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2,544,545

MIXER

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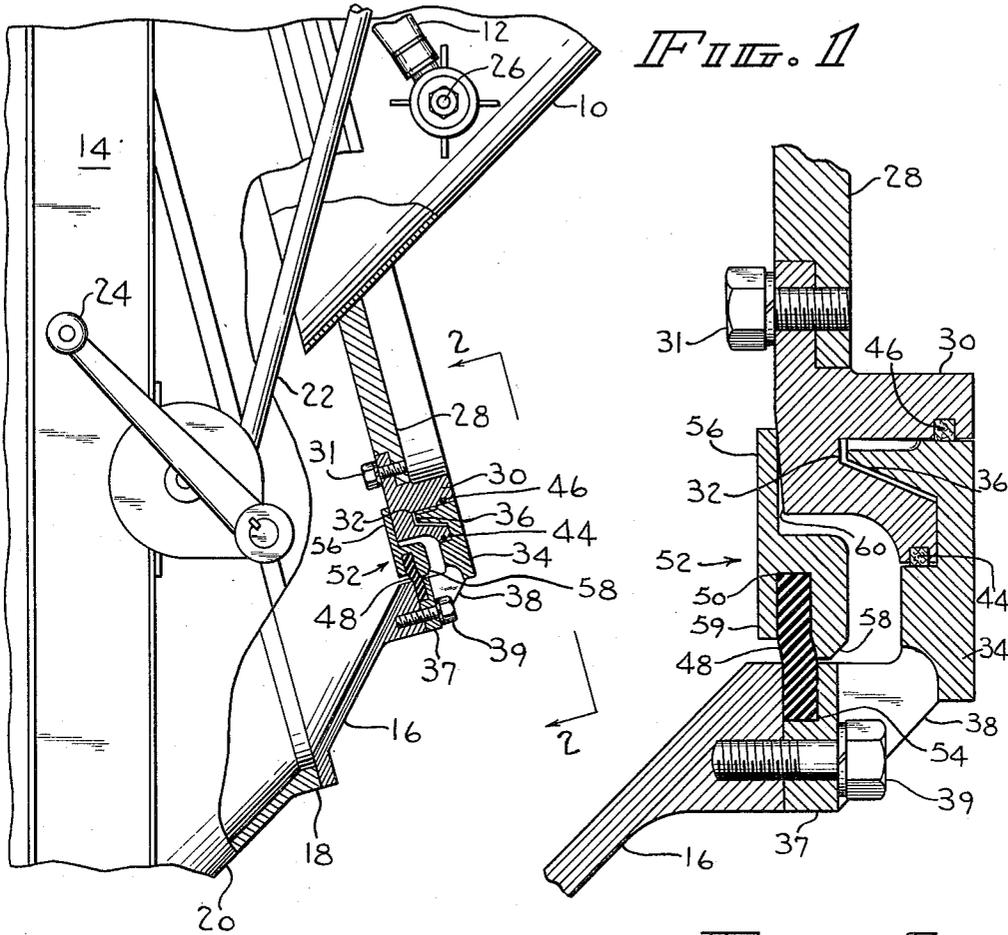


