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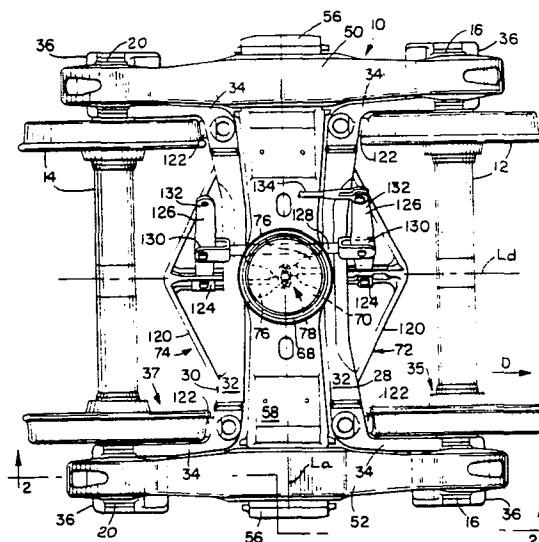
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Railroad car bogie.

A railroad car bogie (10) comprising spaced wheelsets (12, 14) has axle ends (16) of each wheelset journaled in bearings (18, 22) which in turn are carried respectively by an adapter (24, 26). Each adapter is connected to a side portion (34) of a U-shaped steering arm (28, 30) so as to form a wheelset-steering arm unit (35, 37). Elastomeric devices (40) join the side portions (34) of the steering arms (28, 30) to pedestal jaws (46, 48) formed at ends of a pair of spaced side frames (50, 52). Interposed between the wheelset-steering arm units (35, 37) is a connecting device (78) joining the steering arms (28, 30) at a central location proximate to a bolster (58) of the bogie (10).



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RAILROAD CAR BOGIE

This invention relates to railroad car trucks, i.e. bogies.

Modern railroad car bogies are commonly referred to as three-piece bogies which include spaced side frames resiliently supporting therebetween a transversely positioned
5 bolster. The bolster contains a centerplate which in turn supports a body of the railroad car. The side frames have downward projecting jaws in which axle ends of a front and a rear wheelset are rotatively journaled. Such bogies may also be described as nonsteerable in that the
10 bolster, side frame and wheelsets are purposefully maintained in a squared relationship.

Steerable bogies, on the other hand, are ones having wheelsets which may yaw, for example. Such bogies are well known and one typical type is disclosed in U.S. Patent
15 No. 3,789,770. As disclosed, this bogie allows rotation of each wheelset about its vertical axis so that the wheelset may take an out-of-square position with respect to a longitudinal axis of the bogie. The wheelsets are joined by positive mechanical linkage which controls and
20 maintains the relationship between the wheelsets. Additionally, this linkage is connected to a body of the railroad car so that movement between the car body and the wheelsets is maintained in a fixed relationship.

Providing a flexible connection between the axle ends
25 of the wheelset and the side frame to allow yawing therebetween is also well known and is disclosed in, for example, U.S. Patent No. 3,785,298. In this case, a resilient or elastomeric device interfaces between pedestal jaws of a side frame of the bogie and axle ends of the wheelsets to
30 allow limited movement therebetween which is restrained by the elastomeric device.

U.S. Patent No. 3,528,374 discloses a bogie which is one of the first to adapt steering principles to the modern day three-piece bogie. In this instance, a bolster has its
35 ends resiliently carried by side frames. Ends of the side

frames are adapted to allow the wheelsets of the bogie to yaw. Yawing in turn is regulated by parallel elastic bracing members connecting aligned front and rear axle ends and diagonally positioned elastic bracing members connecting opposite front and rear axle ends. A substantially identical concept and structure is utilized in the BARBER-SCHEFFEL High Speed Radial Truck presently being offered for sale by Standard Car Truck Company of Chicago, Illinois.

A further arrangement to provide a bogie with wheelsets which can yaw so as to maintain an aligned relationship with the track on which the bogie is travelling is disclosed by U.S. Patent No. 4,003,316. As so disclosed, holding frames which carry the axle ends of the wheelsets are individually connected to a bolster of the bogie through a ball bearing socket arrangement enclosed in a pad. Any lateral movement of the bolster effects a rotational movement of the holding frame and thus the wheelsets.

