June 23, 1970 R. L. LICH 3,516,365

MOTORIZED RAILWAY CAR TRUCK

Filed March 27, 1968 4 Sheets-Sheet 1

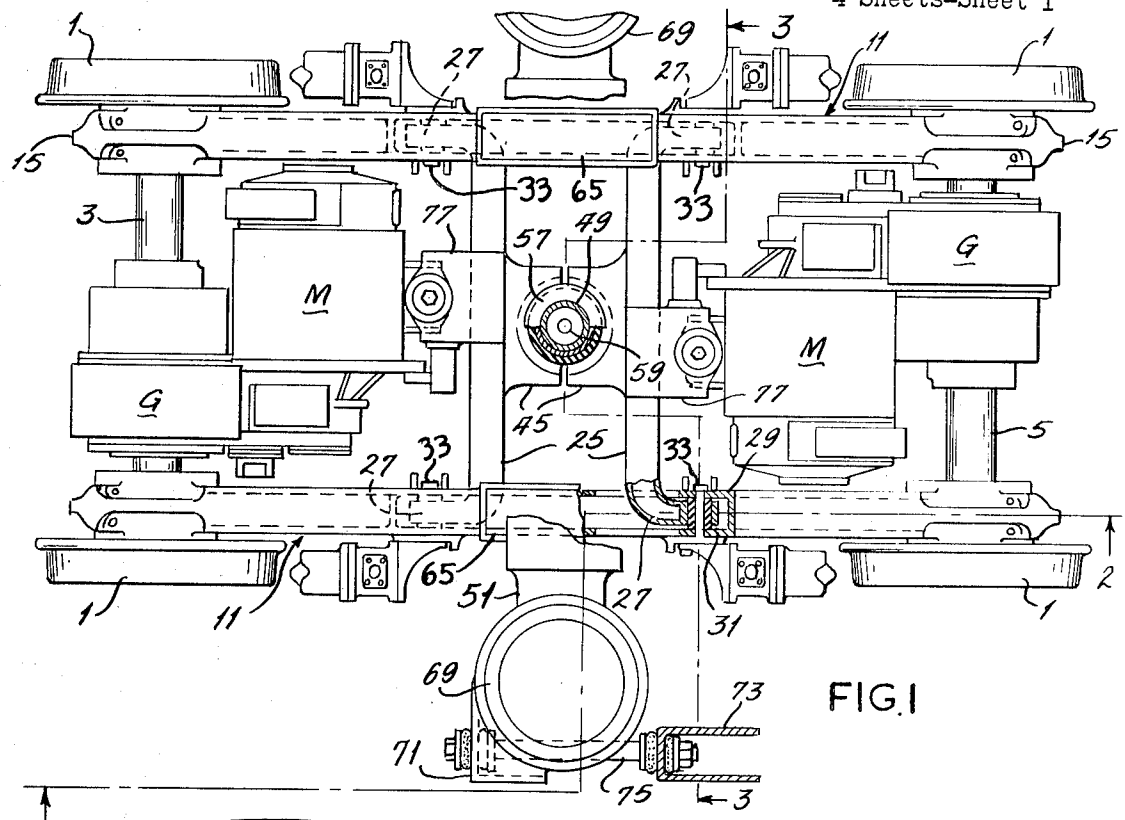

FIG.1

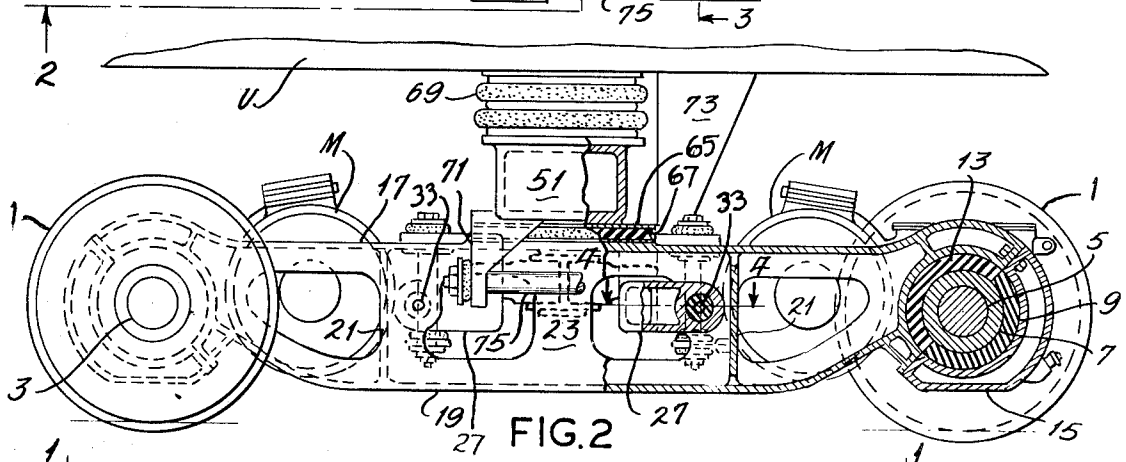

FIG.2

