

PATENT SPECIFICATION

(11)

1 445 578

1 445 578

- (21) Application No. 37634/73 (22) Filed 8 Aug. 1973 (19)
 (31) Convention Application No. 282 136 (32) Filed 21 Aug. 1972 in
 (33) United States of America (US)
 (44) Complete Specification published 11 Aug. 1976
 (51) INT. CL.³ F16C 17/10 33/02 B60G 1/02
 (52) Index at acceptance
 F2A 6D 6E2 D36 D46
 B7D 3A1A



(54) BEARING ASSEMBLY

(71) We, CATERPILLAR TRACTOR CO., a Corporation organised and existing under the laws of the State of California, United States of America, of 100 N.E. Adams Street, Peoria, State of Illinois 61602, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to bearing assemblies and, more particularly but not exclusively, is concerned with bearing assemblies for pivotally mounting rigid axles on vehicles.

One or more of the axles of motor vehicles may be pivotally attached to the vehicle body so as to accommodate movement of the vehicle over uneven terrain. These axles, which are commonly referred to as "rigid axles" are generally attached to the vehicle by means of a trunnion bearing assembly.

Known trunnion bearing assemblies normally employ complicated castings which form a part of the axle housing with which they are associated. Such castings require extensive and costly machining and include a number of complicated parts.

In accordance with the present invention, there is provided a bearing assembly relatively rotatably connecting two members, said assembly comprising a sleeve having a cylindrical outer bearing surface, a shallow bore formed in one of said members and receiving one end of said sleeve, a through bore formed in the other of said members and including bearing means and rotatably receiving said outer bearing surface of said sleeve, and a thrust plate engaging the opposite end of said sleeve and operative to retain said one end of said sleeve in said shallow bore.

For a better understanding of the invention reference will now be made by way of example, to the accompanying drawings, in which:—

Fig. 1 is a side elevational view of a vehicle incorporating a bearing assembly in accordance with the present invention;

Fig. 2 is a detailed view, partially in section, of the axle trunnion support assembly forming part of the vehicle shown in Figure 1;

Fig. 3 is a view taken generally along lines III—III of Fig. 1 with some parts omitted for clarity; and

Fig. 4 is a detailed view of a bearing assembly in accordance with the invention which form part of the trunnion support assembly shown in Figure 2.

Referring to the drawings and particularly to Fig. 1, there is illustrated a rigid axle assembly shown generally at 10, attached to the rear of a vehicle such as wheel loader 12 having a front frame 14 and a rear frame 16, and an interconnecting articulating joint shown generally at 18. A suitable earth-moving implement 20, such as an earth-working bucket, is mounted on the front frame. An engine 22 and transmission and transfer drive mechanism 24 are mounted on the rear frame and operatively connected to power a pair of front wheels 26 and a pair of rear wheels 28. The front wheels 26 are driven through a fixed front axle and differential mechanism shown generally at 30, and a front drive line 32 which transmits power from the transfer drive mechanism 24 to the differential of the front axle. A rear drive line and U-joint system 34 transmit power from the transmission and transfer drive mechanism 24 to the rear rigid axle assembly 10 through an input member 36, as shown in Fig. 2.

Referring now to Figs. 2 and 3, the axle assembly 10 includes an axle housing 38 which is transversely rockable on a front and rear trunnion arrangement shown generally at 40 and 42, respectively. A front trunnion support 44 and a rear trunnion support 46 are disposed on either side of the axle housing 38, and are secured to a pair of longitudinal frame members 48 through a plurality of bolts 50.

A differential assembly shown generally by reference numeral 52 includes an input pinion and bevel gear arrangement, as well as differential gearing internally of the axle

housing 38. This differential assembly is secured to a front face 54 of the axle housing by a plurality of bolts 56. A trunnion 58 conveniently forms a portion of the differential assembly, and is supported within the front trunnion support 44 by a pair of sleeve bearings 59. A pair of retaining plates 60 are removably secured on either side of the front trunnion support by a plurality of screws 62, and are adapted to contain a pair of O-ring seals 64 therein. The front trunnion arrangement 40 is thus of conventional construction and does not provide a thrust function.

The rear trunnion arrangement 42 comprises a simple and economic construction and arrangement of parts wherein a rear face 66 of the axle housing 38 is provided with a pilot bore 68 therein which is adapted to receive one end of a trunnion sleeve 70. The outer surface of sleeve 70 defines a cylindrical bearing surface. As shown more clearly in the enlargement at Fig. 4, the trunnion sleeve 70 is urged against an inner pocket face 72 by a thrust plate 74 and a single circle of bolts 76 which pass through a corresponding plurality of apertures 78 therein and are inserted in a plurality of threaded bores 80 in the housing. The trunnion sleeve and the axle housing pivot in the trunnion support 46 through an intermediate pair of sleeve bearings 82, which are disposed in a corresponding pair of stepped bores 84 defining a through bore in the support. A front thrust washer 86 is disposed between the rear face 66 of the axle housing and a front face 88 of the support in circumscribing relation to the sleeve 70. Similarly, a rear thrust washer 90 is disposed between the thrust plate 74 and a rear face 92 of the support.

The sleeve bearings 59 and 82, as well as the thrust washers 86 and 90, are preferably made of laminated phenolic plastics material with a fabric base. Such antifriction material has low wear properties, and is desirable for those locations subject to limited rotary movement, but high loads. A fabric is contiguously associated with the wear surface, and is bonded into a phenolic resin preferably containing uniformly dispersed graphite. One such phenolic material bushing which is suitable, is sold under the tradename INSA-ROC.

