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Building material mixer

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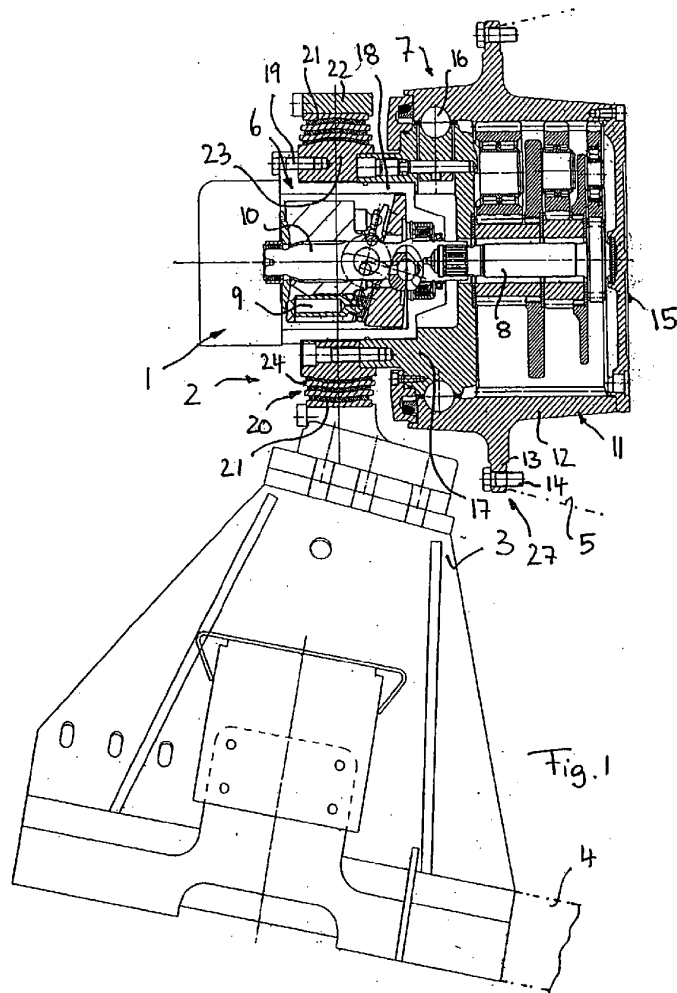
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ABSTRACT

The present invention relates to a building material mixer having a mixer drum which can be rotationally driven by a mixer drive, with the mixer drum being rotatably supported by the mixer drive at a mixer frame part, in particular a traveling gear frame part, at one of its end face ends and with the mixer drive having a drive part, in particular a hydraulic motor, and a drive transmission connected to the mixer drum. In accordance with the invention, the building material mixer is characterized in that the mixer drive is movably supported by movable bearing means at the mixer frame part allowing tilting movements; and in that the mixer drum is fastened to the transmission housing of the drive transmission.



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COMPLETE SPECIFICATION
STANDARD PATENT

Invention Title: Building material mixer

The following statement is a full description of this invention, including the best method of performing it known to me/us:

FIELD OF THE INVENTION

The present invention relates to a building material mixer having a mixer drum which can be rotationally driven by a mixer drive, with the mixer drum being rotatably supported by the mixer drive at a mixer frame part, in particular a traveling gear frame part, at one of its end face ends and with the mixer drive having a drive part, in particular a hydraulic motor, and a drive transmission connected to the mixer drum.

BACKGROUND ART

[Mere reference to background art herein should not be construed as an admission that such art constitutes common general knowledge in relation to the invention.]

With building material mixers in the form of truck mixers, which are usually used for the supply of premixed concrete to construction sites, large dynamic forces frequently act on the mixer drum, for example when driving over bumpy approach roads so that the frequently heavily loaded mixer drums cause considerable dynamic bearing forces. On the other hand, twists of the traveling gear frame on which the mixer drum is supported arise when driving on uneven ground so that alignment errors of the bearing points result or the bearing point at the frame side twists with respect to the bearing point at the drum side. These twists and dynamic bearing stresses are particularly problematic on the side of the mixer drum which is supported by the mixer drive since such twists or dynamic bearing forces cannot easily be introduced into the transmission of the mixer drive. To be able to compensate or allow the named twists and alignment errors as a result of frame twists, the connection between the mixer drive and the mixer drum is conventionally made in a yielding manner in that a twist-capable connection part is used for the mixer drum fastening.