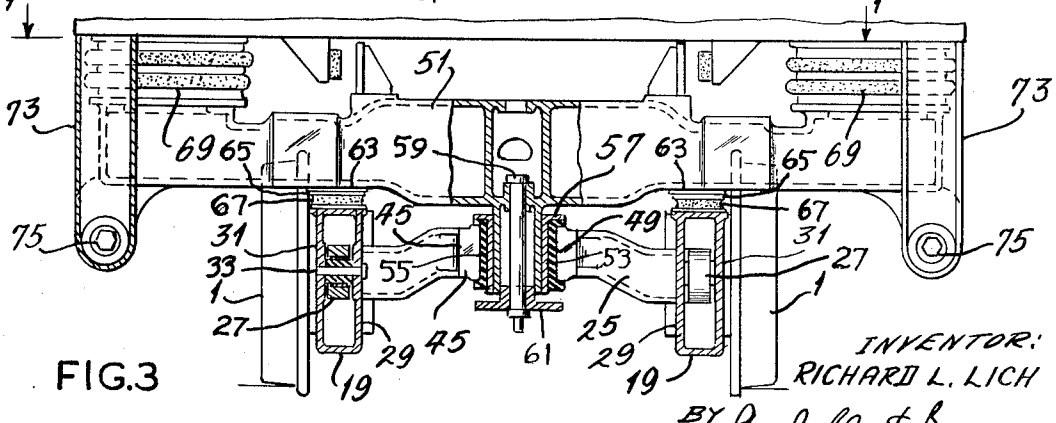

FIG.3

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MOTORIZED RAILWAY CAR TRUCK

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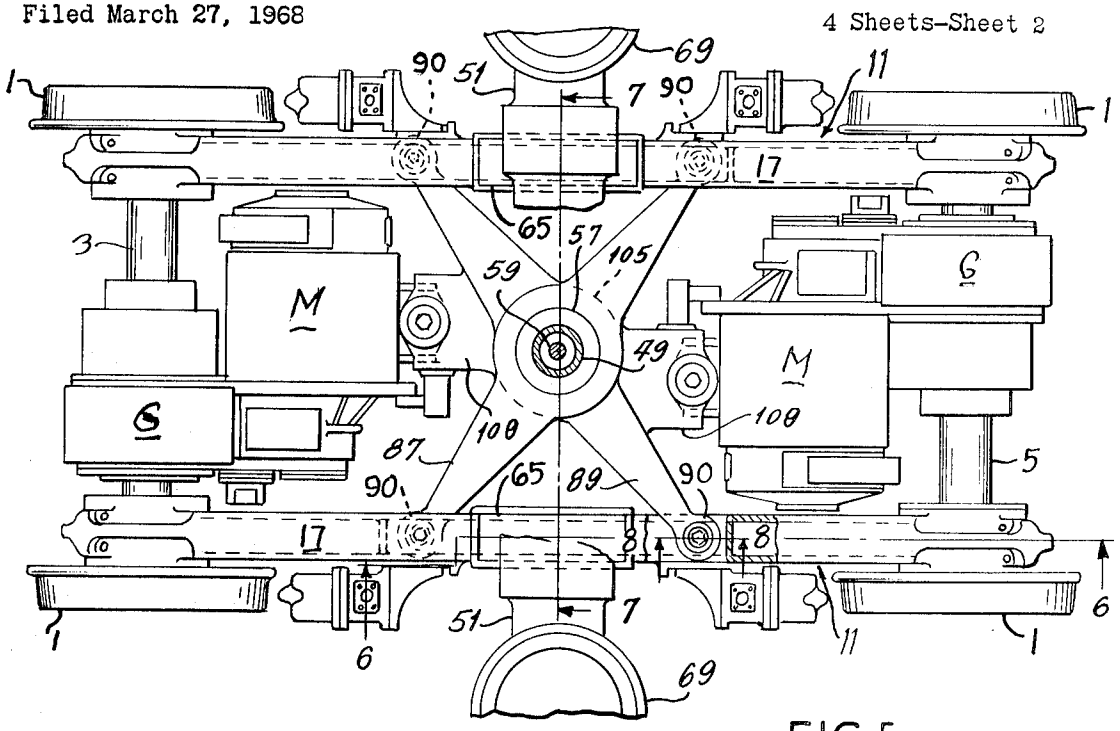