FIG. 1

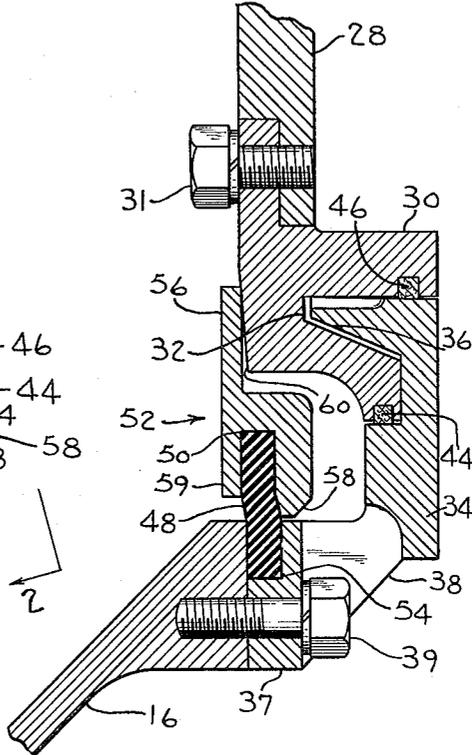


FIG. 3

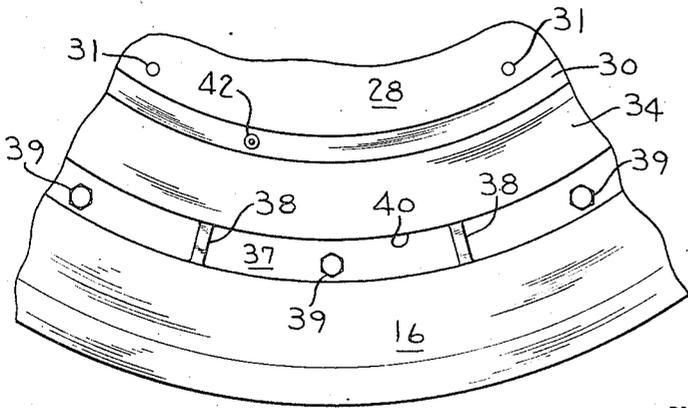


FIG. 2

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2,544,545

MIXER

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9 Claims. (Cl. 259—161)

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This invention relates to concrete mixers of the type having a hopper discharging into the end of a mixing drum as common in truck mixers. More particularly, this invention relates to the arrangement for sealing the bearing between the hopper and the rotatable annular end plate associated with the drum.

Truck mixers generally have a rotatable mixing drum mounted on the frame with the open end or mouth at the rear. The drum is provided with internal mixing elements which may aid charging when the drum rotates in one direction and aid discharging when rotation is reversed, or it may be rotated in the same direction at all times. The majority of truck mixers have a charging hopper which is movable into and out of contact with the drum mouth while others are provided with a hopper carried by the drum and mounted in a bearing so the hopper may be maintained stationary while the drum rotates. In either construction the hopper discharges into the drum centrally of the mixing elements and is, therefore, provided with an annular end plate to close the space between the hopper and the drum. In the first construction mentioned the closure plate is rotatable on a bearing carried by the hopper and seats on the drum mouth for rotation therewith while the other construction employs a plate integral with the drum and having the hopper centrally located therein and mounted in a bearing.

Thus it will be apparent that both constructions have a bearing between the hopper and the end plate. It is obvious that fine particles from the mix or grout in the drum would shortly destroy the bearing, and to prevent damage a seal is generally utilized to prevent direct contact of the mix with the bearing. While any such bearing and seal must be lubricated to render proper service, the problem of providing a single seal of high efficacy and long life has not been satisfactorily solved in the prior art. Indeed, the trend has been toward more complex structures having high initial cost and being expensive and difficult to replace when worn.

The principal object of this invention is to provide a simple sealing arrangement having high efficacy and long life.

Another object is to provide a sealing arrangement which compensates for wear without losing its efficacy.

A further object is to provide a sealing arrangement which relieves pressure on the bearing, thus providing a more free running bearing and adding to bearing life.

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Still another object is to provide a low cost sealing arrangement having high efficacy and long life and being readily replaceable.

Other objects and advantages will be pointed out in, or be apparent from, the specification and claims, as will obvious modifications of the single embodiment shown in the drawings, in which:

Fig. 1 is a fragmentary side elevation of a charging hopper and drum provided with my sealing arrangement and having parts broken away and in section;

Fig. 2 is a view taken on line 2—2 of Fig. 1; and

Fig. 3 is an enlarged sectional view of the bearing and seal shown in Fig. 1.

