

[54] **RAILWAY WHEEL AND AXLE ASSEMBLY**

[72] Inventors: **Wilhelmus Lambertus Van Wierst**, Santpoort; **Pieter Jozef Marie Paffen**, Alkmaar, both of Netherlands

[73] Assignee: **Koninklijke Nederlandsche Hoogovens En Staalfabrieken N.V.**, Ijmuiden, Netherlands

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[58] Field of Search.....295/36 R, 36 A, 44, 45, 46, 295/49; 308/180; 151/54

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Primary Examiner—Arthur L. La Point

Assistant Examiner—Howard Beltran

Attorney—Hall & Houghton

[57] **ABSTRACT**

A flanged wheel and axle assembly of the type having a bearing enclosed against a collar on the axle by a pressure plate system, is provided with two pressure plates, one mounted axially behind the other, the plates being in mutual contact only in a central zone, the plate closest to the wheel resting directly or indirectly against the bearing structure, and the second plate being drawn towards the end of the axle by drawing means extending through the first plate. A sleeve preferably is provided on the axle between the pressure plate system and the bearing structure; the bearing structure preferably comprises spaced cylindrical and adjustable bearing; the drawing means preferably comprises three or more bolts positioned symmetrically about the central zone of contact; and the assembly forms part of a railway car subjected to high loads.

5 Claims, 2 Drawing Figures

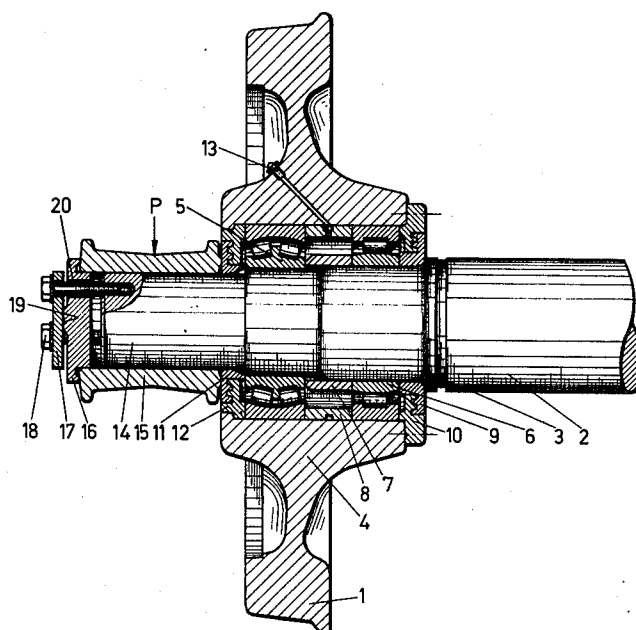


FIG. 1

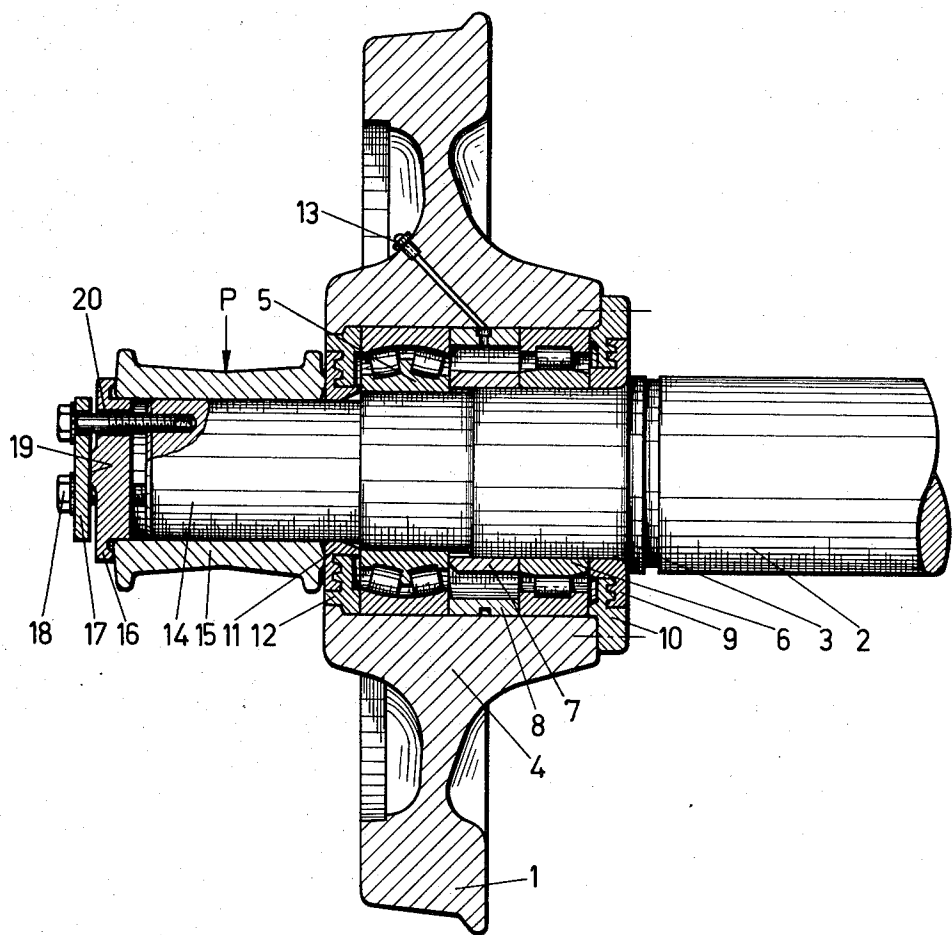
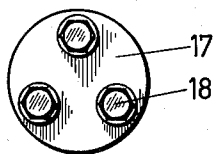