Figure 3 shows a conventional mixer drive, more precisely its transmission, which is made as a two-stage planetary gear which is driven by a drive motor not shown in any more detail at the input side and drives a drum flange at the output side, said drum flange being shown at the right in Figure 3 and being rigidly connected to the mixer drum. The transmission housing of the mixer transmission shown in Figure 3 is rigidly screwed to a bearing block rigidly connected to the traveling gear. Twists of the traveling gear frame supporting the mixer drive with respect to the mixer drum or vice

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versa can be compensated up to a certain degree by the drum flange designed to be capable of twisting.

5 As Figure 3 shows, the said drum flange is directly shaped at the output shaft of the mixer transmission, but is made very thin so that it allows twists as a result of tilting movements. In addition, the bearing of the output shaft supporting the drum flange by obliquely positioned tapered roller bearings is made such that the twist stiffness is also kept very limited by it to permit compensation movements.

10 The permitting of the named twists and their compensation can, however, bring along fatigue problems. In addition, the vibration problems as a result of dynamic loads can only be solved in an unsatisfactory manner by the solutions known up to now. It would also be desirable to achieve compact solutions.

15 Starting from this, it is a preferred object of the invention to provide an improved building material mixer of the initially named kind which avoids disadvantages of the prior art and further develops the latter in an advantageous manner. In particular a better compensation of twists of the frame part supporting the mixer drive with respect to the mixer drum should be achieved with a compact, small bearing
20 arrangement which simultaneously also intercepts the dynamic loads from the mixer drum.

SUMMARY OF THE INVENTION

25 In one broad form, the invention provides a building material mixer having a mixer drum which can be rotationally driven by a mixer drive, the mixer drum being rotatably supported by the mixer drive adjacent an end face of the mixer drive, the mixer drive being located adjacent a mixer frame part, in particular a traveling gear frame part, the mixer drive having a drive axis, a drive part, in particular a hydraulic
30 motor, and a drive transmission connected to the mixer drum, the drive transmission having a transmission housing, wherein the mixer drive is movably supported by movable bearing means at the mixer frame part allowing tilting movements of the mixer drive; and in that the mixer drum is fastened to the transmission housing of the drive transmission, and wherein the movable bearing means has a bearing ring, an

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annular inner bearing part associated with the bearing ring, and at least one resilient bearing member provided between the bearing ring and the annular inner bearing part, the bearing ring and annular inner bearing part being held movably with respect to one another by said at least one resilient bearing member, the at least one resilient bearing member being fitted under a sufficiently strong bias which prevents tensile strains in the at least one resilient bearing member.

It is therefore proposed no longer to intercept the twists between the mixer frame and the mixer drum or no longer to intercept them only at the interface between the mixer transmission and the mixer drum. Preferably, the total mixer drive is fastened movably to the mixer frame such that the total mixer drive also takes part in twist movements of the mixer drum with respect to the traveling gear frame or, vice versa, twist movements of the traveling gear frame are compensated at the interface between the mixer frame and the mixer drive. In accordance with the invention, the mixer drive is movably supported at the mixer frame part by movable bearing means allowing tilting movements.

Typically in this connection, the mixer drum is fastened to the transmission housing of the drive transmission, whereby a drum flange projecting beyond the drive transmission is saved and hereby the axial construction length of the arrangement can be shortened. In contrast to previous solutions, the output movement of the mixer transmission is no longer transmitted via a transmission shaft and a drum flange fastened thereto, but rather via the transmission housing of the mixer transmission to the mixer drum. The transmission housing is accordingly no longer rigidly fastened to the mixer frame part, but is rotatably supported thereat. Not only an arrangement with a shorter axial construction can be achieved in this manner, but also a better force flow with respect to the bearing forces induced by the mixer drum. The transmission shaft is no longer exposed to the known high bending forces; in addition, due to a moving together of the bearing point at the frame side and of the bearing point at the mixer drum side, a lower lever arm is produced which overall results in a lower twist strain on the mixer drive and in particular of the mixer transmission.