Referring to the drawings in detail, Figs. 1 to 3 illustrate a charging hopper 10 of the type suspended from and carried by hangers or arms 12 pivoted on the truck frame 14 for moving the rotatably mounted closure or end plate 16 into and out of contact with the drip ring 18 on the mouth of mixing drum 20 in response to movement imparted to the hangers through link 22 by actuation of hand crank 24 or other suitable means. This actuating mechanism does not form a part of this invention but is preferably as shown in my co-pending application Serial No. 58,782. It should be noted, however, that the force seating the closure plate on the drum mouth is applied to the non-rotating hopper by the hangers through a laterally projecting stud 26 on each side of the hopper.

The frusto-conical or dished closure plate 16 is rotatably carried on the hopper by means of a bearing to permit the plate to rotate with the drum when seated thereon. (It will be evident that the end plate could be flat rather than dished.) Thus an annular plate 28 is welded or otherwise secured to hopper 10 and a bearing piece 30 secured to its outer periphery by bolt 31. The outer face of this bearing piece is provided with an annular notch 32 which is adapted to receive a second bearing piece 34 having a complementary tongue 36. This construction, as clearly shown in the drawings, mounts the end plate 16 rotatably on the hopper assembly while providing for limited relative axial movement between the bearing pieces 30 and 34. However, the interfitting tongue and notch construction precludes axial separation of the pieces in one direction, while means to be later described precludes axial separation of the pieces in the opposite direction. The bearing piece 34 is connected by webs 38 to annular mounting piece 37 which is connected to end plate 16 by bolts 39.

This construction provides arcuate openings 40 (Fig. 2) for a purpose to be described hereinafter. Lubricating grease is introduced into the bearing through grease fitting 42 approximately at the base of notch 32 in the stationary bearing member 30. Leather or neoprene annuli 44, 46 may be mounted in the stationary bearing piece to effect a seal tending to retain the grease in the bearing.

As is well known, the bearing between the stationary hopper and the rotating end plate cannot perform satisfactorily unless sealed from the contents of the mixing drum since the fine particles in the mix shortly destroy bearing surfaces. To obtain a highly efficacious seal a neoprene or rubber annulus 48 is stretched until its inner periphery may be fitted into notch 50 in the steel sealing ring 52 where it is retained by the natural resiliency of the material. The outer periphery of the elastic ring 48 is then securely mounted in the groove 54 between end plate 16 and mounting piece 37. As shown more clearly in Fig. 3, the inner face of the bearing piece 30 is provided with an inwardly directed sealing face designed for engagement by the sealing face of the seal ring 52. The inner face of the bearing piece 30 is positioned at a point along the drum axis closer to the drum than the position the seal member would occupy in a normal, unstressed condition of the elastic ring, so that when the parts are engaged as shown in Fig. 3, the inner periphery of the elastic ring 48 is displaced or offset axially towards the drum in respect to the outer periphery of said ring to thereby stress in shear the elastic body of the ring. The elasticity of ring 48 naturally urges ring 52 into contact with the inner face of bearing piece 30 and also precludes axial separation of the bearing pieces in a direction opposite to that previously referred to in respect to the interfitting notch and tongue members 36 and 32. This force is greatly enhanced by providing an annular, radially-extending flange 58 on one face of ring 52 terminating close to the inner surface of mounting piece 37 to place the rubber ring 48 in direct shear. This construction additionally serves to tend to move the ring axially in a bodily fashion, thus reducing the tilting action of the sealing ring. However, there may be some tilting action and for this reason the inner face of stationary bearing 30 may be slightly beveled at 60 (exaggerated in Fig. 3) to obtain a flat seating surface between the sealing ring and the bearing face. Grease is, of course, introduced between these surfaces to provide for freer running and prevent entrance of grout.