FIG. 2



WILHELMUS L. VAN WIERST
& PIETER J.M. PAFFEN,

INVENTORS

BY

Hall & Houghton

ATTORNEY

RAILWAY WHEEL AND AXLE ASSEMBLY

This invention relates to a structure comprising a shaft or axle and a flanged wheel rotatably supported thereon, particularly a railwheel for extremely high loads per shaft, in which a bearing structure of the wheel is enclosed against a collar on the shaft or axle by a pressure plate system secured to the end face of the shaft or axle. When using railway cars for industrial applications there is an increasing tendency to apply higher loads per shaft. This is particularly true for railway cars for internal transport in factories, for instance for moving in railroad yards of metallurgical factories. Examples of railroad cars for which this is the case are the pig iron mixing cars and the so-called casting cars for conveying cast steel ingots.

As a rule in such cars the wheels are secured on the shafts or axles and thus the latter are made rotatable. A modern development is to mount the wheels freely rotatable on stationary shafts or axles. An advantage of this structure consists in the fact that the wheels are free to take up their own speed in curves, so that the wear between wheel and rail, particularly at these very high shaft loads, is restricted.

As a result of the stability of the cars which often is required, the weight to be taken up is usually transitted to the axles or shafts in zones outboard of the wheels. For this purpose the shafts or axles are extended to zones past the outer face of the wheel. This gives a problem how to enclose and keep in place the wheel and the bearing from the free end of the shaft or axle. It would be possible to mount a sleeve over the end of the shaft or axle between the wheel and the end face and to enclose and keep in place this sleeve by the pressure plate system, which sleeve in its turn keeps the wheel and the bearing in the correct position.

However, this structure could entail the disadvantage that in the zones of the very highly loaded axle ends and the sleeves mounted on them, such axle ends and such sleeves deform to such an extent that the pressure plate system is locally subjected to very high stresses. Particularly if the pressure plate system is secured by a number of bolts onto the end face of the axle end, such bolts will be loaded quite differently mutually. This often gives rise to rupture of these bolts or of the pressure plate system. Such rupture of bolts may be the cause of damage to cars.

This invention aims at obtaining a structure in which this danger does not arise. In particular the structure according to the invention aims at obtaining a more uniform loading and stressing of the pressure plate system.

In view thereof this invention consists in embodying a structure as given in the preamble above in such a way that the pressure plate system consists of two plates, one mounted axially behind the other, which plates are only in mutual contact in the central zone, the first plate being closest to the wheel and applying pressure directly or indirectly against the bearing structure and the second plate being drawn towards the end of the shaft or axle by means of bolts extending through the first plate. More especially the invention consists in that between the wheel and the end face of the shaft or axle end a sleeve is slid over this end, which is kept in place by the pressure plate system between the first plate and the bearing system. As a result of the fact that the two plates are in contact with one another only in

the central part there is a possibility of some movement of these plates with respect to each other. It has appeared that this possibility of movement is sufficient to take up the discontinuities in view of the non-uniform deformation of the axle or shaft end and of the sleeve. Thereby the bolts will be loaded more uniformly, so that too high loads are avoided.

