June 12, 1962 R. N. JANEWAY 3,038,416

BOLSTER CENTERING LINKAGE

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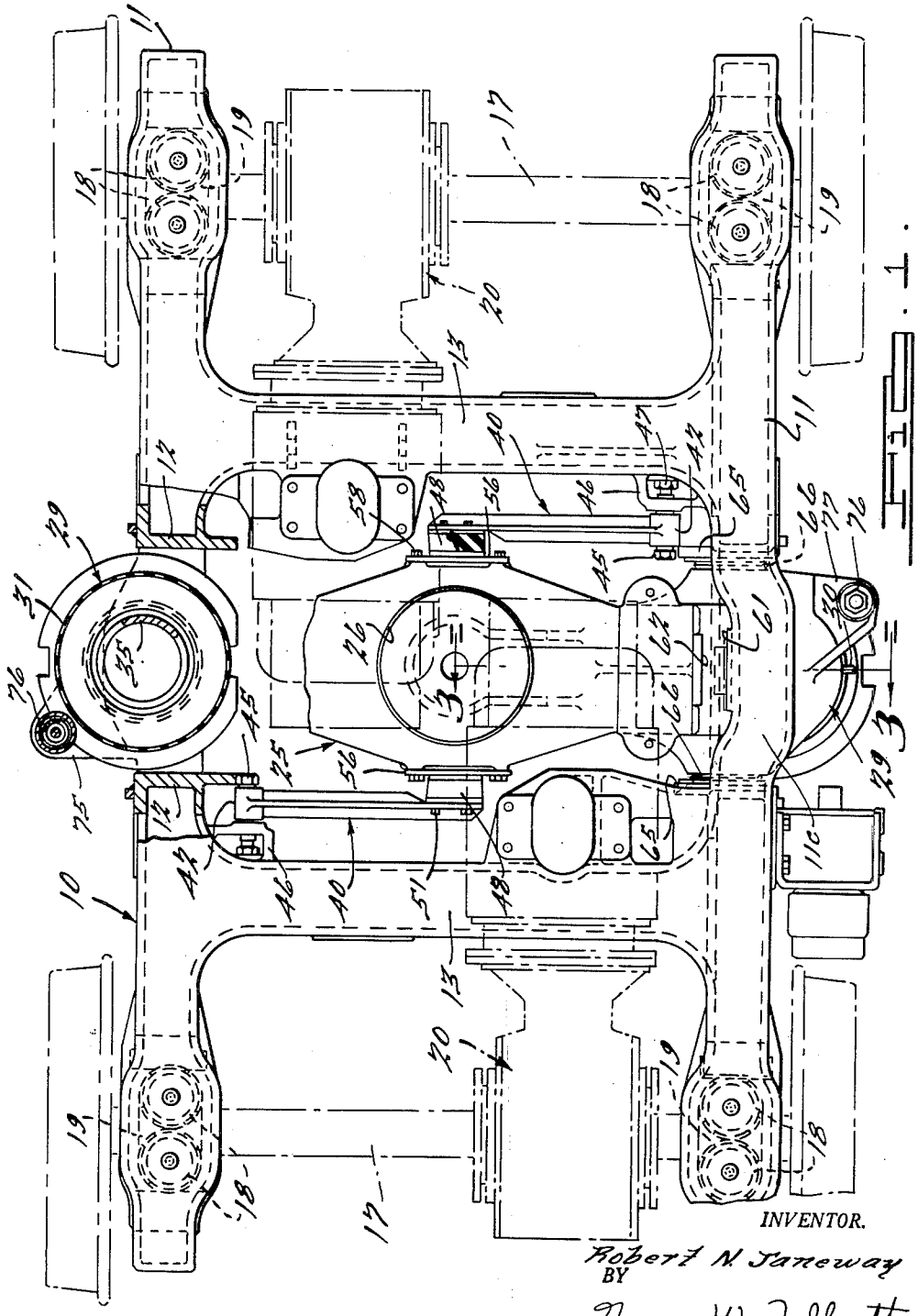