FIG. 5

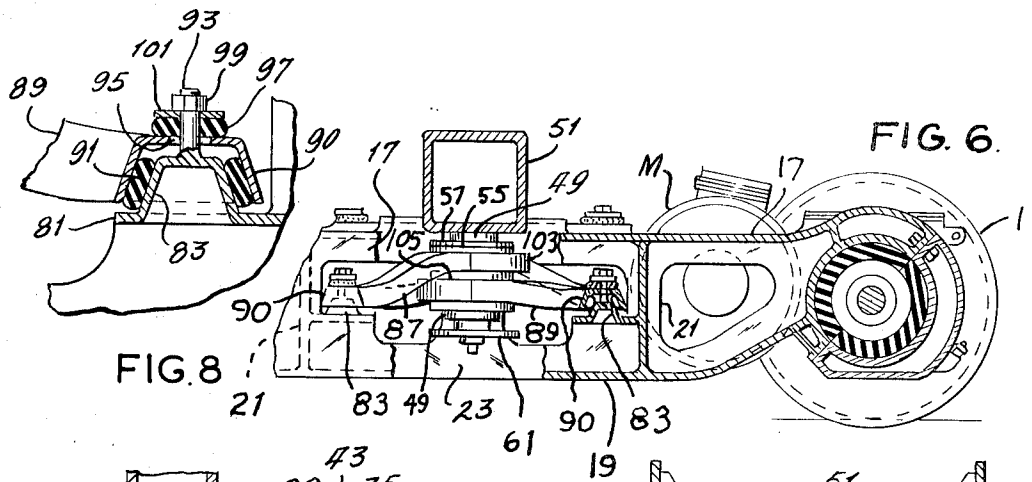

FIG. 6.

FIG. 8

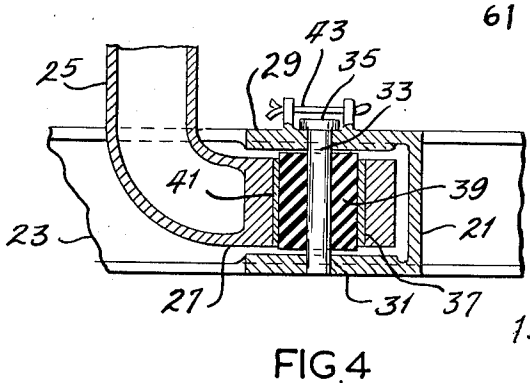

FIG. 4

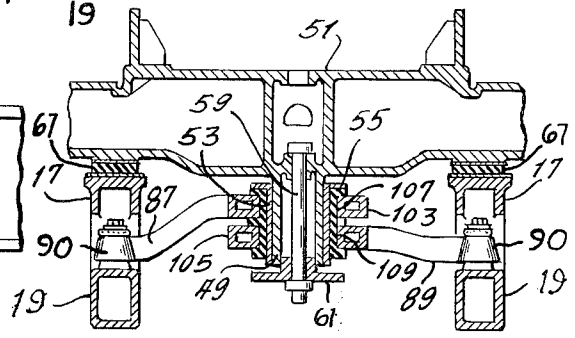

FIG. 7

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MOTORIZED RAILWAY CAR TRUCK

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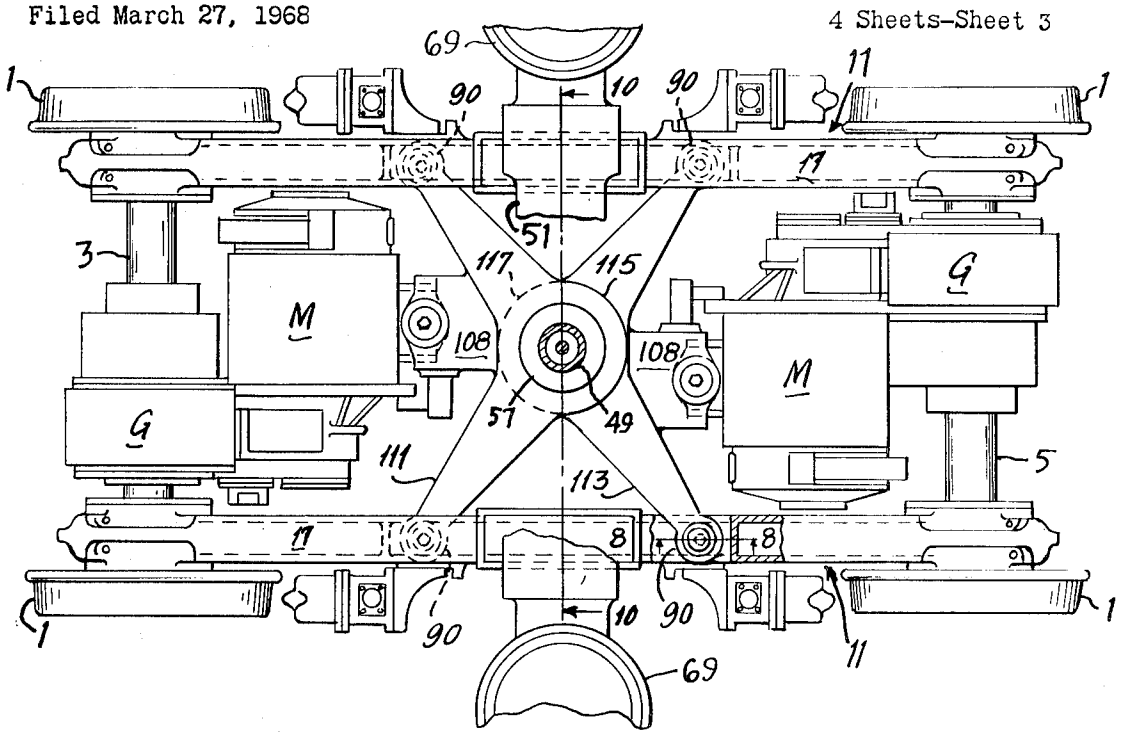