Although the effect of the new structure is already noticeable if there is a rather arbitrary distribution of the bolts over the surface of the pressure plates, the best results are obtained if the bolts are positioned on an imaginary circle, and in particular if only three bolts are positioned at the same distance from the axle center and at the same mutual angles, so according to an equilateral triangle.

In this last embodiment it is possible, independent on the discontinuity of the deformation of axle end and sleeve to obtain a substantially uniform distribution of forces between the three bolts.

In this structure the two pressure plates can more or less tilt (turn or wobble) with respect to each other about the point or small zone of contact in the central part. In order to make the stability of the structure as high as possible is its preferable to take additional measures by which the non-uniformity of the deformation of the axle end and of the sleeve are restricted to minimum values. It has appeared that this is obtainable by a good choice and mutual positioning of the bearings, by which the wheel is supported on the axle or shaft. According to the invention in this respect a structure is preferable in which the wheel is rotatable around the shaft by means of a first and a second bearing, the first bearing being a spherical or other adjustable roll bearing, positioned in the plane through the rim of the wheel, the second bearing being a cylindrical roll bearing at a distance from the first bearing. This choice and positioning of the bearings moreover has the advantage that the forces in the bearings may be calculated accurately, the calculated horizontal forces on the wheel being taken up by the spherical roll bearing and the calculated vertical forces being taken up by both bearings simultaneously. Thanks to this possibility to calculate the bearings exactly it is also possible to choose bearings having the same efficient life time during operation of the railroad car.

This invention will now be explained in more detail with reference to the enclosed drawing. In said drawing:

FIG. 1 shows the structure in axial section, and FIG. 2 shows a detail of FIG. 1 in end view.

In FIG. 1 reference numeral 1 indicates a rail wheel in axial section. This flanged wheel is rotatable about shaft or axle 2, which is provided with collar or shoulder 3 spaced from and facing the outboard end of the shaft 2. Within the hub 4 of wheel 1 there is an anti-friction bearing assembly outboard of the shoulder 3 and comprising a spherical roll bearing 5, a cylindrical roll bearing 6 and two distance keeping (positioning) rings 7 and 8. The spherical roll bearing is positioned or centered about in the plane which is perpendicular to the axis and goes through the rim of wheel 1 where this contacts the rail. The inner rings of the bearings 5 and 6 are separated by a ring 7 and the outer rings of these bearings by ring 8. The bearings 6 and 5 lie inboard and outboard of the plane through the flange of the wheel, respectively, in the form shown.

To the right in FIG. 1 the bearing is enclosed by a set of labyrinth seal rings 9 and 10, labyrinth seal ring 10 being secured by bolts in a manner not shown to the hub 4 of wheel 1. Labyrinth seal ring 9 rests against collar 3 of axle 2. To the left in FIG. 1 the bearing is also enclosed by a set of labyrinth seal rings 11 and 12, labyrinth seal ring 12 having been slid into the hub 4 from the central side of the axle or shaft. The lubrication of the bearings 5 and 6 is possible through a passage in communication with a lubricating nipple 13, said passage opening between rings 7 and 8. Axle or shaft 2 is extended to have an axle end 14, on which there is a sleeve 15. The upper structure of the railroad carriage is mounted on said sleeve 15 in such a way that the weight of this upper structure with the load of the car is transmitted through sleeve 15 onto axle end 14. This is diagrammatically shown by an arrow P giving the concerning force in FIG. 1. Sleeve 15 is enclosed and kept in position in contact with wheel 1 by means of a pressure plate system or means 16, 17, 18. This pressure plate system consists of two plates 16 and 17 and three bolts 18. Pressure plate 16 is in contact with the edge of sleeve 15 by a collar-shaped edge and is spaced somewhat from the outboard end of the axle 14, as shown. Moreover plate 16 has a protruding part at 19, pointing outwardly and being positioned centrally of the plate. In contact with this protruding part is a pressure plate 17. By means of the set of bolt means 18 this plate 17 is drawn towards the axle end 14, for which purpose the end face of this end is provided with screw-threaded holes. Bolts 18 thereto extend through holes 20 in pressure plate 16, which holes 20 are of such a diameter that the bolts 18 pass therethrough with considerable clearance.