In a further embodiment of the invention, the mixer drum is fastened to a drum bearing point of the transmission housing, said drum bearing point being set back

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from the end face of the drive transmission facing the mixer drum toward the drive part of the mixer drive such that the drive transmission projects from the named drum bearing point toward the mixer drum or into the mixer drum. The drum bearing point is therefore set back toward the drive motor, whereby the bearing forces introduced into the transmission housing at the drum bearing point have a low lever length with respect to the bearing point at the frame side and a favorable force flow can be achieved with respect to the bearing forces.

The transmission housing may in particular have a fastening flange projecting forward at the jacket surface side at which the mixer drum or a mixer drum connection member is rigidly fastened, is for example screwed tight by bolts. The named fastening flange can be placed onto the transmission housing in the manner of a tire, for example, and can be rigidly fastened there, for example welded on or screwed. In a further development of the invention, the fastening flange is preferably integrally shaped onto the transmission housing.

Preferably, the bearing means on the frame side, by means of which the mixer drive is supported rotationally fixedly at the mixer frame with respect to the axis of rotation of the drive, but in a manner allowing tilting movements transversely thereto, advantageously engage at a bearing point of the mixer drive which is disposed in the region of the drive part, in particular of the hydraulic motor of the mixer drive. The named bearing point of the mixer drive at the frame side can preferably be disposed approximately centrally to the axial extent of a motor body of the mixer drive.

Accordingly, therefore, the bearing points of the mixer drive, namely the bearing point at the frame side, on the one hand, and the bearing point at the mixer drum side, on the other hand, are moved together such that overall favorable conditions result with respect to the force flow and to the dissipation of the bearing forces. In addition, a particularly compact construction is achieved which is characterized by low axial space requirements.

As mentioned, the bearing means in particular include an elastic/resilient bearing member by which the mixer drive is fastened to the mixer frame part. This allows the bearing means to be advantageously resilient and movement-damping, so that not

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only twists and alignment errors between the frame part and the mixer drum can be compensated, but also dynamic bearing forces can be intercepted in a favorable manner and unwanted vibrations can be reduced.

5 The resilient bearing member does not necessarily have to be a rubber bearing member; it can also be a plastic bearing member having corresponding properties or a bearing member made of another material which has the desired resilient and/or vibration-damping properties.

10 The bearing means for the movable support of the mixer drive at the frame permitting tilting movements can generally be designed differently with respect to their structures. In accordance with an advantageous embodiment of the invention, a bearing ring can be provided in which a preferably cylindrical and/or annular inner bearing part is seated such that the inner bearing part is held rotationally fixedly
15 toward the bearing ring with respect to the axis of rotation of the drive, but can move with respect to the bearing ring, and indeed in particular in the form of tilting movements around a tilting axis extending transversely to the axis of rotation of the mixer drive and/or of the mixer drum, with the movability advantageously being designed such that tilting movements are possible around a plurality of tilting axes
20 which are disposed in a plane perpendicular to the axis of rotation of the mixer drum.

In a further embodiment of the invention, a plurality of resilient bearing members can be layered onto one another between the bearing ring and the inner bearing part seated therein, with annular intermediate members being able to be provided
25 between the individual bearing members.

The named bearing ring does not necessarily have to have the shape of a closed ring; a bearing ring in the form of a ring segment in the manner of a semi-annular or three-quarter annular bearing bed or a bearing fork can also be provided. Preferably,
30 however, a fully circumferential bearing ring is provided in which the inner bearing part is seated enclosed over the full circumference. The inner bearing part is advantageously made somewhat cylindrical and in particular likewise in annular shape, with the outer jacket side of the inner bearing part being able to be arched like a ball.

