

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements in or relating to Pivot Centres for Articulated and Bogie Locomotives

We, BEYER PEACOCK & COMPANY LIMITED, a British Company, of Gorton, Manchester 18, and JAMES HADFIELD, a British subject, of The White House, Pinfold Lane, Romiley, Chester, 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 pivot centres for articulated and bogie locomotives of all types and in particular Diesel-Electric, Diesel-Hydraulic, Diesel-Mechanical, Gas Turbine and Electric locomotives.

The object of the invention is the provision of an improved pivot centre of the above character, which, amongst other advantages, can be applied, for example, to bogie pivot centres on electric or Diesel locomotives without restricting the basic design of the bogies or imposing limitations on the space available for traction motors or gear boxes, or for access to such transmission units for inspection and maintenance.

The invention consists broadly of a pivot centre for articulated and bogie locomotives comprising a male member and a female member, said female member including a wearing element which is mounted so as to be movable towards the male member for taking up wear, wherein said wearing element is biased in the direction for taking up wear by means of a horizontally movable wedge which is itself biased by means of a horizontal helical spring.

In order that the invention may be the more clearly understood two pivot centre constructions in accordance therewith will now be described, reference being made to the accompanying drawings wherein:

Figure 1 is a sectional elevation of one of said constructions the section being on line I—I of Figure 2.

Figure 2 is a sectional plan of the same, with the male pivot member removed the section being on line II—II of Figure 1.

Figure 3 is a sectional elevation of the

other construction, the section being on line III—III of Figure 4.

Figure 4 is a sectional plan of the same, the section being on line IV—IV of Figure 3.

Figure 5 is a cross section of the same, the section being on line V—V of Figure 4.

Referring first to Figures 1 and 2 the construction comprises a female pivot member 1, 2 which is mounted on the frame structure 3 of the bogie or truck or alternatively the swing bolster of the bogie or truck if such is provided, and a male pivot member 4 attached to the superstructure of the locomotive which extends downwards engaging the female member. The male member 4 has a flat bottom bearing plate 5 which rests on a corresponding flat bearing plate 6 at the bottom of the female member and supports the weight of the superstructure.

The male member 4 is also fitted with a renewable ring 7 in the form of a truncated cone, as in our prior Specification No. 647,480, and the female member 1, 2 is machined to the same contour, this arrangement being designed to permit a certain amount of tilting between the male and female members in both longitudinal and transverse directions.

The female member 1, 2 comprises a fixed bearing block 1 and an adjustable bearing block or wearing element 2 machined as mentioned above to the same conical contour as the ring 7 of the male member, with a clearance 8 between blocks 1 and 2 at each side to permit horizontal longitudinal movement of block 2 towards the male member as wear takes place.

The adjustable bearing block 2 is permanently biased towards the fixed block 1 by means of a spring loaded wedge 9 and wear on the circumferential bearing surfaces of the male and female members is thus automatically taken up.

The wedge 9 moves in a horizontal direction. It has its geometrical axis at right angles to the direction of movement of the adjustable

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bearing block 2 and its two faces are equally inclined in opposite direction with respect to said geometrical axis. One of said faces is in contact with the bearing block 2 and the other in contact with a fixed bearing block 10. The taper of the wedge 9 is so arranged that reversal of action can take place in response to the bearing blocks 1 and 2 being forced apart by the male member when the superstructure is being lowered into position on the bogies or trucks and also under conditions of tilting between the male and female members in a longitudinal direction.

The wedge 9 is loaded by means of a long horizontal helical spring consisting of two component parts 11 and 12 arranged in series and connected by a bolt 13 passing through a longitudinal hole 27 in said wedge.

More particularly, the component spring part 11 is in compression between a shoulder 28 countersunk in said hole in the wedge and a head 29 on the rear end of the bolt 13, a suitable washer 30 being provided between said spring part 11 and said head 29, and the component spring part 12 is in compression between a head 31 screwed on the forward end of said bolt and a fixed surface 32 beyond the forward end of the wedge, a washer 33 being provided between said sprung part and said surface. The load thus applied to the wedge is such that under all conditions of wear of the male and female pivot members there is no clearance between said pivot members in a longitudinal direction, thus eliminating all "knocking" which occurs when clearance exists in pivot centres and the consequential shock loads and damage to the structure of the locomotive which can occur under these conditions. Also the pressure exerted by the bearing blocks 1 and 2 on the male member creates a frictional resistance to rotation of the male member relative to the female member which greatly assists in preventing "hunting" or oscillation of the bogie or truck in the track.