In FIG. 2 the pressure plate 17 with bolts 18 is shown and it appears therefrom that these three bolts are positioned on the corners of a geometrical figure being an equilateral triangle symmetrically with respect to the axis of the system.

Now if the load P is transmitted to sleeve 15 and from this sleeve 15 to axle end 14, this axle end will bend downwardly under the influence thereof. However, as the sleeve does not extend through the inside of the wheel, there will be almost no bending moment in the sleeve about the same axis as the bending moment occurring in the axle 2. As a result thereof the end face of the axle end 14 and the left end of sleeve 15 turn a little with respect to each other so that the heads of the bolts 18 will tend to displace mutually to a different extent with respect to pressure plate 16. This unequal displacement is taken up in that pressure plate 17 will tilt about supporting surface 19 with respect to pressure plate 16. This tilting will automatically adjust itself in such a way that the forces in the three bolts 18 will be the same.

If only two bolts 18 would be applied, a free possibility of movement of the plates 16 and 17 with respect to each other transversely to the connecting line of these two bolts would remain. If more than three bolts 18 would be applied, the adjustment of pressure plate 17 with respect to plate 16 would always be only such that at most in three bolts the tension forces would be substantially the same, although also in the remaining bolts the differences in pulling forces would be substantially less than without a free movability of the two pressure plates 16 and 17 with respect to each other. It is, how-

ever, clear that the best compensation of the differences in the tensile forces in the bolts will be obtained if three bolts 18 are applied. In that case the plates 16 and 17 will have to make the least possible tilting movement with respect to each other if the bolts are placed according to the said pattern of an isosceles triangle.

As will be clear from the above the correction in the bolt forces obtained by the invention is necessary as a result of the occurrence of a bending moment in axle end 14. By the positioning of the spherical roll bearing 5 about the plane through the active part of the rim of wheel 1 the amount of this bending moment is reduced as far as possible.

We claim:

1. An improved car wheel structure for supporting heavy load, said structure being of the type comprising
 - a. a shaft or axle having an outboard end and a shoulder spaced from and facing said outboard end,
 - b. an anti-friction bearing assembly supported on said axle outboard of said shoulder,
 - c. a wheel mounted on said bearing assembly and rotatable thereon relative to said axle, and
 - d. pressure plate means secured to the outboard end of said axle for pressing said assembly against said shoulder; wherein the improvement comprises
 - e. a sleeve mounted on the outboard end of said axle between said pressure plate means and said assembly,
 - f. a first pressure plate in said pressure plate means and bearing against the outboard end of said sleeve and spaced from the end of said axle,
 - g. a second pressure plate in said pressure plate means bearing against said first pressure plate outboard thereof for pressing said first pressure plate against said sleeve
 - h. one of said pressure plates having a central protruberance extending toward the other for limiting the mutual contact between said pressure plates to the central parts thereof in substantially axial alignment with said axle, and
 - i. a set of bolt means in said pressure plate means arranged in spaced relation about said central portion and passing through said first and second plates and threadedly engaging in the end of said axle in spaced relation about its central axis,
 - j. said bolt means passing through said first plate loosely,
- whereby tightening of said bolt means exerts pressure via said second plate, said protruberance, said first plate, and said sleeve against said assembly, while providing for relative tilting of said first and second pressure plates about said protruberance on bending of said axle.

2. An improved structure as claimed in claim 1, wherein said bolt means are positioned to lie on a circle concentric to the central axis of the axle.

3. An improved structure as claimed in claim 2, wherein said set consists of three bolt means equally spaced about said circle.

4. An improved structure as claimed in claim 1, wherein said anti-friction bearing assembly comprises first and second anti-friction bearings, the first bearing being a spherical bearing positioned in the plane

through the rim of the wheel, and the second being a cylindrical roller bearing at a distance from said first bearing.

5. An improved structure as claimed in claim 4, wherein said wheel is flanged and said second and first bearings are positioned inboard and outboard of the plane through the flange of the wheel, respectively.

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