FIG.9

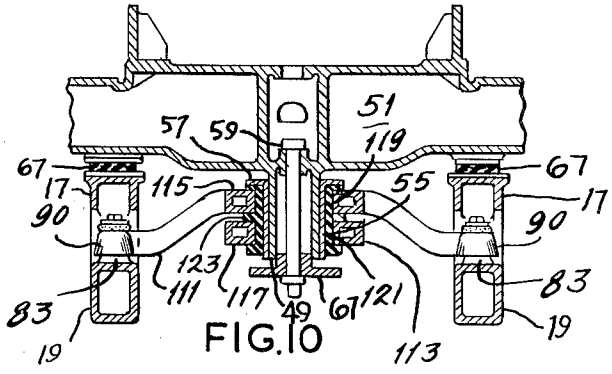

FIG.10

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MOTORIZED RAILWAY CAR TRUCK

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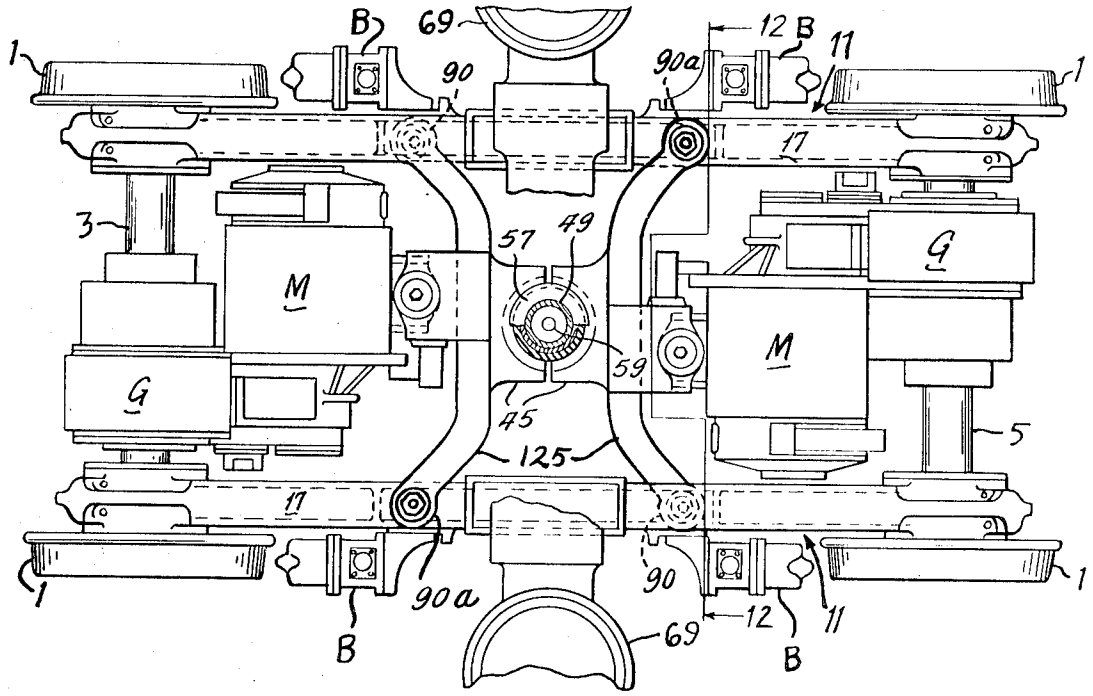