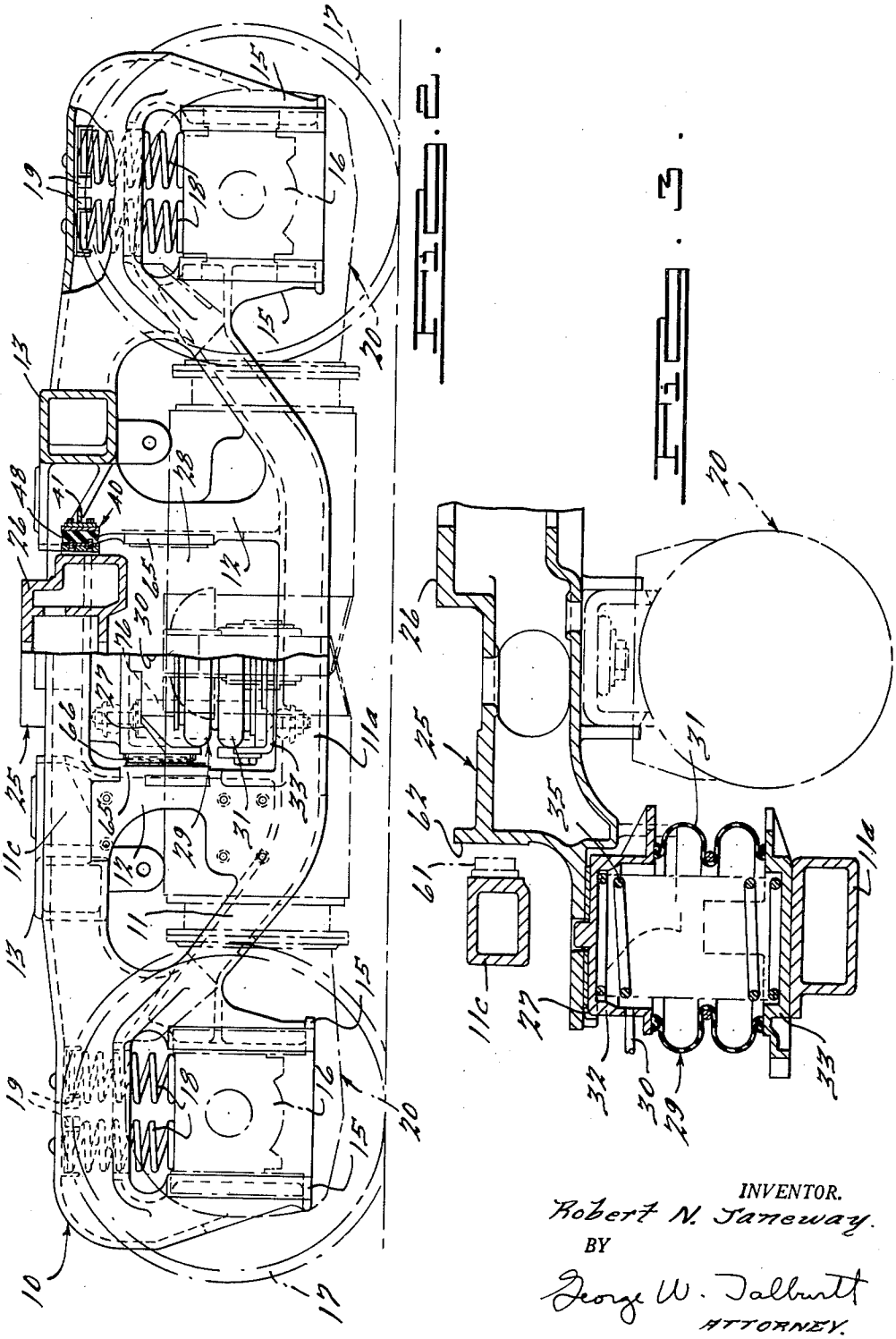
FIG. 1.