The female member 1, 2, the wedge 9 and the spring 11, 12 are housed in an oil-tight container which provides an oil bath for the working parts. This container comprises a casting 14 having a recess 35 which contains the female member 1, 2 and the wedge 9. A cover plate 15 covers said recess 35 and the male member projects into said recess through a hole in said cover plate, with a dust seal 16 between said male member and the edge of said hole.

The spring part 11 is also contained in said recess, but the bolt 13 projects through a wall of said recess to the outside so that said spring part 12 is outside said casting.

An oil-tight cover 17 mounted on the outside of said casting encloses said spring part 12. A screwed plug 18 provides access for removal of spring part 11 and bolt 13.

Referring now to the construction illustrated in Figures 3 to 5, this is the same in principle

as that of Figures 1 and 2 and like references have been employed for similar parts of the two constructions. In the case of Figures 3 to 5 however a long horizontal helical spring 19 is employed actuating the wedge 9 by means of a lever 20 and compression link 21. The spring 19 is enclosed within a plunger 22 which slides in a bored hole 34 formed in the casting 14 on the side of the pivot centre remote from the wedge, and parallel to a horizontal line at right angles to the direction of travel of the adjustable bearing block 2, i.e. parallel to that diameter of the pivot centre which contains the clearances 8. The lever 20 oscillates in a second recess 23 formed in the said casting 14, about a fixed vertical pivot pin 24 between its ends. The hole 34 breaks into the recess 23 and the spring 19 is in compression between a screwed plug 25, screwed into the outer end of said hole 34, and one end of the lever 20. The compression link 21 extends from the other end of said lever to the wedge 9 through an opening 36 in the partition between the recesses 23 and 35. The pivot pin 24 is disposed so that said lever affords a mechanical advantage. This mechanical advantage and the space available to accommodate the spring 19 permits the employment of a spring of relatively light section and optimum deflection rate. All the working parts are enclosed in an oilbath constituted by the cavities 23 and 35 and the hole 34. The screw plug 25 provides for removal of spring 19 and plunger 22 whilst the oiltight cover 26 provides for removal of the lever 20 after the cover plate 15 and pin 24 have been removed. The cover plate 15 covers both the cavity 23 and the recess 35.

In both of the above embodiments the fact that the slidable bearing block 2 can be forced to move away from the fixed bearing block 1 is of the greatest importance. For example, if excessive tilting movement should take place as might happen in the case of a derailment the sliding block 2 withdraws as required and prevents binding between the male and female members which would otherwise occur and relieves the supporting structure from excessive strains which would be caused by such binding.

The conical form of the pivot members is also of great importance since it permits a certain amount of tilting in both longitudinal and lateral directions without binding and also tends to minimise the stress created by "snatching" when starting heavy trains. This conical form in conjunction with the fact that the slidable block 2 can be forced back due to the reversible action of the wedge 9 is also of value in facilitating erection since the weight of the superstructure as it is lowered into position automatically forces the bearing blocks 1 and 2 apart during entry of the male member. Thus the assembly does not require any slackening of the spring or any manipula-

tion of component parts.

Both embodiments are particularly valuable for application to bogies or trucks wherein design features and space restrictions require a pivot centre entirely contained within a small space in the vertical direction.

It will be seen that, in both embodiments the loading spring is parallel to the geometrical axis of the wedge, but the arrangement is such that the extent of said spring beyond either end of said wedge is much less than the length of said spring, and thus a compact design is achieved.

What we claim is:—

1. A pivot centre for articulated and bogie locomotives comprising a male member and a female member, said female member including a wearing element which is mounted so as to be movable towards the male member for taking up wear, wherein said wearing element is biased in the direction for taking up wear by means of a horizontally movable wedge which is itself biased by means of a horizontal helical spring.

2. A pivot centre according to claim 1, and in which said spring is substantially parallel to or in line with the wedge, wherein the arrangement is such that the extent of said spring beyond either end of said wedge is less than the length of said spring.

3. A pivot centre according to claim 2, wherein said spring is divided into two component parts arranged in series and connected by a connecting element extending longitudinally of said spring.

4. A pivot centre according to claim 3, wherein one of said component spring parts is in compression between said wedge and a surface at one end of said connecting element, and the other component spring part is in compression between a fixed surface and a surface at the other end of said connecting element.