FIG. 11

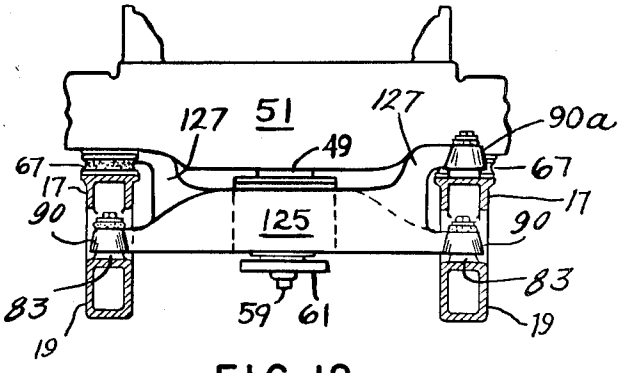

FIG. 12

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United States Patent Office

3,516,365

Patented June 23, 1970

3,516,365

MOTORIZED RAILWAY CAR TRUCK

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Filed Mar. 27, 1968, Ser. No. 716,404

Int. Cl. B61c 9/50; B61f 3/04

U.S. Cl. 105—133 23 Claims

ABSTRACT OF THE DISCLOSURE

A railway vehicle two-axle truck having separate side frames supported at their ends on the axles and a pair of vertically unloaded transverse members each resiliently supported from both side frames and cooperating to pivotally receive a depending central vertical pivot boss on a transverse load-supporting bolster supported directly on the side frames, the bolster pivot boss and the transverse members cooperating with each other to maintain the side frames in tram while freely permitting longitudinal vertical tilting movements of the side frames with respect to each other.

FIELD OF THE INVENTION

The invention relates to railway rolling stock and consists particularly in a two-axle railway vehicle truck of the type in which a bolster, mounting body-support springs, is swivelly supported on truck framing carried by the axles.

DESCRIPTION OF THE PRIOR ART

In railway trucks of the type in which the bolster is swivelly supported on the truck frame and mounts body-support springs, the bolster is usually supported at the center of the frame by a pivot bearing, as for example, in U.S. Pat. 2,877,719, and the frame has pedestal jaws at its corners to receive the axle boxes and is supported on springs carried by the axle boxes or by equalizing bars seated on the axle boxes. This construction requires a heavy transverse frame member because of the high bending moment caused by the central support thereon of the bolster, and the weight of the frame is also increased by the use of pedestal jaws to position the axle boxes.

SUMMARY OF THE INVENTION

The invention provides a very light weight, yet positively trammed and fully equalized truck suitable for high speed passenger service, by mounting separate side frames directly on the axle boxes, resiliently supporting a pair of transverse members each at their opposite ends from one of the side frames, forming each of the transverse members with a concave vertical pivot element at its center, supporting a transverse bolster on the side frames and matingly inserting a pivot boss depending from the center of the bolster in the concave pivot elements of the transverse members to fix the latter against movement transversely of the truck with respect to each other.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of one embodiment of the invention, horizontally sectionalized along line 1—1 of FIG. 3.

FIG. 2 is a side elevation view partially longitudinally vertically sectionalized along line 2—2 of FIG. 1.

FIG. 3 is a transverse vertical sectional view along line 3—3 of FIG. 1.

FIG. 4 is an enlarged horizontal sectional view along line 4—4 of FIG. 2.

FIG. 5 is a plan view of another embodiment of the invention.

FIG. 6 is a fragmentary longitudinal vertical sectional view along line 6—6 of FIG. 5.

FIG. 7 is a transverse vertical sectional view along line 7—7 of FIG. 5.

FIG. 8 is an enlarged longitudinal vertical sectional view along line 8—8 of FIG. 5.

FIG. 9 is a plan view of a third embodiment of the invention.

FIG. 10 is a transverse vertical sectional view along line 10—10 of FIG. 9.

FIG. 11 is a plan view of a fourth embodiment of the invention.

FIG. 12 is a transverse vertical sectional view along line 12—12 of FIG. 11.

In FIGS. 1–4, the numeral 1 refers to flanged railway wheels, mounted in spaced pairs on the ends of spaced axles 3 and 5. Axles 3 and 5 rotatably mount journal boxes 7 inwardly of wheels 1. Journal boxes 7 are surrounded by elastomeric bushings 9. Transversely spaced, longitudinally extending side frames 11 are supported on the axles at their ends, which are formed with channel section semicircular apertures 13, into which bushings 9 and journal boxes 7 are locked by semicircular end clamps 15 of similar cross section.

Side frames 11 are of truss configuration having vertically spaced top chords 17 and bottom chords 19 merging at their ends and connected intermediate their ends by upright columns 21, 23 and 21 arranged symmetrically lengthwise of the side frame.