Obviously, if grease is not supplied to the seal, grout may work past the seal. If the lubrication is thus neglected, the grout will fall out of arcuate openings 40 and the danger of damage to the bearing is reduced to a minimum. To prevent any such possibilities due to inadequate lubrication, it is preferred that the parts be automatically lubricated as shown in the co-pending Rockburg et al. application Serial No. 64,572.

The elasticity of the assembly will compensate for wearing of the seal with use, thus maintaining high efficacy. At first blush it would appear that the rubber in shear tends to force the bearing surfaces together and increase the bearing load. This is the case only when the end plate is not seated on the drum mouth and the bearing parts are not rotating, thus being of no consequence. When the hopper hangers 12 are swung down to move the end plate into contact

with the drip ring, the force is applied to the stationary parts. Therefore, after initial contact is obtained between the end plate and drip ring, further movement of hangers 12 drives the stationary bearing piece against the sealing ring, thus increasing the shearing force on the rubber and increasing the sealing force while simultaneously relieving bearing pressure to provide a freer running bearing.

The simplicity of this seal as opposed to prior structures will be readily appreciated. The manufacturing cost is low and maintenance is both simple and inexpensive with the components being readily replaceable. For example, the short leg 59 of the notched end of the sealing ring 52 permits the rubber annulus 48 to be readily removed and replaced. While the embodiment shown illustrates my invention applied to the type of charging hopper which is pivoted on arms carried by the frame so that the end plate may be moved into or out of contact with the drip ring on the drum mouth, it will be apparent that this invention permits of ready application to those structures wherein the charging hopper assembly is carried on a shaft extending along the drum axis and on those structures wherein the end plate is integral with the mixing drum and the hopper is rotatably mounted in the center of the drum-carried end plate where it may be retained in a stationary position with the hopper end up for charging or in a stationary position with the open hopper end facing down for discharging since all of these truck mixer structures embody a stationary charging hopper mounted centrally of the end plate.

Obvious modifications will occur to those skilled in the art. For example, the rubber ring 48 may be replaced by other elastic materials such as spring steel (which would be in the form of arcuate segments), etc. The form of the parts may be changed without departing from the spirit of this invention. For these reasons this invention is to be limited only by the scope of the claims.

I claim:

1. A mixer including a mixing drum rotatable about its axis and having an opening in its end, a charging hopper assembly adapted to discharge into said drum centrally of said opening, an end plate adapted for rotation with said drum, bearing means between said hopper assembly and said end plate to permit relative rotation therebetween, said bearing means comprising first and second bearing pieces, said first piece being mounted on said hopper assembly and having an annular surface facing the drum interior, said second piece being carried by said end plate and cooperating with said first piece to retain said hopper assembly and said end plate in assembled relationship, and sealing means between said end plate and said hopper assembly to prevent mix in the drum from contacting said bearing means, said sealing means including, an annular elastic ring having its outer periphery mounted in said end plate, an annular seal mounted on the inner periphery of said ring and contacting said annular surface, said outer periphery of said ring and said annular surface being offset with respect to the drum axis to stress the elastic ring in shear and resiliently maintain said seal in contact with said annular surface, said annular surface being tapered with respect to a plane normal to the drum axis to insure an annular seating surface between the seal and the surface when the seal cocks with respect to a plane normal to said axis due to the shear action on said elastic ring.

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2. A mixer including a mixing drum rotatable about its axis and having an opening in its end, a charging hopper assembly adapted to discharge into said drum centrally of said opening, an end plate adapted for rotation with said drum, bearing means between said hopper assembly and said end plate to permit relative rotation therebetween, said bearing means comprising first and second bearing pieces, said first piece being mounted on said hopper assembly and having an annular surface facing the drum interior, said second piece being carried by said end plate and cooperating with said first piece to retain said hopper assembly and said end plate in assembled relationship, and sealing means between said end plate and said hopper assembly to prevent mix in the drum from contacting said bearing means, said sealing means including, an annular elastic ring having its outer periphery mounted in said end plate, an annular seal mounted on the inner periphery of said ring and contacting said annular surface, said outer periphery of said ring and said annular surface being offset with respect to the drum axis to stress the elastic ring in shear and resiliently maintain said seal in contact with said annular surface, the outer periphery of said seal being in close proximity to the end plate where the elastic ring is mounted so that the shear stress is confined to a small portion of the elastic ring and the tendency of the seal to cock out of normal with respect to the drum axis is minimized, said annular surface being tapered with respect to a plane normal to the drum axis to insure an annular seating surface between the seal and the surface when the seal cocks with respect to a plane normal to said axis due to the shear action on said elastic ring.