5. A pivot centre according to claim 4, wherein said connecting element consists of a single bolt passing through a longitudinal hole in said wedge.

6. A pivot centre for articulated and bogie locomotives comprising a male member and a female member, said female member including a wearing element which is mounted so as to be movable towards the male member for taking up wear, wherein said wearing element is biased in the direction for taking up wear by means of a horizontally movable wedge which is itself biased by means of two component horizontal helical springs one of which is in compression between the rear end of said wedge and a shoulder at the rear end of a bolt which passes through a longitudinal hole in said wedge and the other of which is in compression between a fixed surface and a shoulder at the forward end of said bolt beyond the forward end of said wedge.

7. A pivot centre according to claim 6,

wherein the first named of said component helical springs engages a counter sunk shoulder within the rear end of said hole.

8. A pivot centre for articulated and bogie locomotives comprising a male member and a female member, said female member including a wearing element which is mounted so as to be movable towards the male member for taking up wear, wherein said wearing element is biased in the direction for taking up wear by means of a horizontally movable wedge which is itself biased by means of a horizontal helical spring located on the side of the pivot centre opposite to said wedge and operating said wedge through the medium of a lever.

9. A pivot centre according to claim 8, wherein said lever is pivoted between its ends about a fixed vertical axis, said spring being in compression between a fixed part and one end of said lever, and the other end of said lever loading said wedge through the medium of a compression link.

10. A pivot centre according to claim 8 or 9, wherein said lever acts at a mechanical advantage.

11. A pivot centre according to any of the preceding claims, wherein said male and female members are of conical contour whereby tilting between said male and female members is permitted.

12. A pivot centre according to any of the preceding claims wherein the weight of the superstructure is supported by the engagement of flat horizontal surfaces at the end of the male member and within the female member respectively.

13. A pivot centre according to any of the preceding claims, wherein the wedge has its two surfaces inclined in opposite directions to a horizontal line at right angles to the direction of travel of the wearing element of the female member.

14. A pivot centre according to any of the preceding claims, wherein the taper of the wedge is such that reversal of action can take place in opposition to the spring in response to pressure exerted by the male member on the wearing element of the female member.

15. A pivot centre according to any of the preceding claims, wherein the female member, the wedge and the spring are housed in an oil-tight container which provides an oil bath, and into which the male member projects through an oil-tight seal.

16. A pivot centre according to claim 15, wherein said container comprises a casting having a recess which contains the female member and the wedge, and a cover for said recess through which the male member projects.

17. A pivot centre according to claim 16 as limited to claim 6, wherein said former component spring part is also contained in said recess, and said bolt projects through a wall of said recess so that said latter component spring

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tion of component parts.

Both embodiments are particularly valuable for application to bogies or trucks wherein design features and space restrictions require a pivot centre entirely contained within a small space in the vertical direction.

It will be seen that, in both embodiments the loading spring is parallel to the geometrical axis of the wedge, but the arrangement is such that the extent of said spring beyond either end of said wedge is much less than the length of said spring, and thus a compact design is achieved.

What we claim is:—

1. A pivot centre for articulated and bogie locomotives comprising a male member and a female member, said female member including a wearing element which is mounted so as to be movable towards the male member for taking up wear, wherein said wearing element is biased in the direction for taking up wear by means of a horizontally movable wedge which is itself biased by means of a horizontal helical spring.
2. A pivot centre according to claim 1, and in which said spring is substantially parallel to or in line with the wedge, wherein the arrangement is such that the extent of said spring beyond either end of said wedge is less than the length of said spring.
3. A pivot centre according to claim 2, wherein said spring is divided into two component parts arranged in series and connected by a connecting element extending longitudinally of said spring.
4. A pivot centre according to claim 3, wherein one of said component spring parts is in compression between said wedge and a surface at one end of said connecting element, and the other component spring part is in compression between a fixed surface and a surface at the other end of said connecting element.
5. A pivot centre according to claim 4, wherein said connecting element consists of a single bolt passing through a longitudinal hole in said wedge.
6. A pivot centre for articulated and bogie locomotives comprising a male member and a female member, said female member including a wearing element which is mounted so as to be movable towards the male member for taking up wear, wherein said wearing element is biased in the direction for taking up wear by means of a horizontally movable wedge which is itself biased by means of two component horizontal helical springs one of which is in compression between the rear end of said wedge and a shoulder at the rear end of a bolt which passes through a longitudinal hole in said wedge and the other of which is in compression between a fixed surface and a shoulder at the forward end of said bolt beyond the forward end of said wedge.
7. A pivot centre according to claim 6,

wherein the first named of said component helical springs engages a counter sunk shoulder within the rear end of said hole.