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In a further embodiment of the invention, the bearing ring surrounds a housing part which surrounds the drive part of the mixer drive, in particular its hydraulic motor, and at which the aforesaid inner bearing part is provided. In this connection, the inner bearing part can be made as a separate component and can be rigidly fastened to the housing part. Alternatively, the inner bearing part can also be made integrally directly at the housing part.

The bearing ring surrounding the named housing part can be rigidly fastened to the mixer frame part, for example screwed by bolts.

The transmission housing supporting the mixer drum can generally have a different structure. In accordance with an advantageous embodiment of the invention, the transmission housing has a jacket surface part which is connected to the mixer drum and which is rotatably supported at a housing connection part which is supported by the aforesaid bearing means at the mixer frame. The housing connection member can advantageously surround the drive part of the mixer drive, in particular its motor body, and/or form a housing part for this drive part.

To enable a simple servicing of the motor of the mixer drive and a good accessibility thereto, the housing connection member surrounding the drive part can advantageously form a mounting chamber into which the drive part, in particular the engine of the mixer drive, can be placed at the end face in the manner of a separate module. Accordingly, the motor only has to be pushed axially onto the transmission, with it vice versa also being able to be dismantled in a simple manner. For this purpose, a coupling is preferably provided between the motor shaft and the transmission input shaft which can be closed and released by an axial movement.

To avoid excess stress on the moving bearing means for the support of the mixer drive by excessive twists, the movability of the mixer drive support is limited in an advantageous further development of the invention. For this purpose, an abutment can be provided which limits a tilting of the mixer drive with respect to the mixer frame. The abutment can generally be made in different manners in this connection. In accordance with an advantageous embodiment of the invention, the abutment can include an abutment part formed by the bearing ring as well as an abutment part

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formed by the transmission housing or connected thereto, said abutment parts moving apart on the reaching of a predetermined order of magnitude of the tilting movement.

- 5 In a further embodiment of the invention, the movable support of the mixer drive at the mixer frame part has a movability in the form of a permitted angular offset of more than 2° and preferably less than 10°. The permitted angular offset can advantageously amount to between 4° and 8°, in particular approximately 6°, which enables a sufficient compensation of frame twists, on the one hand, and prevents vibration problems due to excessive movability, on the other hand.

10 The invention will be explained in more detail in the following with respect to a preferred embodiment and to associated drawings.

15 **BRIEF DESCRIPTION OF THE DRAWINGS**

There are shown in the drawings:

Fig. 1: a longitudinal section through the mixer drive of a truck mixer and its support on a frame block fastened to the traveling gear frame;

- 20 **Fig. 2:** a longitudinal section through the mixer drive and its support from Fig. 1, with the mixer drive being tilted with respect to the frame block supporting it by the movability of the support; and

Fig. 3: a longitudinal section through a conventional mixer drive in which the transmission housing is rigidly screwed to the bearing block and the mixer drum is fastened via a drum flange seated on a transmission output shaft.

DESCRIPTION OF PREFERRED EMBODIMENT(S)

- The mixer drive 1 shown in Figures 1 and 2 is seated via a mixer support 2 on a bearing block 3 which is supported with the traveling gear frame 4 of a truck mixer not shown in another respect. In this connection, the truck mixer comprises in a manner known per se a multiaxial traveling gear having corresponding wheels which supports the named traveling gear frame 4 on which an operator's cabin is arranged in a manner likewise known per se, with the mixer drive and the mixer drum 5 driven by it being disposed behind said operator's cabin.

As Figure 1 shows, the mixer drive 1 comprises a drive part 6 for the generation of a rotatory drive movement as well as a drive transmission 7 which is driven by the named drive part 6 at the input side and drives the mixer drum 5 rotationally at the output side. In the embodiment drawn, the drive transmission 7 is made as a two-stage planetary gear whose sun gear of the first stage is driven via the input shaft 8 by the drive part 6.

In the drawn embodiment, the drive part 6 comprises a hydraulic motor 9 in the form of a hydraulic axial piston engine whose drive shaft 10 can be rotationally fixedly coupled to the input shaft 8 of the drive housing 7. The drive part 6 is seated at the drive transmission 7 at the end face, cf. Figure 1.