Most recent developments in steerable bogies are perhaps disclosed in U.S. Patent No. 4,067,261 and 4,067,069. Patent 4,067,261 discloses as its preferred embodiment a bogie quite similar to the commercially available bogie noted above. Particular emphasis is placed on the use of wheels having highly profiled wheel treads to generate steering forces. A pair of U-shaped subframes carries the axle ends of each wheelset and may be interconnected by a pair of diagonally positioned rods. These rods may, in turn, be joined through a dampening device.

Patent 4,067,069 disclosed a further steerable railroad car bogie wherein resilient means of predetermined stiffness interconnect the axle ends carrying subframes of the bogie at a centrally located point. Additionally, resilient means interconnect the subframes with the side frames of the bogie and the bogie with a body of the car.

The DR-1 Steering Assembly Truck commercially available from Dresser Industries, Inc., of Depew, New York, appears to embody many of the teachings found in this patent.

According to the invention there is provided
5 a railroad car bogie including, a pair of spaced side frames, a bolster positioned transversely between said side frames and having ends supported resiliently in windows formed in each said side frame, spaced front and rear wheelsets connected to said side frames through
10 a front and rear steering arm respectively connected with each wheelset to form front and rear wheelset-steering arm units, said units being disposed on opposite sides of said bolster, means interposed between said side frames and said steering arms to allow said units to move relative
15 to said frames selectively in multi-directions as a reaction to dynamic forces created by travel of said bogie, and connecting means joining said units, said connecting means allowing said wheelset-steering arm units to pitch and roll independently of one another and inhibiting
20 yawing movements of said units in the same rotational direction and horizontal lateral movements of said units which are in opposite directions.

The bogie of this invention has several important advantages over both steerable and nonsteerable bogies
25 presently known.

Known steerable bogies allow the wheelsets to react to dynamic forces created during the travel of the bogie and to move to a new position in response to these forces. For example, when the bogie encounters a left-
30 hand curve in the track, the forwardmost or front wheelset tends to rotate counterclockwise about its vertical axis, i.e. yaw, while moments later the rear wheelset tends to rotate clockwise about its vertical axis. However, the amount of rotation of each wheelset is
3. equal as the wheelsets move from a parallel to a

nonparallel position. This rotational tendency is created by the configuration of the outer surface of the wheels interacting with the track. Because most such curves are also banked to allow higher speed travel, the wheelset also
5 rotates about the longitudinal axis of the bogies, i.e. roll.

In known steerable bogies such movements are controlled either solely by some resilient device or by a positive mechanical linkage connecting the front and rear
10 wheelsets and the wheelsets are not restrained from yawing in the same rotational direction. Such yawing can lead to lozenqing of the side frames wherein the side frames - remain parallel but move to a longitudinal offset position. Lozenqing reduces the critical speed at which dynamically
15 induced oscillations of the wheelsets about a vertical axis occur i.e. hunting, and therefore reduces the dynamic stability of the bogie, particularly at high speeds.

In nonsteerable bogies yawing movements of the wheelsets are inhibited and therefore lozenqing is inhibited.
20 However, in such bogies, the wheelsets are unable to follow the contours of the track and wearing of the wheelsets is advanced by slippage between the wheelsets and the track which occurs as the bogie traverses a curve.

A bogie of the present invention as compared with
25 known bogies, combines a reduction in wear of the wheelsets due to slippage with an increase in dynamic stability at high speeds. The wheelsets can accommodate yawing movements in opposite directions, rolling and pitching, and are thus able to follow the contours of the track,
30 slippage being therefore reduced. Yawing movements of the wheelsets in the same direction, however, are inhibited and this provides a reduction in the tendency to lozenge and corresponding increase in stability, particularly at high speeds.