8. A pivot centre for articulated and bogie locomotives comprising a male member and a female member, said female member including a wearing element which is mounted so as to be movable towards the male member for taking up wear, wherein said wearing element is biased in the direction for taking up wear by means of a horizontally movable wedge which is itself biased by means of a horizontal helical spring located on the side of the pivot centre opposite to said wedge and operating said wedge through the medium of a lever.

9. A pivot centre according to claim 8, wherein said lever is pivoted between its ends about a fixed vertical axis, said spring being in compression between a fixed part and one end of said lever, and the other end of said lever loading said wedge through the medium of a compression link.

10. A pivot centre according to claim 8 or 9, wherein said lever acts at a mechanical advantage.

11. A pivot centre according to any of the preceding claims, wherein said male and female members are of conical contour whereby tilting between said male and female members is permitted.

12. A pivot centre according to any of the preceding claims wherein the weight of the superstructure is supported by the engagement of flat horizontal surfaces at the end of the male member and within the female member respectively.

13. A pivot centre according to any of the preceding claims, wherein the wedge has its two surfaces inclined in opposite directions to a horizontal line at right angles to the direction of travel of the wearing element of the female member.

14. A pivot centre according to any of the preceding claims, wherein the taper of the wedge is such that reversal of action can take place in opposition to the spring in response to pressure exerted by the male member on the wearing element of the female member.

15. A pivot centre according to any of the preceding claims, wherein the female member, the wedge and the spring are housed in an oil-tight container which provides an oil bath, and into which the male member projects through an oil-tight seal.

16. A pivot centre according to claim 15, wherein said container comprises a casting having a recess which contains the female member and the wedge, and a cover for said recess through which the male member projects.

17. A pivot centre according to claim 16 as limited to claim 6, wherein said former component spring part is also contained in said recess, and said bolt projects through a wall of said recess so that said latter component spring



part is outside said casting, and wherein said container is completed by a cover mounted on the outside of said casting and enclosing the projecting bolt portion and the latter component spring part.

18. A pivot centre according to claim 16 as limited to claim 9, wherein said casting is formed with a second recess for said lever, said two recesses being covered by the same cover referred to in claim 16 and communicating with each other by way of an opening which gives passage way to said compression

link, and wherein said casting has a bore hole therein which houses said spring and breaks into said second recess.

19. A pivot centre substantially as herein described with reference to Figures 1 and 2 or Figures 3 and 4 of the accompanying drawings.

A. A. THORNTON & CO.,
Chartered Patent Agents,
Napier House, 24—27, High Holborn,
London, W.C.1.,
For the Applicants.

PROVISIONAL SPECIFICATION

Improvements in or relating to Pivot Centres for Articulated and Bogie Locomotives

- 20 We, BEYER, PEACOCK & COMPANY LIMITED, a British Company, of Gorton, Manchester 18, and JAMES HADFIELD, a British Subject of The White House, Pinfold Lane, Romiley, Chester, do hereby declare this invention to be described in the following statement:—

25 This invention relates to pivot centres for articulated and bogie locomotives of all types and in particular Diesel-Electric, Diesel-Hydraulic, Diesel-Mechanical, Gas Turbine and Electric locomotives.

- 30 In order that the invention may be the more clearly understood two pivot centre constructions in accordance therewith will now be described, reference being made to the accompanying drawings wherein:

35 Figure 1 is a sectional elevation of one of said constructions the section being on line I—I of Figure 2.

40 Figure 2 is a sectional plan of the same, with the male pivot member removed the section being on line II—II of Figure 1.

Figure 3 is a sectional elevation of the other construction, the section being on line III—III of Figure 4.

45 Figure 4 is a sectional plan of the same, the section being on line IV to IV of Figure 3.

Figure 5 is a cross section of the same, the section being on line V—V of Figure 4.

- 50 Referring first to Figures 1 and 2 the construction comprises a female pivot member 1, 2 which is mounted on the frame structure 3 of the bogie or truck or alternatively the swing bolster of the bogie or truck if such is provided, and a male pivot member 4 attached to the superstructure of the locomotive which extends downwards engaging the female member. The male member 4 has a flat bottom bearing plate 5 which rests on a corresponding flat bearing plate 6 at the bottom of the female member and supports the weight of the superstructure.