As Figure 1 shows, the drive transmission 7 comprises a housing 11 which includes a jacket surface part 12 which surrounds the transmission stages of the planetary gear at the circumferential side. A radially projecting drum flange 13 is provided approximately centrally at the jacket surface part 12 and the mixer drum 5, which is only indicated in Figure 1, can be rigidly fastened thereto by bolts 14. In this connection, the said drum flange 13 is set back from the end face 15 of the drive transmission 7 facing the mixer drum 5 toward the drive part 6, cf. Figure 1, so that the drive transmission 7 or its transmission housing 11 projects toward the mixer drum 5.

The jacket surface part 12 of the transmission housing 11 is rotatably supported by a rolling bearing 16 at a housing connection part 17 which covers the drive transmission 7 at the end face, on the one hand, and bounds a mounting chamber 18, on the other hand, into which the hydraulic motor 9 of the drive part 6 is inserted at the end face, cf. Figure 1. The hydraulic motor 9 can hereby be fixed easily at the drive transmission 7 in the manner of a separate module or can be inserted into the housing connection part 17 in that it is fastened by bolts 19.

The housing connection part 17 is supported rotationally fixedly with respect to the axis of rotation of the motor by the mixer support 2, but tiltably around tilting axes extending transversely thereto at the bearing block 3 of the traveling gear frame 4. The tiltability of the mixer drive 1 is given in all directions in the manner of a ball joint, i.e. the tiltability can take place around several tilting axes extending in a plane

perpendicular to the drawing plane of Figure 1. Figure 2 shows a tilted position, with the maximum tilting angle of 6° being drawn.

5 The mixer support 2 in this connection comprises movably formed bearing means 20 which permit tilting movements transversely to the drive axis and which are made resilient and damping, in particular elastic.

10 In the drawn embodiment, the bearing means 20 advantageously comprise a plurality of resilient, deformable bearing members 21 which can in particular be made in the form of rubber bearing members by which the mixer drive 1 is fastened to the bearing block 3 connected to the traveling gear frame 4.

15 In this connection, the bearing means 20 advantageously include a bearing ring 22 in which an inner bearing part 23 is seated which is likewise made in annular form and which can be tilted with respect to the bearing ring 22. This is enabled by the resiliently deformable bearing members 21 which are seated between the bearing ring 22 and the inner bearing part 23, cf. Figure 1. In this connection, the bearing members 21 can form ring shell segments, but are preferably made as bearing ring members and have a flattened elongate cross-section, cf. Figure 1. In the drawn embodiment, a plurality of
20 annular resilient bearing members 21 are seated over one another or in one another, with the bearing members 21 being separated from one another by intermediate pieces 24 likewise of ring shape, cf. Figure 1. In this connection, the resilient, in particular elastic, bearing members 21 are biased between the bearing ring 22 and the inner bearing part 23 such that they are only stressed on pressure or shear, but are not tensile stressed,
25 even on deformations such as Figure 2 shows. The bearing ring 22 and the inner bearing part 23 are movable toward one another, and are in particular tiltable, as Figure 2 shows, due to the resilient bearing members 21 so that the bearing means 20 overall or the mixer support 2 has a movability which permits tilting movements of the mixer drive 1 around almost any desired tilting axes transversely to the drive axis.

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The tiltability of the mixer drive 1 with respect to the bearing block 3 is limited in this respect by an abutment 25 which is formed, on the one hand, by an end face of the bearing ring 22 and, on the other hand, by a cover ring 26 which covers the bearing gap

between the jacket surface part 12 of the transmission housing 11 and its housing connection part 17 and is fastened to the latter housing connection part 17.

Throughout this specification, including the claims, where the context permits, the term
5 "comprise" and variants thereof such as "comprises" or "comprising" are to be interpreted as including the stated integer or integers without necessarily excluding any other integers.