35 In a preferred embodiment the steering arms are U-shaped and have side portions carrying bearings in which

the axle ends of the wheelsets are journalled. Preferably each side frame has a pedistal jaw formed at each end thereof and the side portions of the steering arms are disposed in the jaws. Advantageously the means interposed
5 between the side frames and the steering arms are elastomeric devices. The elastomeric devices accommodate such movements of the wheelset-steering arm units which are not restrained by the connecting means.

In a preferred embodiment the connecting means
10 includes a bracket, formed on a middle part of each steering arm, projecting towards the bolster, and linkage means proximately aligned with a lateral axis of the bogie, each end of the linkage means carrying a multi-directional rotation device operatively connected to the steering arm
15 brackets.

A preferred embodiment of the invention will now be described by way of example only and with reference to the accompanying drawings wherein:

FIG. 1 is a plan view of a railroad car bogie
20 incorporating this invention.

FIG. 2 is a side elevational view in partial section of the bogie of FIG. 1.

FIG. 3 is a detailed plan view of a portion of the steering arm of the bogie of FIG. 1 wherein the arms are
25 joined by a connecting device.

FIG. 4 is a cross-sectional view of the connecting device as generally seen along the line 4-4 of FIG. 3.

A railroad car bogie is shown generally at 10 and includes a front wheelset 12 and a rear wheelset 14. The
30 front wheelset 12 has axle ends 16 journaled in front wheel bearings 18 while in a like manner the rear wheelset 14 has axle ends 20 journaled in rear wheel bearings 22. It should be understood that the bogie 10 is bi-directional, and the terms "front" and "rear" are used to more conveniently describe the bogie 10.
35

Fitted over a top portion of each bearing 18, 22

is an adapter. Front adapters are designated 24 and rear adapters 26. The adapters 24, 26 each have an annular boss which projects upwardly from an upper side thereof.

Supported on the front adapters 24 is a front steering arm 28 while the rear adapters 26 carry a rear steering arm 30.

Each of the front and rear steering arms 28, 30 is generally U-shaped and comprises a middle portion 32 connecting with Z-shaped side portions 34. On an underside of each side portion 34 at its outer end 36 is an annular recess which mates with the boss of the adapters 24, 26 so as to join the steering arms 28, 30 with respective wheelsets 12, 14 into a front and a rear wheelset steering arm unit or combination 35, 37.

On an upper surface of each steering arm side portion outer end 36 is an upwardly facing recess 38 in which is fitted an elastomeric device 40. An upper portion of each elastomeric device 40 in turn fits within a downwardly facing recess 42 formed in a roof portion of a front and a rear pedestal jaw 46, 48 of a pair of spaced left, right side frames 50, 52.

Each side frame 50, 52 has a centrally located window 54 to receive an end 56 of a transversely positioned bolster 58. The ends 56 of the bolster 58 are resiliently supported on sets of coil springs 60 in a known manner. FIG. 2 shows one such resilient connection between the side frame 52 and the bolster 58, and it should be understood that connection between the bolster 58 on the side frame 50 is similar.

To dampen vertical oscillating related to coil spring suspension, a pair of friction snubbing devices 62 interacts between the bolster ends 56 and vertical wear plates 64 carried on spaced sides 66 of each side frame window 54.

The bolster 58 includes an integrally formed center plate 68 which connects with a body of the railroad car (not shown) in a known manner. Below the centerplate 68

in the bolster 58 is a cavity 70 providing a clear horizontal passage through a center of the bolster 58. One preferred embodiment of such a bolster center cavity 70 is set forth in U.S. Patent No. 4,114,540. The bogie 5 10 further includes front and rear braking means 72, 74 which is discussed in greater detail subsequently.

On the middle part 32 of the front and rear steering arms 28, 30 is a bracket 76 which forms part of a connecting means 78 between the front and rear 10 wheelset-steering arm units 35, 37. The brackets 76 project into the bolster centre cavity 70 in an opposing manner as is best understood by viewing FIGS. 1 and 3.