3. In a concrete mixer, a mixing drum having an open end, a charging hopper assembly adapted to discharge mix into the drum through said opening, an annular end plate, bearing means mounting said end plate on said hopper assembly for relative rotation thereon and providing relative axial movement between the end plate and the hopper assembly, manually actuated means acting on said hopper assembly for moving said hopper assembly and said end plate axially with respect to said drum from a charging position in which said plate seats on said drum end to a discharging position in which said plate is spaced from said drum end, and means sealing said bearing means from the contents of said drum, said sealing means including an annular member secured to said end plate and extending transversely of the drum axis into sealing engagement with an inwardly facing sealing surface provided on said hopper assembly for transmitting the seating force from said manually actuated means to said end plate.

4. A mixer including a mixing drum having an opening in its end and being rotatable about its axis, a charging hopper assembly, an end plate, means for mounting the end plate for rotation on and for limited axial movement with respect to the hopper assembly including a first bearing member carried by said hopper assembly and having an annular notch facing rearwardly, a second bearing piece mounted on said end plate and having an annular tongue projecting forwardly into said notch, said interfitting annular notch and tongue precluding axial separation of the bearing pieces in one direction, an elastic ring having its outer periphery mounted in said plate, a seal mounted on the inner periphery of said ring and contacting an inwardly facing sealing surface provided on the interior of said hopper as-

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sembly, said inner periphery of said ring being displaced axially towards the drum with respect to the outer periphery thereof to stress said elastic ring in shear, said stressed ring being operative to bias the seal into contact with the sealing surface of the hopper assembly and to preclude axial separation of said bearing pieces in the opposite direction, actuatable means carrying the hopper assembly and being operative to move the hopper carried end plate into and out of contact with the drum end, application of force on said hopper assembly by said actuatable means after the end plate has contacted the drum end being operative to increase the bias on the seal and decrease the bearing pressure.

5. A mixer including a mixing drum mounted for rotation about its axis and having an opening in one end, a charging hopper assembly, an end plate adapted to rotate with the mixing drum, bearing means for mounting the end plate on said hopper assembly for rotation and for relative axial movement with respect thereto and including a first bearing piece carried by said hopper assembly and provided with a rearwardly opening annular notch, a second bearing piece having an annular forwardly facing tongue projecting into said notch, said interfitting notch and tongue precluding axial separation of the bearing pieces in one direction, mounting means for supporting said second bearing piece on said end plate and having an annular series of arcuate openings therein positioned radially outwardly of said annular tongue, an elastic ring having its outer periphery mounted in said plate, a seal mounted on the inner periphery of said ring and contacting an inwardly facing sealing surface provided on said hopper assembly, the inner periphery of said elastic ring being offset axially towards the drum with respect to the outer periphery of the ring to stress the body of the ring in shear and bias the seal into contact with the sealing surface of said hopper assembly, the bias of said elastic ring being operative to resiliently retain said bearing pieces in assembled relationship against axial separation in the opposite direction while maintaining a sealing relationship between said seal and said hopper assembly, said arcuate openings discharging outwardly any material leaking past said seal.