A pair of elastomeric O-ring seals 94 are mounted around the periphery of the thrust washers 86 and 90 and are provided with a

cross-section which is greater than the axial thickness of the thrust washers so that upon assembly, the O-rings are compressed between the associated faces to effect improved sealing thereof. Grease or other lubricant is supplied to the bearing area via a fitting 96, a passage 98, and a reservoir or pocket 100. Such lubricant extends the life of the bearings, and replenishment is needed relatively infrequently. The O-rings are excellent for allowing excess lubricant to escape, are economical, and are longlived for the limited rotary conditions encountered.

While the preferred embodiment relates to trunnion supports for vehicle axles, the bearing assembly disclosed is suitable for the pivotal connection of a wide variety of members.

WHAT WE CLAIM IS:—

1. A bearing assembly relatively rotatably connecting two members, said assembly comprising a sleeve having a cylindrical outer bearing surface, a shallow bore formed in one of said members and receiving one end of said sleeve, a through bore formed in the other end of said members and including bearing means and rotatably receiving said outer bearing surface of said sleeve, and a thrust plate engaging the opposite end of said sleeve and operative to retain said one end of said sleeve in said shallow bore.

2. An assembly as claimed in claim 1, wherein said thrust plate has an annular shoulder which is operative to retain said other of said members in position on said sleeve.

3. An assembly as claimed in claim 1 or 2 wherein said sleeve includes a cylindrical through bore, and wherein a plurality of bolts extend through said thrust plate and said through bore, are retained in threaded bores in said one of said members and serve to urge said thrust plate against said sleeve.

4. An assembly as claimed in claim 1, 2 or 3, wherein said one of said members is a rigid axle and said other of said members is a support member attached to a vehicle frame.

5. A bearing assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

For the Applicants,
FRANK B. DEHN & CO.,
Imperial House,
15-19, Kingsway,
London, WC2B 6UZ.

housing 38. This differential assembly is secured to a front face 54 of the axle housing by a plurality of bolts 56. A trunnion 58 conveniently forms a portion of the differential assembly, and is supported within the front trunnion support 44 by a pair of sleeve bearings 59. A pair of retaining plates 60 are removably secured on either side of the front trunnion support by a plurality of screws 62, and are adapted to contain a pair of O-ring seals 64 therein. The front trunnion arrangement 40 is thus of conventional construction and does not provide a thrust function.

The rear trunnion arrangement 42 comprises a simple and economic construction and arrangement of parts wherein a rear face 66 of the axle housing 38 is provided with a pilot bore 68 therein which is adapted to receive one end of a trunnion sleeve 70. The outer surface of sleeve 70 defines a cylindrical bearing surface. As shown more clearly in the enlargement at Fig. 4, the trunnion sleeve 70 is urged against an inner pocket face 72 by a thrust plate 74 and a single circle of bolts 76 which pass through a corresponding plurality of apertures 78 therein and are inserted in a plurality of threaded bores 80 in the housing. The trunnion sleeve and the axle housing pivot in the trunnion support 46 through an intermediate pair of sleeve bearings 82, which are disposed in a corresponding pair of stepped bores 84 defining a through bore in the support. A front thrust washer 86 is disposed between the rear face 66 of the axle housing and a front face 88 of the support in circumscribing relation to the sleeve 70. Similarly, a rear thrust washer 90 is disposed between the thrust plate 74 and a rear face 92 of the support.

The sleeve bearings 59 and 82, as well as the thrust washers 86 and 90, are preferably made of laminated phenolic plastics material with a fabric base. Such antifriction material has low wear properties, and is desirable for those locations subject to limited rotary movement, but high loads. A fabric is contiguously associated with the wear surface, and is bonded into a phenolic resin preferably containing uniformly dispersed graphite. One such phenolic material bushing which is suitable, is sold under the tradename INSA-ROC.

A pair of elastomeric O-ring seals 94 are mounted around the periphery of the thrust washers 86 and 90 and are provided with a

cross-section which is greater than the axial thickness of the thrust washers so that upon assembly, the O-rings are compressed between the associated faces to effect improved sealing thereof. Grease or other lubricant is supplied to the bearing area via a fitting 96, a passage 98, and a reservoir or pocket 100. Such lubricant extends the life of the bearings, and replenishment is needed relatively infrequently. The O-rings are excellent for allowing excess lubricant to escape, are economical, and are longlived for the limited rotary conditions encountered.

While the preferred embodiment relates to trunnion supports for vehicle axles, the bearing assembly disclosed is suitable for the pivotal connection of a wide variety of members.

WHAT WE CLAIM IS:—

1. A bearing assembly relatively rotatably connecting two members, said assembly comprising a sleeve having a cylindrical outer bearing surface, a shallow bore formed in one of said members and receiving one end of said sleeve, a through bore formed in the other end of said members and including bearing means and rotatably receiving said outer bearing surface of said sleeve, and a thrust plate engaging the opposite end of said sleeve and operative to retain said one end of said sleeve in said shallow bore.

2. An assembly as claimed in claim 1, wherein said thrust plate has an annular shoulder which is operative to retain said other of said members in position on said sleeve.

3. An assembly as claimed in claim 1 or 2 wherein said sleeve includes a cylindrical through bore, and wherein a plurality of bolts extend through said thrust plate and said through bore, are retained in threaded bores in said one of said members and serve to urge said thrust plate against said sleeve.

4. An assembly as claimed in claim 1, 2 or 3, wherein said one of said members is a rigid axle and said other of said members is a support member attached to a vehicle frame.

5. A bearing assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

For the Applicants,
FRANK B. DEHN & CO.,
Imperial House,
15—19, Kingsway,
London, WC2B 6UZ.