Ends 80 of each bracket 76 lie adjacent to and on opposite sides of a vertical plane passing through a longitudinal axis Ld of the bogie 10. Each bracket end 80 is 15 bifurcated into an upper prong 82 and a lower prong 84. Sets of vertically aligned apertures 86, 88 are formed in each upper and lower prong pair 82, 84 of each bracket end 80. When the front and rear wheelset-steering arm units 20 35, 37 are in a squared relationship with respect to the side frames 50, 52 and the bolster 58, the aperture pairs 82, 84 align with a vertical plane which passes through a lateral axis La of the bogie 10.

Pressed into each of the apertures 86, 88 is a bushing 25 90. Horizontally disposed between the upper and lower prongs 82, 84 of each bracket end 80 is an elongated linkage bar 92. Apertures 94, 96 are formed adjacent to ends of the bar 92 and are so positioned to align with the apertures 86, 88 in the upper and lower prongs 82, 84 30 respectively.

In each bar aperture 94, 96 is a spherical bearing set 98 comprising an inner element 100 and an outer element 102. The outer element 102 has a circular outer wall 104 to fit snugly within the bar apertures 94, 96 and a 35 concave spherical inner wall 106. The inner wall 106 engages in a complementary manner with a convex spherical-shaped outer wall 108 of the inner bearing element 100.

The inner bearing element further includes an inner circular passage 110.

Disposed through each bushing 90 and through the inner passage 110 of each bearing set 98 is a pin 112. Each pin 112 has an enlarged head 114 to limit downward
5 movement and a lower cotter pin aperture 116. A cotter pin 118 may be conveniently disposed through lower pin aperture 114 after assembly to limit upward movement of that pin 112.

Dynamic and static forces occurring during operation
10 of the bogie 10 result in the wheelset-steering arm units 35, 37 tending to move rotationally and linearly in all three directions. Because these forces vary in direction and magnitude, the actual movements of the wheelset-steering arm units 35, 37 are largely unpredictable.
15 However, the structure of the bogie 10 is such that these multi-directional movements may be accommodated between sets limited and selectively regulated to the degree that certain movements are predictable.

As may be more easily understood by viewing FIG. 4,
20 either wheelset-steering arm unit 35, 37 may move linearly in an vertical direction, pitch or roll without such movements being impeded by the connecting device 78. Such movements of each unit 35, 37 are independant of each other, that is each unit 35, 37 is not restrained by the
25 other through the connecting device 78. Thus, wheelset 12, 14 of either unit 35, 37 may move aligned position with the track over which the wheelset 12, 14 is in contact to accommodate for variation in track direction and rail height.

However, certain linear horizontal movements and
30 yawing movements of the wheelset-steering arm units 35, 37 are restrained by the connecting device 78. For example, all horizontal movements of the units 35, 37 which are in opposite directions and which align with the lateral axis La of the bogie 10 are inhibited by the connecting device
35 78. Likewise, yawing movements of the units 35, 37

which are in the same rotational direction are inhibited by the connecting device 78. Yawing of the wheelset-steering arm units 35, 37 occurs when the bogie 10 proceeds about a curved section of track. Furthermore, such yawing movements of the units 35, 37 are maintained in opposite rotational directions by the connecting device 78.

Inhibiting yawing movement in the same rotational direction of the units 35, 37 is particularly important to maintain proper dynamic stability of the bogie 10. For example, during travel, the side frame 50, 52 tends to lozenge, i.e. the side frames 50, 52 remain parallel but move to a longitudinally offset position, under dynamically induced forces. For lozenging to occur both wheelset-steering arm units must yaw in the same rotational direction. Lozenging reduces the critical speed of the bogie 10 wherein the wheelsets 12, 14 tend to hunt, i.e. dynamically induced oscillating about a vertical axis of each wheelset. The connecting device 78 prohibits such yawing in the same rotational direction. Thus, the side frames 50, 52 are inhibited from lozenging which in turn maintains the critical speed above that which the bogie 10 and associated railroad car body is expected to travel.

On the other hand, horizontal movements of the units 35, 37 which are aligned with the longitudinal axis 1d of the bogie 10 are not restrained by the connecting device 78. Such movements occur when the front and rear braking means 72, 74 are activated.