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BOLSTER CENTERING LINKAGE

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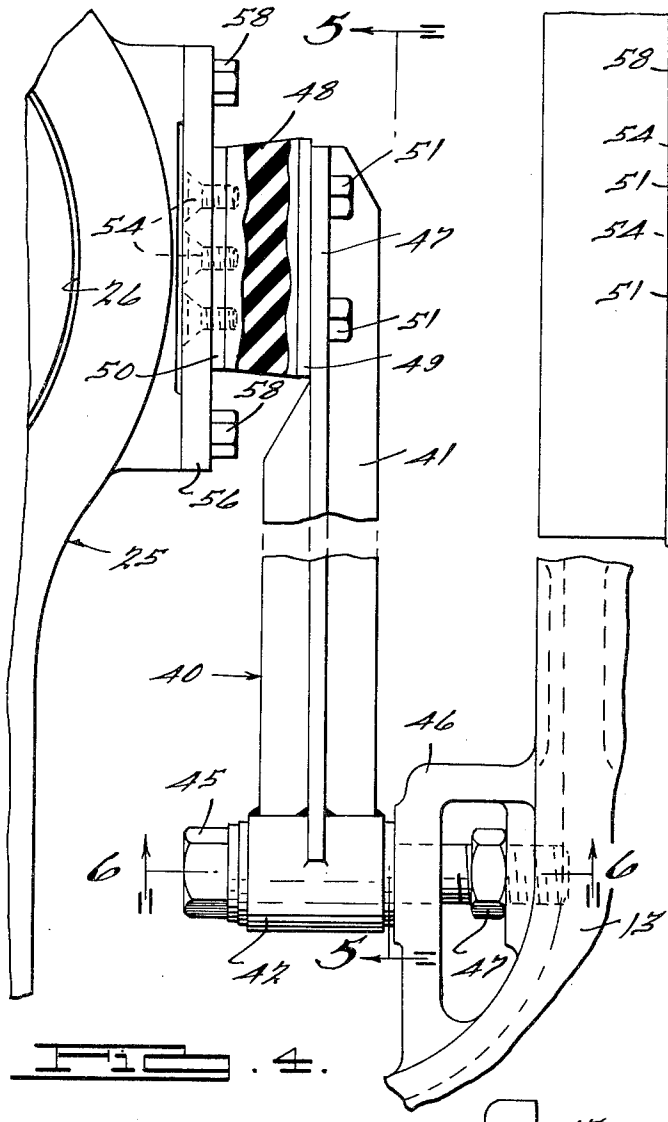



FIG. 4.

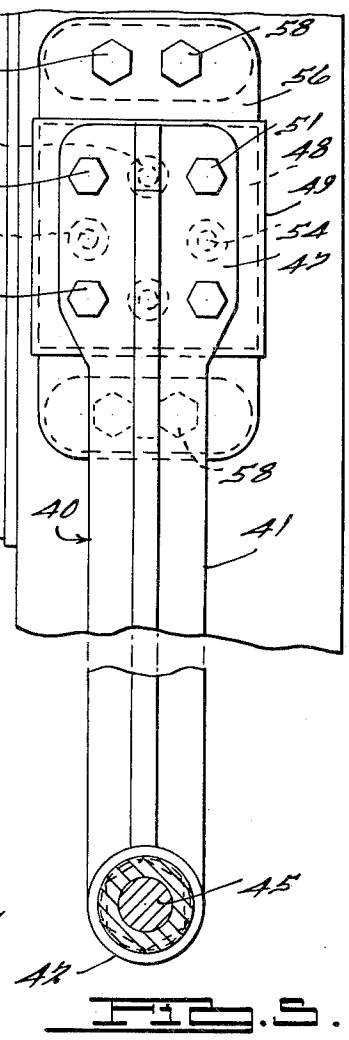



FIG. 5.

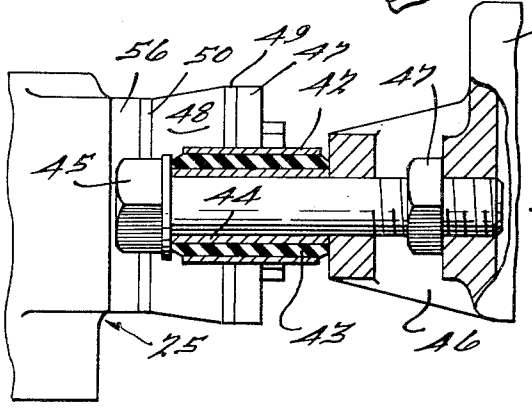



FIG. 6.