60 The male member 4 is also fitted with a renewable ring 7 in the form of a truncated cone, as in our prior Specification No. 647,480, and the female member 1, 2 is machined to the same contour, this arrangement being

designed to permit a certain amount of tilting between the male and female members in both longitudinal and transverse directions.

The female member 1, 2 comprises a fixed bearing block 1 and an adjustable bearing block 2 machined as mentioned above to the same conical contour as the ring 7 of the male member, with a clearance 8 between blocks 1 and 2 at each side to permit horizontal longitudinal movement of block 2 as wear takes place.

The adjustable bearing block 2 is permanently biased towards the fixed block 1 by means of a spring loaded wedge 9 and wear on the circumferential bearing surfaces of the male and female members is thus automatically taken up.

The wedge 9, which has both its faces inclined to the direction of travel, moves in a horizontal direction at right angles to the direction of movement of the adjustable bearing block 2, one face of said wedge being in contact with the bearing block 2 and the other in contact with a fixed bearing block 10. The taper of the wedge 9 is so arranged that reversal of action can take place in response to the bearing blocks 1 and 2 are being forced apart by the male member when the superstructure is being lowered into position on the bogies or trucks and also under conditions of tilting between the male and female members in a longitudinal direction.

The wedge 9 is loaded by means of springs 11 and 12 arranged in series and connected by a bolt 13 and the necessary nuts and washers. The load thus applied to the wedge is such that under all conditions of wear of the male and female pivot members there is no clearance between said pivot members in a longitudinal direction, thus eliminating all "knocking" which occurs when clearance exists in pivot centres and the consequential shock loads and damage to the structure of the locomotive which can occur under these conditions. Also the pressure exerted by the bearing blocks 1 and 2 on the male member creates a frictional



resistance to rotation of the male member relative to the female member which greatly assists in preventing "hunting" or oscillation of the bogie or truck in the track.

- 5 The casting 14 which houses the bearing blocks and associated parts is made oil tight thus forming an oil bath enclosing the working parts, and is fitted with a cover plate 15, with a dust seal 16 around the opening in the cover plate which admits the male member.

- 10 An oil-tight casing 17 encloses the external spring 12 and a screwed plug 18 provides access for removal of spring 11 and bolt 13.

- 15 Referring now to the construction illustrated in Figures 3 to 5, this is the same in principle as that of Figures 1 and 2 and like references have been employed for similar parts of the two constructions. In the case of Figures 3 to 5 however a spring 19 is employed actuating the wedge 9 by means of a lever 20 and compression link 21. The spring 19 is enclosed within a plunger 22 which slides in a bored hole formed in the casting 14 on the side of the pivot centre remote from the wedge, and parallel to the direction of travel of said wedge, i.e. parallel to that diameter of the pivot centre which contains the clearances 8. The lever 20 oscillates in a cavity 23 formed in the said casting 14, about a vertical pivot pin 24 which is disposed so that said lever affords a mechanical advantage. This mechanical advantage and the space available to accommodate the spring 19 permits the employment of a spring of relatively light section and optimum deflection rate. All the working parts are enclosed in an oilbath. A screwed plug 25 provides for removal of spring 19 and plunger 22 whilst the oiltight cover 26 provides for removal of the lever 20 after the cover plate

15 and pin 24 have been removed.

In both of the above embodiments the fact that the slideable bearing block 2 can be forced to move away from the fixed bearing block 1 is of the greatest importance. For example, if excessive tilting movement should take place as might happen in the case of a derailment the sliding block 2 withdraws as required and prevents binding between the male and female members which would otherwise occur and relieves the supporting structure from excessive strains which would be caused by such binding.

The conical form of the pivot members is also of great importance since it permits a certain amount of tilting in both longitudinal and lateral directions without binding and also tends to minimise the stress created by "snatching" when starting heavy trains. This conical form in conjunction with the fact that the slideable block 2 can be forced back due to the reversible action of the wedge 9 is also of value in facilitating erection since the weight of the superstructure as it is lowered into position automatically forces the bearing blocks 1 and 2 apart during entry of the male member. Thus the assembly does not require any slackening of the spring or any manipulation of component parts.

Both embodiments are particularly valuable for application to bogies or trucks wherein design features and space restrictions require a pivot centre entirely contained within a small space in the vertical direction.

A. A. THORNTON & CO.,
Chartered Patent Agents,
Napier House, 24—27, High Holborn,
London, W.C.1,
For the Applicants.

Al.