The braking means 72, 74 is conventional in nature and includes a brake beam 120 with brake shoes 122 supported from outer ends of such for engagement with the front and rear wheelsets 12, 14. Each brake beam 120 pivotally connects with a lower end 124 of a brake lever 126. A tie rod 128 pivotally joins a center portion 130 of each lever 126. An upper end 132 of one brake lever 126 may be pivotally joined to a body of the railroad car (not

shown) while the upper end 132 of the other brake lever 126 is operatively connected to a power device (not shown) by a connecting rod 134.

Movement of the connecting rod 134 in the direction
5 opposite the arrow D in FIG. 1 forces the brake shoes 122 against the wheelsets 12, 14 to move the units 35, 37 slightly apart. These slight movements of the units 35, 37 in opposite directions are not inhibited by the connecting device 78.

10 Proper mechanical operation of the connecting device 78 is enhanced by placing the device 78 within the protective environment provided by the bolster center cavity 70. Further, by locating the spherical bearing sets 98 of the linkage bar 92 between the upper and lower
15 prongs 82, 84 of each bracket end 80, the bearing sets 78 are shielded from foreign matter associated with railroad car travel.

Likewise, the connecting device 78 may be readily assembled or disassembled to allow periodic maintenance.
20 However, because the connecting device 78 allows each wheelset-steering arm unit 35, 37 to move in a number of directions without regulation of those movements, the connecting device 78 is not unduly subject to the dynamic forces causing those movements. Thus, the connecting device
25 78 may remain reasonably maintenance free.

A further advantage provided by the connecting device 78 is that it is reasonably fail safe from disassembly. For such disassembly to occur, one of the pins 112 must become disassociated from the linkage bar 92. Downward
30 movement of each pin 112 is limited by the pin head 114. Upward movement of the pin 112 can only occur upon failure of the cotter pin 118 and application of a sufficient force over an opposite gravitational force to cause a lower end of the pin 112 to move above the linkage bar 92.
35 The likelihood of both such events occurring is slight indeed.

While various minor modifications may be suggested

by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of our contribution to the art.

CLAIMS

1. A railroad car bogie (10) including, a pair of spaced side frames (50,52), a bolster (58) positioned transversely between said side frames (50,52) and having ends supported resiliently in windows (54) formed in each said side frame (50,52), spaced front and rear wheelsets (12,14) connected to said side frames (50,52) through a front and rear steering arm (28,30) respectively connected with each wheelset (12,14) to form front and rear wheelset-steering arm units (35,37), said units being disposed on opposite sides of said bolster (58), means (40) interposed between said side frames (50,52) and said steering arms (28,30) to allow said units (35,37) to move relative to said frames (50,52) selectively in multi-directions as a reaction to dynamic forces created by travel of said bogie (10), and connecting means (78) joining said units (35,37), said connecting means (78) allowing said wheelset-steering arm units to pitch and roll independently of one another and inhibiting yawing movements of said units (35,37) which are in the same rotational direction and horizontal lateral movements of said units (35,37) which are in opposite directions.

2. A railroad car bogie (10) as claimed in claim 1 wherein said steering arms (28,30) are U-shaped.

3. A railroad car bogie (10) as claimed in claim 1 or 2 wherein side portions (34) of said steering arms (28,30) carry bearings (18,22) in which axle ends (16) of said wheelsets (12, 14) are journaled.

4. A railroad car bogie (10) as claimed in claim 3 wherein each said side frame (50,52) has a pedestal jaw (46,48) formed at each end thereof and the side portions (34) of said steering arms (28,30) are disposed in said jaws (46,48).

5. A railroad car bogie (10) as claimed in any of claims 1 to 4 wherein the means interposed between said side frames (50,52) and said steering arms (28,30) are

elastomeric devices (40).

6. A railroad car bogie (10) as claimed in any of claims 1 to 5 wherein said connecting means (78) includes a bracket (76) formed on a middle part (32) of each said steering arm (28,30) and projecting towards said bolster (58), linkage means (92) proximately aligned with a lateral axis (La) of said bogie (10), and a multi-directional rotation device (98) carried one each at ends of said linkage means (92) and operatively connected to said steering arm brackets (76) respectively.