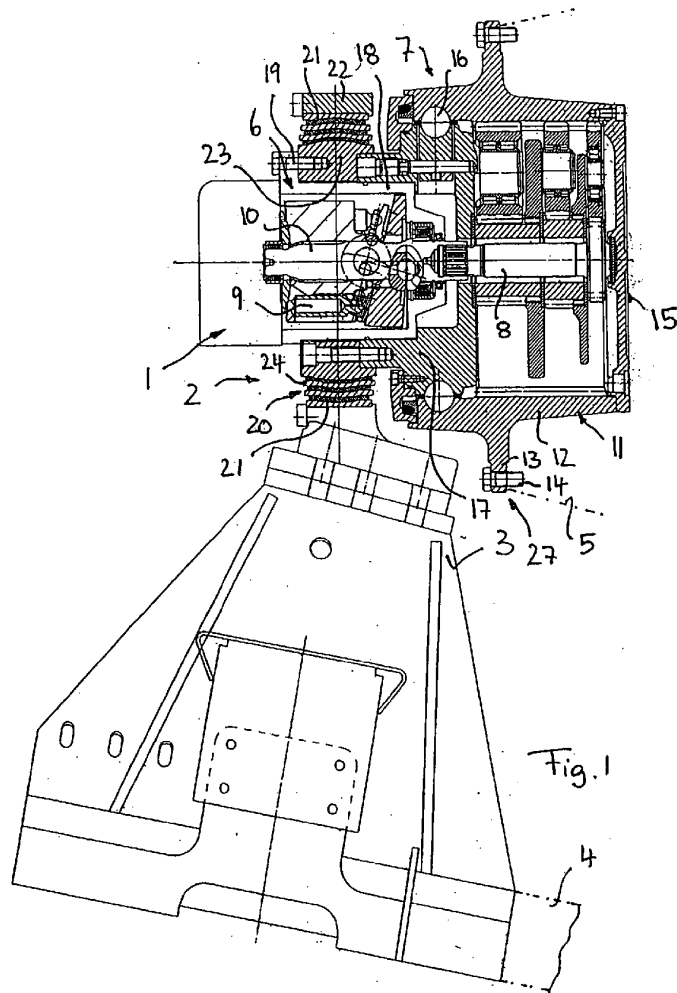
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

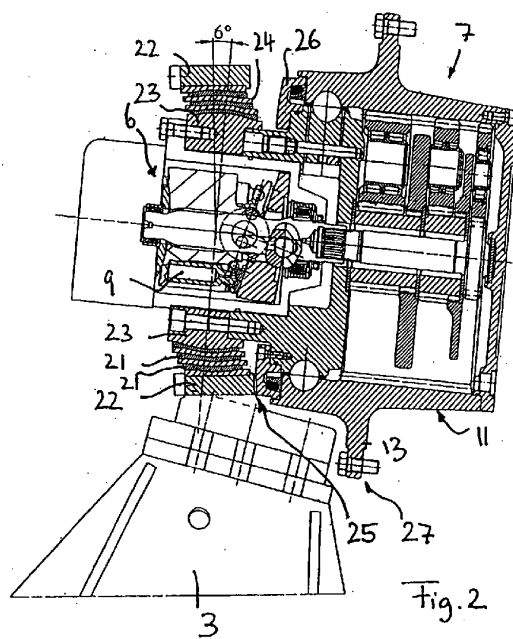
1. A building material mixer having a mixer drum which can be rotationally driven by a mixer drive, the mixer drum being rotatably supported by the mixer drive adjacent an end face of the mixer drive, the mixer drive being located adjacent a mixer frame part, in particular a traveling gear frame part, the mixer drive having a drive axis, a drive part, in particular a hydraulic motor, and a drive transmission connected to the mixer drum, the drive transmission having a transmission housing,
wherein the mixer drive is movably supported by movable bearing means at the mixer frame part allowing tilting movements of the mixer drive; and in that the mixer drum is fastened to the transmission housing of the drive transmission, and wherein the movable bearing means has a bearing ring, an annular inner bearing part associated with the bearing ring, and at least one resilient bearing member provided between the bearing ring and the annular inner bearing part, the bearing ring and annular inner bearing part being held movably with respect to one another by said at least one resilient bearing member, the at least one resilient bearing member being fitted under a sufficiently strong bias which prevents tensile strains in the at least one resilient bearing member.
2. A building material mixer in accordance with claim 1, wherein the bearing ring and the at least one resilient bearing member surround the mixer drive and the drive axis thereof.
3. A building material mixer in accordance with claim 1 or 2, wherein the mixer drive is fastened to the mixer frame part by the bearing member.
4. A building material mixer in accordance with any one of the preceding claims, wherein the mixer drum is fastened to a drum bearing point of the transmission housing, the drum bearing point being offset from the end face of the drive transmission remote from the drive part of the mixer drive, toward the said drive part, such that the drive transmission projects from the drum bearing point into the mixer drum and/or toward the mixer drum.

