providing for axial adjustment of the shaft 20. Provision is made, however, for adjusting the grinding member 13 so that the disc 15 which it carries may be caused to rotate in a plane parallel to that of the disc carried by the member 14. To this end the motor 21 is secured to a flanged plate 71 which is mounted upon transversely extending rods 72 and 73 of tramming devices 74 and 75, respectively. The said devices are similar although oppositely arranged. Each includes a bar 76 which is formed or provided with ears 77 for mounting one of the rods 72 and 73, the said bar being supported in a horizontal position by co-operating wedges 78 and 79 (Figure 7). The former is secured to the base 10. The latter may be adjusted lengthwise by screws 80 and 81 which it carries and which engage a base projection 82, whereby to raise or lower the rod 72 or 73, as the case may be.

It will be apparent that the use of two tramming devices in the manner described has the advantage that either end of the motor may be raised or lowered with respect to the other or both ends may be raised or lowered to the same degree, the plate 71 rocking upon the rods 72 and 73 to permit relative vertical movement between the bars 76. In this connection it will be noted that the bars and wedges of the tramming devices are ribbed as at 83 and grooved as at 84 so as to permit free movement of the wedges 79 transversely of the base 10 while preventing movement in a longitudinal direction. In order to enable the motor 21 to be shifted bodily in a horizontal plane each of the bars 76 is preferably formed or provided with a depending projection 76a (Figure 7) which is engaged by screws 85 and 86. The said screws are carried by the fixed wedges 78 and are adjustable to move the motor 21 in a direction transverse of the length of the base 10. The bars and wedges are secured in the positions to which they are adjusted by bolts 87 which, of course, are loosened prior to such adjustments. The bolts 87 screw into threaded sockets formed in the base 10, the holes which are provided in the said bars for the bolts being large enough to permit adjustment of the bars in the manner described.

From the foregoing it will be apparent that the drive shafts for the grinding members are permanent parts of the motors and are mounted in such a manner that whipping is prevented. At the same time provision is made for the necessary axial adjustments of the drive shafts. The sealing of the motors in the manner described is, therefore, effective and permanent. Hence the mill has the advantage that it may be operated under such conditions as exist, for example, in a flour mill. In such an environment accumulation of dust and other fine particles upon the parts of the motors is prevented as is the ignition of an explosive atmosphere in the vicinity, whereby injury to individuals or the motors or overheating of the latter, with the attendant danger of fire, are avoided. The mill has the further advantage that the grinding members may be adjusted with facility as occasion may require.

We claim as our invention:

1. An electric driving motor for an attrition mill comprising a housing in which a rotor and stator are arranged, an axially adjustable shaft which carries said rotor and to which a grinding member is adapted to be secured, said housing

having heads in which bearings for the journals of said shaft are mounted, a cover carried by said housing in spaced relation with respect to one of said heads, said cover having an air inlet, a fan fixed to said shaft and enclosed by said cover for said cooling motor, and means mounted upon said cover for axially adjusting said shaft, whereby to enable the clearance between said grinding member and a companion member to be varied.

2. An explosion-proof electric driving motor for an attrition mill comprising a housing, said housing having an inner shell in which a rotor and stator are arranged, an axially adjustable shaft which carries said rotor and to which a grinding member is adapted to be secured, heads which close the ends of said inner shell to exclude dust, bearings in said heads in which the journals of said shaft are mounted, an outer shell which surrounds the inner shell and which co-operates with the latter to provide a passage, a cover carried by said housing in spaced relation with respect to one of said heads, said cover having an air inlet, a fan fixed to said shaft and enclosed by said cover for forcing air through said passage to cool said motor and means carried by said cover for axially adjusting said shaft, whereby to enable the clearance between said grinding member and a companion member to be varied.

3. An explosion-proof electric driving motor for an attrition mill comprising a housing, said housing having an inner shell in which a rotor and stator are arranged, an axially adjustable shaft which carries said rotor and to which a grinding member is adapted to be secured, heads which close the ends of said inner shell to exclude dust, bearings in said heads in which the journals of said shaft are mounted, an outer shell which surrounds the inner shell and which co-operates with the latter to provide a passage, a cover carried by said housing in spaced relation with respect to one of said heads, said cover having an air inlet, a fan fixed to said shaft and enclosed by said cover for forcing air through said passage to cool said motor, an adjustable bearing carried by said cover for taking up end thrust of said shaft and means carried by said cover for axially adjusting said shaft, whereby to enable the clearance between said grinding member and a companion member to be varied.

4. An explosion-proof electric driving motor for an attrition mill comprising a housing, said housing having an inner shell in which a rotor and stator are arranged, an axially adjustable shaft which carries said rotor and to which a grinding member is adapted to be secured, heads which close the ends of said inner shell to exclude dust, anti-friction bearings in said heads in which the journals of said shaft are mounted, the inner race members of said bearings being fixed to said journals while the outer race members are slidably supported by said heads, an outer shell which surrounds the inner shell and which cooperates with the latter to provide a passage, a cover carried by said housing in spaced relation with respect to one of said heads, said cover having an air inlet, a fan fixed to said shaft and enclosed by

said cover for forcing air through said passage to cool said motor and means carried by said cover for axially adjusting said shaft, whereby to enable the clearance between said grinding member and a companion member to be varied.

5. An explosion-proof electric driving motor for an attrition mill comprising a housing, said housing having an inner shell in which a rotor and stator are arranged, an axially adjustable shaft which carries said rotor and to which a grinding member is adapted to be secured, heads which close the ends of said inner shell to exclude dust, bearings in said heads in which the journals of said shaft are mounted, an outer shell which surrounds the inner shell and which co-operates with the latter to provide a passage, a cover carried by said housing in spaced relation with respect to one of said heads, said cover having an air inlet, a fan fixed to said shaft and enclosed by said cover for forcing air through said passage to cool said motor, an adjustable bearing carried by said cover for taking up end thrust of said shaft and means mounted upon said cover and including said bearing for axially adjusting said shaft to vary the clearance between said grinding member and a companion member.

6. An explosion-proof electric driving motor for an attrition mill comprising a housing, said housing having an inner shell in which a rotor and stator are arranged, an axially adjustable shaft which carries said rotor and to which a grinding member is adapted to be secured, heads which close the ends of said inner shell to exclude dust, bearings in said heads in which the journals of said shaft are mounted, an outer shell which surrounds the inner shell and which co-operates with the latter to provide a passage, a cover carried by said housing in spaced relation with respect to one of said heads, said cover having an air inlet, a fan fixed to said shaft and enclosed by said cover for forcing air through said passage to cool said motor, an adjustable bearing carried by said cover for taking up end thrust of said shaft, means mounted upon said cover for axially adjusting said shaft to vary the clearance between said grinding member and a companion member and resilient means acting against one of said first mentioned bearings for holding said shaft against said thrust bearing.

7. An explosion-proof electric driving motor for an attrition mill comprising a sealed housing in which a rotor and stator are arranged, an axially adjustable shaft which carries said rotor and to which a grinding member is adapted to be secured, bearings in said housing in which the journals of said shaft are mounted and means mounted upon said housing for axially adjusting said shaft to vary the clearance between said grinding member and a companion member, said last named means including an axially adjustable element supported in substantial co-axial relation with respect to said shaft and a bearing located between said shaft and element for transmitting thrust from the former to the latter.

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