For tying side frames 11 together, maintaining them in tram, and providing a swivel center for the truck, while permitting unobstructed limited tilting of the side frames longitudinally of the truck, a pair of longitudinally spaced transverse members, or cross-ties 25, 25 formed with short end portions 27 extending outwardly longitudinally of the truck are individually connected by the latter to side frame columns 21. To effect the last-named connection, each of the side frame columns 21 includes inner and outer longitudinal vertical webs 29 and 31, both transversely perforated at 33 to receive a pin 35, and each end portion 27 of cross-ties 25 is formed with a transverse cylindrical aperture 37 substantially larger than pin 35. To provide for limited pivotal movement of each cross-tie end 27 with respect to the side frames, a bushing assembly comprising an elastomeric bushing 39 with a metal sleeve 41 is press-fitted into aperture 37, surrounding pin 35, which upon insertion through the aligned side frame perforations 33 and the bushing aperture, is suitably retained in place by a cotter pin 43.

The central portions of cross-ties 25 are formed with opposing projections 45 extending toward each other longitudinally of the truck with their transverse faces 46 spaced slightly from each other and each of the projections has, in its transverse face 46, a vertical, semicylindrical recess 47, recesses 47 being coaxial with each other and cooperating to pivotally receive a vertical cylindrical boss 49 depending from the center of bolster 51. To permit cross-tie 25 to tilt transversely of the truck with re-

spect to each other, as required by the differential longitudinal tilting of side frames **11**, boss **49** is of substantially less diameter than recesses **47** and pivotally fits into a cylindrical bearing sleeve **53**, between which and the walls of recesses **47** is positioned an elastomeric bushing **55** outwardly flanged along its top and bottom margins to fit closely on projections **45**. The upper margin of sleeve **53** is also outwardly flanged at **57** to support the sleeve on the upper surface of bushing **55**. For preventing vertical separation of bolster boss **49** from recesses **47**, a center pin **59** depends from the bolster through boss **49** and supports, on its lower end projecting therefrom a retainer disk **61** which underlies cross-tie projections **45** and is spaced vertically from the bottom thereof to avoid interference with the differential tilting movements of the two cross-ties **25**.

Bolster **51** extends transversely in both directions from boss **49**, across side frames **11**, on the top chords of which it is supported by downwardly facing side bearings **63**, slidably resting on upwardly facing side bearing plates **65** carried by resilient pads **67** on the side frame top chords. With this arrangement, the bolster load is transmitted directly into the side frames and thence to the axles, freeing cross-ties **25** of any vertical load and permitting them to be of correspondingly light construction. The resilient pads **67** provide continuous vertical support of the bolster without interference by it with the necessary equalizing tilting movement of the side frames lengthwise of the truck.

At its ends, outboard of the side frames, bolster **51** mounts upright flexible-wall pneumatic springs **69** on which vehicle body underframe U is supported for limited vertical and lateral movement with respect to bolster **51**. For transmitting longitudinal draft and braking forces between the truck and vehicle body, transverse plate-like brackets **71** and **73** depend from the bolster ends and from the underframe respectively at both sides of the truck and are connected to each other by longitudinally extending anchor links **75**, which are arranged for limited universal pivoting about their end connections, to freely accommodate the relative vertical and lateral movements of the underframe and the truck.

It will be evident from the foregoing description that, as viewed in plan, bolster boss **49** and the connections at **33** between cross-ties **25** and side frames **11** define a nondeformable figure, whereby the side frames are continually maintained in perpendicular relation with the axles; i.e., the truck is maintained in tram.

The truck may include, in the spaces between axles **3** and **5** and the adjacent cross-ties **25**, traction motors M drivingly connected to and supported on the adjacent axles by gear boxes G and associated bearings. For supporting the sides of motors M remote from axles **3** and **5**, cross-ties **25** constituting a transom are provided with brackets **77** supportingly connected to the motor nose portions.

In the second embodiment of the invention, illustrated in FIGS. 5–7, elements similar to those of the first embodiment are designated by the same reference characters. This embodiment differs from that of FIGS. 1–4 principally in the structure by which side frames **11** are interconnected and which form the pivot center for the bolster. Side frame columns **21** are formed with transverse horizontal webs **81** projecting inwardly longitudinally of the truck and webs **81** are formed with upwardly directed frusto-conical portions **83**, to the upper surface of which is secured an upwardly directed stud **85**. A pair of cross-ties **87** and **89** are formed with downwardly open inverted cups **90** at their opposite ends for overlying receipt of diagonally opposite frusto-conical portions **83** of the opposite side frames. Toroidal elastomeric cushions **91** are interposed between the opposing surfaces of frusto-conical portions **83** and cross-tie end cups **90** to support the cross-ties on the side frames and permit some slight pivotal movements of the side frames with respect to the cross-

ties about transverse and longitudinal axes. For holding cross-ties **87** and **89** in assembled relation with side frames **11**, each frusto-conical portion **83** mounts an upwardly directed stud **85**, which extends through a hole **95** of larger diameter in the top of each cup **90**, and an annular elastomeric pad **97** surrounding stud **85** is compressed against the top surface of cup **90** by a nut **99** and washer **101** mounted on the stud. With this arrangement, all necessary pivoting between the side frames and cross-ties is permitted, without any metal-to-metal contact and consequent wear.