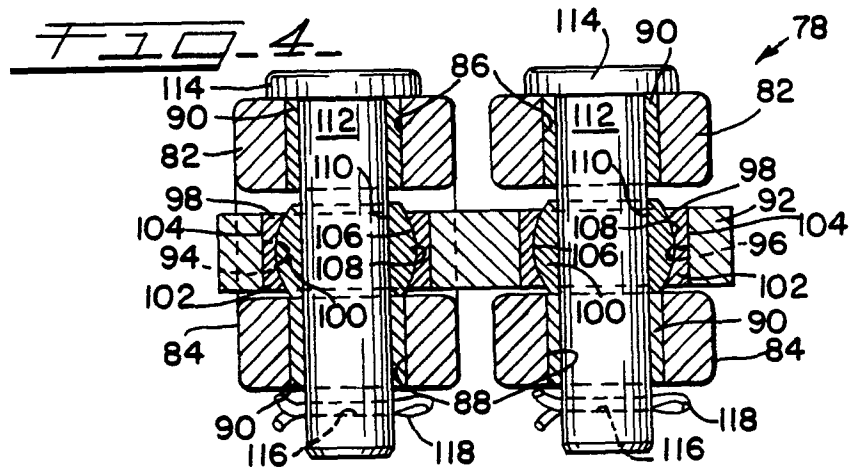
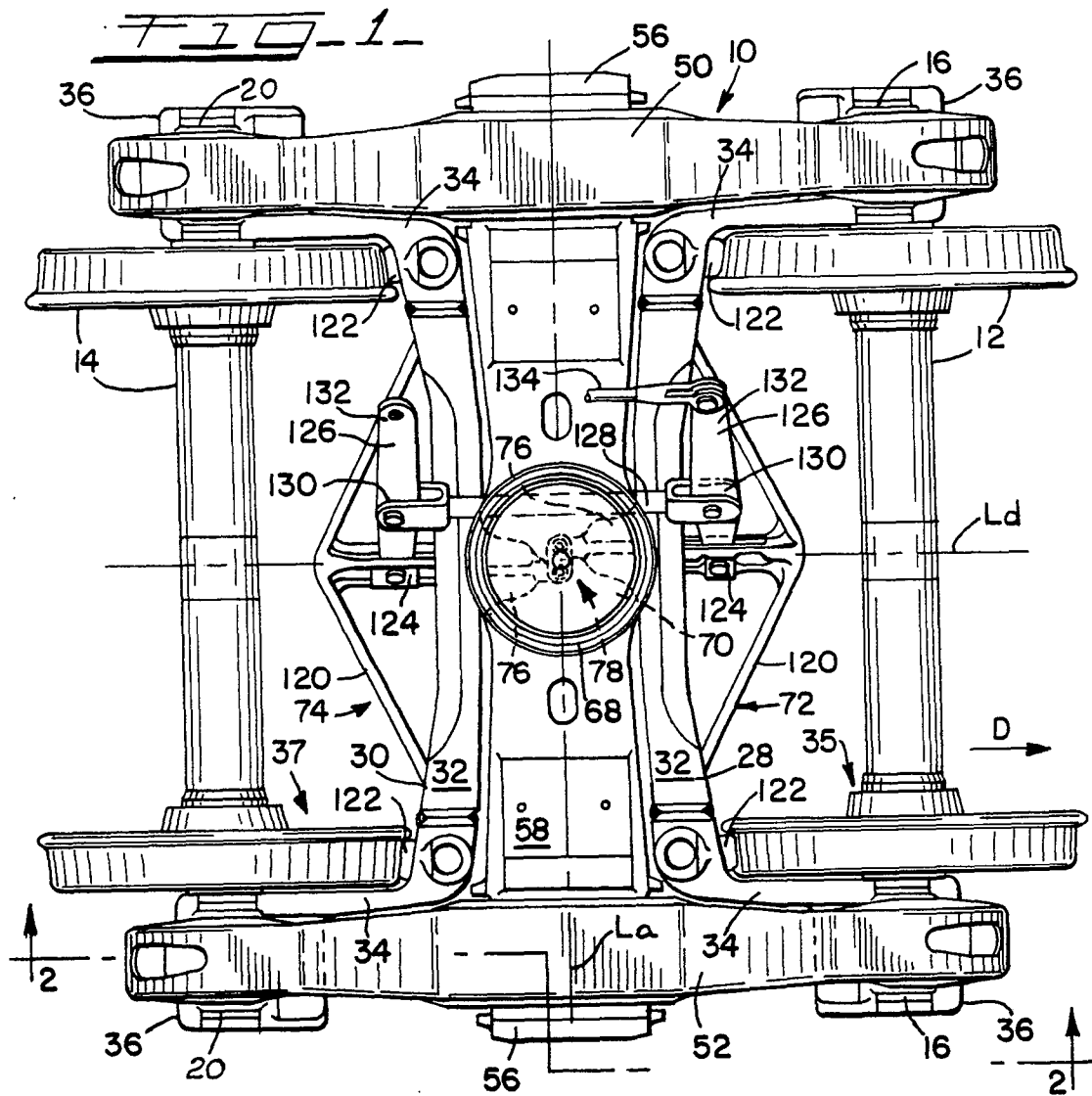
7. A railroad car bogie (10) as claimed in claim 6 wherein said brackets (76) project into a clear passage (70) formed in said bolster (58).