5. A building material mixer in accordance with any one of the preceding claims, wherein the transmission housing has a fastening flange to which the mixer drum is rigidly fastened, the fastening flange preferably being integrally formed with the transmission housing.
6. A building material mixer in accordance with any one of the preceding claims, wherein the transmission housing has a jacket surface part which is connected to the mixer drum and which is rotatably supported at a housing connection part, the housing connection part being supported at the mixer frame part by the movable bearing means.
7. A building material mixer in accordance with claim 6, wherein the housing connection part of the transmission housing surrounds the drive part of the mixer drive or forms the drive part.
8. A building material mixer in accordance with claim 6 or 7, wherein the housing connection part of the transmission housing forms a mounting chamber into which the drive part, in particular its hydraulic motor, can be placed as a separate module.
9. A building material mixer in accordance with any one of the preceding claims, wherein the resilient bearing member is made of rubber and is only stressed on pressure and/or shear.
10. A building material mixer in accordance with any one of the preceding claims, wherein a plurality of resilient bearing members are provided between the bearing ring and the annular inner bearing part, the plurality of resilient bearing member being disposed radially within one another and/or separated from one another by intermediate pieces.
11. A building material mixer in accordance with any one of the preceding claims, wherein the bearing ring surrounds a housing part which encompasses the drive part of the mixer drive and to which the annular inner bearing part is fastened or formed, the bearing ring being rigidly fastened to the mixer frame part.

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12. A building material mixer in accordance with any one of the preceding claims, wherein an abutment is provided for limiting the tilting motion of the mixer drive with respect to the mixer frame part.
13. A building material mixer in accordance with claim 12, wherein the abutment comprises an abutment part formed by the bearing ring which is adapted to abut against an abutment member formed by the transmission housing, in particular its housing connection part.
14. A building material mixer in accordance with any one of the preceding claims, wherein the movable bearing means provides the mixer drive with a tilting angle from the neutral position of between 2° and 15° .
15. A building material mixer in accordance with claim 14, wherein the tilting angle is between 4° and 8° .
16. A building material mixer in accordance with claim 15, wherein the tilting angle is substantially 6° .
17. A building material mixer substantially as hereinbefore described with reference to Figures 1 and 2 of the accompanying drawings.





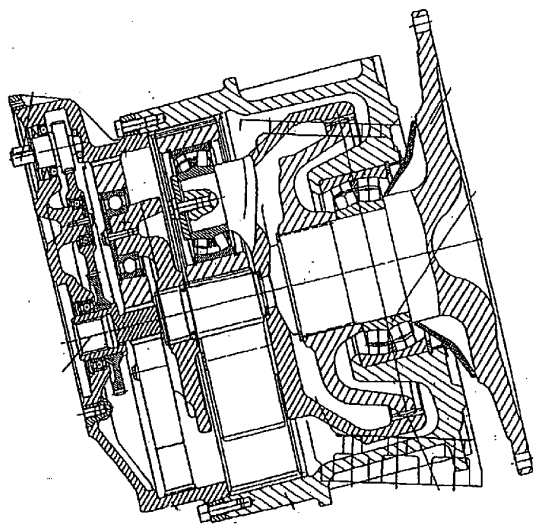


Fig. 3