The central portion **103** of cross-tie **87** is upwardly arched to pass over the central portion **105** of cross-tie **89** with some vertical clearance, and both central portions are enlarged and are centrally vertically cylindrically apertured as at **107** and **109** respectively. Apertures **107** and **109** are vertically aligned and mount, by means of an elastomeric bushing **55**, a metal bearing sleeve **53** in which is pivotally received pivot boss **49** of bolster **51**. For supporting traction motors M, brackets **108** are connected respectively to cross-ties **87** and **89**.

Operation of the embodiment of FIGS. 5–8 is similar to that of the first embodiment, except that the differential longitudinal tilting of the side frames with respect to each other is accommodated by some diagonal tipping of the crossed diagonal cross-ties **87** and **89** relative to each other permitted by the compressibility of elastomeric sleeve **55** and by some longitudinal and transverse pivoting movements between cross-ties **87** and **89** and the side frames, permitted by the shear in the toroidal cushions **91**.

In the third embodiment of the invention, illustrated in FIGS. 9 and 10, elements common to the first and/or second embodiments are designated by the same reference characters. In this embodiment, instead of the cross-ties of the previous embodiments, a pair of V-shaped (in plan) cross-ties **111** and **113** are formed at their opposite ends with inverted cups **90**, which are mounted on and connected to corresponding frusto-conical projections **83** on side frame columns **21**, in the manner illustrated in FIG. 8. The central portions **115** and **117** of cross-ties **111** and **113** respectively are enlarged and formed with vertical cylindrical apertures **119** and **121**. Cross tie **111** is arched sufficiently to permit its central portion **115** to overlap central portion **117** of cross-tie **113**, with some vertical clearance between the two central portions, and with apertures **119** and **121** in vertical alignment to receive elastomeric bushing **53**, and bearing sleeve **55**. For assuring continued vertical separation between central portions **115** and **117**, an annular elastomeric pad **123** may be interposed between the opposing horizontal faces of cross-tie central portions **115** and **117**. Bolster boss **49** is pivotally received in bearing sleeve **55**, as in the previous embodiments, and the bolster is similarly supported on the side frames.

In operation, the truck illustrated in FIGS. 9 and 10 is similar to those of the previously illustrated and described embodiments, except for the action of the cross-ties **111** and **113**. As side frames **11** tilt longitudinally with respect to each other, they pivot slightly about their connections to cross-ties **111** and **113**, on transverse and longitudinal axes and the cross-ties are permitted to tilt transversely of the truck with respect to each other and to bolster pivot boss **49** by the compressibility of elastomeric bushing **55** and annular pad **123**.

In the fourth embodiment of the invention, illustrated in FIGS. 11 and 12, elements common to the above-disclosed embodiments are designated by the same reference characters. In general, this embodiment resembles that of FIGS. 1–4 except that the transverse members or cross-ties **125** are formed at their ends with inverted cup-shaped terminals **90** overlying the side frame bottom chords **19**, as illustrated in FIG. 8, and one end of each cross-tie is vertically bifurcated to provide a second inverted cup-shaped terminal **90***a* overlying one of the side frame top

chords 17, such that the cross-ties 125 may be connected respectively, in the manner shown in FIG. 8, to opposite side frames at vertically spaced points through cup-like terminals 90*a* and to the other side frame at a single point through cup-like terminals 90.

Operation of this embodiment is similar to that of FIGS. 1–4 except that in the present embodiment the vertical spacing of the end connections of the cross-ties respectively to opposite side frames opposes tilting of the side frame transversely and thus resists braking torque applied to the side frames by package brake units B mounted on the side frames and equipped with wheel-tread engaging brake shoes. The single connection of each of the cross-ties 125 to the other side frames permits all transverse and longitudinal tilting required for equalization.

The details of the trucks disclosed herein may be varied substantially without departing from the spirit of the invention and the exclusive use of such modifications as come within the scope of the appended claims is contemplated.