8. A railroad car bogie (10) as claimed in claim 6 or 7 including an upper and lower prong (82,84) comprising a prong set formed at an end of each said bracket (76), said prong sets (82,84) having vertically aligned apertures (86,88) formed therein, said apertures (86,88) in each said set (82,84) being substantially laterally aligned upon said wheelset-steering arm units (35,37) being in a squared relationship with said side frames (50,52), said linkage means comprising an elongated linkage bar (92) with ends disposed respectively between said upper and lower prongs of said prong sets (82,84), bearing means (98) having elements (100, 102) to allow rotational movements therebetween, one each of said bearing means (98) disposed in an aperture (94,96) formed in an end of said linkage bar (92), and pin means (112,114,118) disposed one each in said prong set apertures (86,88) and through said bearing means (98).

9. A railroad car bogie (10) as claimed in claim 8 including bushing means (90) disposed in each of said prong set apertures (86,88), and wherein said bearing means (98) comprises spherical bearing sets (98) disposed one each in said linkage bar apertures, each said bearing set including an outer element (102) having a concave

spherical-shaped inner wall (106) mating in a complementary manner with a convex spherical-shaped outer wall (108) of an inner element (100) of said bearing set (98), and wherein said pin means (112,114,118) comprises pins (112) disposed one each in said bushing means (90) carried by said upper and lower prong in each said bracket (76) and through a circular passage (110) formed in each said spherical bearing inner element (100), each said pin (112) having an enlarged head (114) to limit downward movement of such by engagement with said upper prong (82) respectively and a lower detachable retaining device (118) to allow selective upward movement of said pin (112) and provide ready disassembly of said connecting means (78).

10. A railroad car bogie (10) as claimed in any of the preceding claims including a braking means (72,74) carriable by said bogie (10) independent of said bogie steering arms (28,30), said braking means (72,74) including: a front brake beam (120) having brake shoes (122) carried at outer ends thereof for engagement with said front wheelset (12), a rear brake beam (120) having brake shoes (122) carried at outer ends thereof for engagement with said rear wheelset (14), a front and rear elongated brake lever (126) each having a lower end (124) pivotally connected to said front and rear brake beams (120) respectively, an elongated tie rod (128) disposed between said brake levers (126) and pivotally joined with a middle portion (130) of each said lever (126), and an upper end (132) of said front brake lever (126) prepared for operative connection to a power device and an upper end (132) of said rear brake lever (126) prepared for attachment independent of said bogie (10), whereupon activation of said power device causes said brake shoes (122) to engage said wheelsets (12,14) and cause said wheelsets (12,14) to move longitudinally apart, said movement being uninhibited by said connecting means (78).



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