6. A mixer including a mixing drum rotatable about its axis and having an opening in its end, a charging hopper assembly adapted to discharge into said drum centrally of said opening, an end plate adapted for rotation with said drum, bearing means mounting said end plate on said hopper assembly for relative rotation thereon and providing relative axial movement between the hopper assembly and said end plate, said bearing means comprising first and second bearing pieces, said first piece being mounted on said hopper assembly and having an annular sealing surface facing the drum interior, said second piece being carried by said end plate, said bearing pieces including transversely disposed radially overlapping parts cooperating to preclude axial separation of said hopper assembly and said end plate in one direction, and sealing means between said end plate and said hopper assembly to prevent mix in the drum from contacting said bearing means, said sealing means including an annular elastic ring having its outer periphery mounted in said end plate, an annular seal mounted on the inner periphery of said ring and contacting said annular sealing surface, said outer periphery of said ring and said annular sealing surface being offset

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axially with respect to the drum axis to stress the elastic ring in shear to resiliently maintain said seal in contact with said annular sealing surface to preclude axial separation of said hopper assembly and end plate in the opposite direction, said annular seal being provided with an annular radial flange overlying said elastic ring on the face thereof remote from the drum, the outer periphery of said flange terminating in close proximity to the end plate where the elastic ring is mounted so that the shear stress in the ring is confined to a relatively narrow annular portion of the elastic ring and the tendency of the ring to cock out of normal with respect to the drum axis is minimized.

7. A mixer including a rotatable mixing drum having an open end, a charging hopper assembly including an annular end plate, bearing means mounting the end plate on the hopper assembly for rotation with respect thereto and providing relative axial movement between the end plate and the hopper assembly, said hopper assembly being carried on actuatable means for moving the hopper assembly carried end plate into and out of contact with the open drum end and for exerting a seating force on the hopper assembly, an elastic ring having its outer periphery mounted on said plate, an annular seal mounted on the inner periphery of said ring and contacting an inwardly facing sealing surface provided on said hopper assembly, said inner and outer peripheries of said ring being displaced with respect to the drum axis to stress said ring in shear and bias said seal into contact with said surface, an increase in said seating force exerted on said hopper assembly by said actuatable means when seating said plate on said drum end being operable to increase the stress in said elastic ring.

8. A mixer including a drum, an annular end plate rotatable with said drum, a hopper assembly for discharging mix into the drum centrally of said annular end plate, bearing means mounting said end plate on said hopper assembly for relative rotation therebetween and providing relative axial movement of the end plate and hopper assembly, said bearing means including means precluding axial separation of the end plate and hopper assembly in one direction, an annular elastic ring having its outer periphery mounted in said end plate, an annular seal mounted on the inner periphery of said ring and contacting an inwardly facing sealing surface provided on said assembly, said inwardly facing sealing sur-

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face being axially offset towards the drum with respect to the axial position of said seal member in the normal, unstressed condition of said elastic ring to stress said elastic ring in shear when the annular seal and said inwardly facing sealing surface are operatively engaged to thus bias the seal into contact with said sealing surface and to preclude axial separation of the hopper assembly and end plate in the opposite direction.

9. In a concrete mixer, a mixing drum having an open end, a charging hopper assembly adapted to discharge mix into the drum through said opening, an annular end plate, bearing means mounting said end plate on said hopper assembly for relative rotation therebetween and providing relative axial movement between the end plate and hopper assembly, manually actuated means acting on said hopper assembly for moving said hopper assembly and said plate axially with respect to said drum from a charging position in which said plate seats on said drum end to a discharging position in which said plate is remote from said drum end, and means sealing said bearing means from the contents of said drum, said bearing means including annular portions extending transversely of the axis of rotation of the drum and overlapping radially to preclude axial separation of the bearing members in one direction, said sealing means including an annular member secured to said end plate and extending transversely to the drum axis into engagement with an inwardly facing sealing surface provided on said hopper assembly for holding said bearing means in assembled relationship and precluding axial separation of the end plate and hopper assembly in the opposite direction.

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