What I claim is:

1. A railway vehicle truck comprising a pair of wheeled axles, separate transversely spaced longitudinally extending side frames supported at their ends on said axles, a pair of separate rigid continuous transverse members pivotally connected respectively at their opposite ends to said side frames for independent movement of each respectively about longitudinal and transverse axes with respect to at least one of said side frames, the connections of said transverse members to said side frames being spaced apart longitudinally of said side frames, both said transverse members being formed with cooperating central apertures, a load-supporting bolster swivelly supported on said side frames and having a central vertical pivot boss pivotally received in said cooperating apertures, there being means between said apertures and said boss to permit slight vertical tilting of said transverse members with respect to each other while preventing substantial relative movements of said transverse members in the horizontal plane whereby the cooperating central apertures and the connections of said transverse members to said side frames define horizontally rigid triangles preventing substantial movements in the horizontal plane of said side frames with respect to each other.

2. A railway vehicle truck according to claim 1 in which said means between said apertures and boss comprises a resilient bushing.

3. A railway vehicle truck according to claim 1 including vertically resilient means supporting said bolster on said side frames.

4. A railway vehicle truck according to claim 1 wherein each said side frame has transversely spaced vertical webs and said transverse members have end portions disposed between said side frame webs, said webs and said end portions having aligned transverse openings, a pin passing through said aligned openings, said end portion opening being substantially larger than said pin, and a bushing of elastomeric material surrounding said pin within said end portion opening.

5. A railway vehicle track according to claim 1 including substantially upright conical surfaces on said side frames, the end portions of said transverse members being formed with mating conical recesses, an annulus of elastomeric material being compressed between each of said conical surfaces and recesses.

6. A railway vehicle truck according to claim 5 including means securing said end portions to said side frames to prevent vertical separation therebetween.

7. A railway vehicle truck according to claim 1 including separate motors individually drivingly connected to each of said axles and means supporting each said motors individually from one of said transverse members.

8. A railway vehicle truck according to claim 1 wherein said side frames are of truss shape having spaced upper and lower chords and a pair of upright columns connecting said chords between said axles, the connections of said transverse members to said side frames being effected through said columns.

9. A railway vehicle truck according to claim 1 wherein each of said transverse members is connected to the opposite side frames at points correspondingly disposed longitudinally of said side frames.

10. A railway vehicle truck according to claim 9 wherein said transverse members are parallel to each other and their central apertures are of substantially semicylindrical shape formed in their opposing transverse surfaces.

11. A railway vehicle truck according to claim 10 wherein each said side frame has transversely spaced vertical webs, and said transverse members have their terminals bent to extend longitudinally of the truck between said side frame webs, said webs and said terminals having aligned transverse openings, a pin passing through said aligned openings, said terminal openings being substantially larger than said pin, and a bushing of elastomeric material surrounding each said pin within each said terminal opening.

12. A railway vehicle truck according to claim 10 including a cylindrical metal sleeve surrounding said bolster boss and positioned within said resilient bushing means.

13. A railway vehicle truck according to claim 12 wherein said sleeve is formed with a radial flange at its upper end overlying the upper surfaces of said transverse members.

14. A railway vehicle truck according to claim 1 wherein said transverse members have central portions in respectively overlying and underlying relation with each other.

15. A railway vehicle truck according to claim 14 in which the central portions of said transverse members are offset toward each other longitudinally of the truck from their end portions.

16. A railway vehicle truck according to claim 15 in which said transverse members are of V-shape in plan.

17. A railway vehicle truck according to claim 14 in which said cooperating apertures are each of vertical cylindrical shape and are in vertical alignment with each other.

18. A railway vehicle truck according to claim 17 wherein each of said transverse members is connected to the opposite side frames at points disposed diagonally of the truck with respect to each other.

19. A railway vehicle truck according to claim 17 wherein said transverse members cross each other substantially at the center of the truck.

20. A railway vehicle truck according to claim 1 wherein said transverse members are connected at one end respectively to opposite side frames at points spaced apart vertically, and at their other end to the other side frames at a single point.

21. A railway vehicle truck according to claim 20 wherein said side frames are trusses having vertically spaced upper and lower chords, said vertically spaced connections being connected respectively to said upper and lower chords.

22. A railway vehicle truck according to claim 21 in which said connections comprise substantially upright conical surfaces on said side frame chords, the extremities of said transverse members being formed with mating conical recesses, an annulus of elastomeric material being compressed between each of said conical surfaces and recesses, and means resiliently retaining said mating conical surfaces and recesses in assembled relation.

23. A railway vehicle truck according to claim 20 wherein each of said transverse members is connected to opposite side frames at points correspondingly disposed longitudinally of the truck and said transverse members are generally parallel to each other with their

central apertures substantially semicylindrical and formed in their opposing surfaces.

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U.S. Cl. X.R.

105—182, 197, 199, 200, 208.1, 208.2