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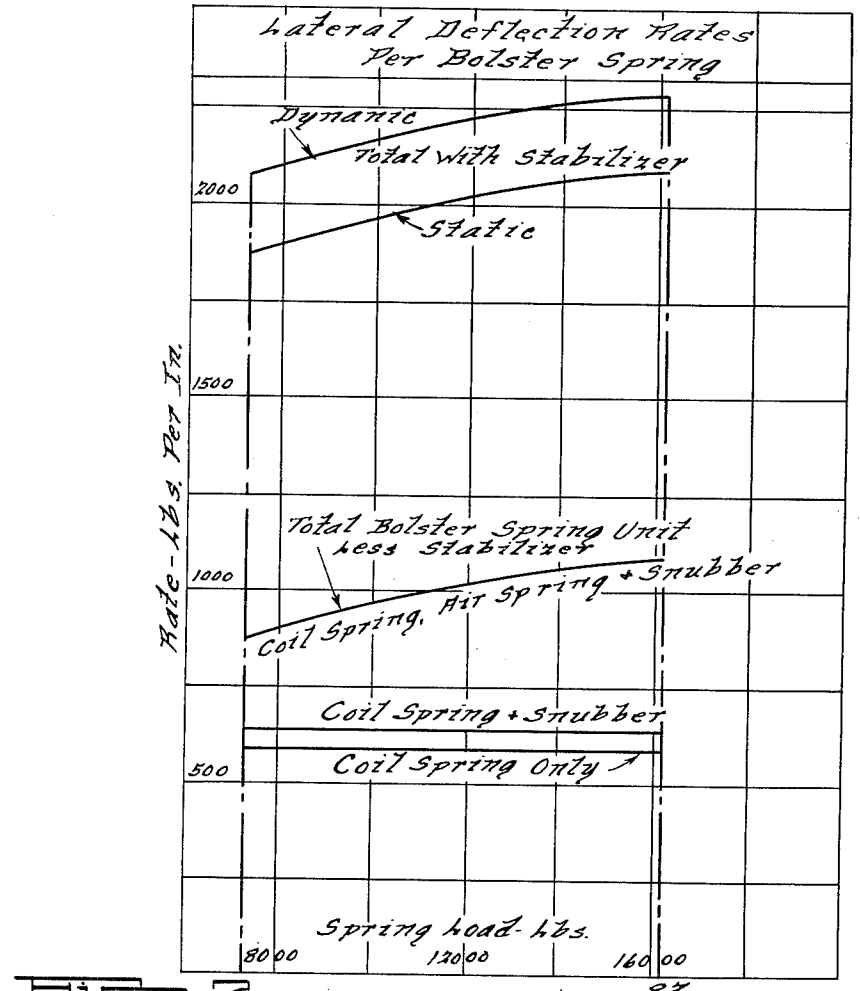



Fig. 7.

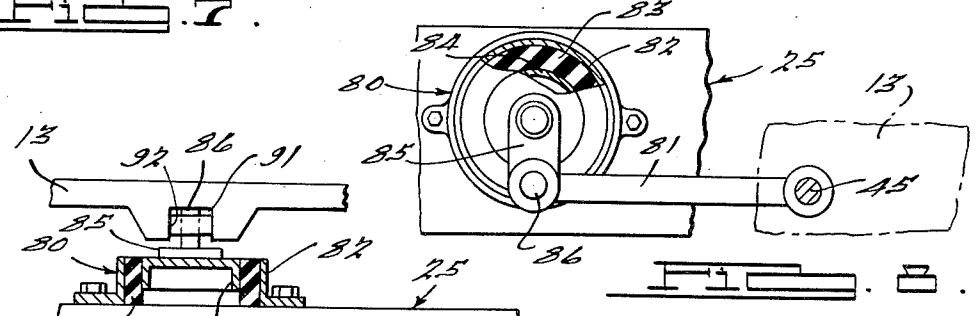



Fig. 8.

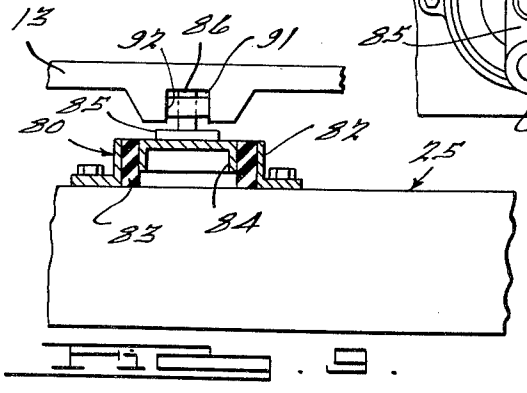



Fig. 9.

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3,038,416

# BOLSTER CENTERING LINKAGE

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7 Claims. (Cl. 105—193)

This invention relates to a rigid frame railway truck having a resiliently supported floating bolster and is particularly concerned with the bolster stabilizing means. The stabilizing means is utilized to elastically resist lateral displacement of the bolster and functions to automatically center the bolster between the frame side members and the frame transoms and also resiliently cushions lateral movement of the bolster.

It is a primary object of this invention to provide a low-cost, light weight, high speed, rigid frame railway truck that has a novel type of stabilizing means for its floating bolster.

It is another object of this invention to provide a resilient connection between a lateral bolster stabilizing link and the truck members connected thereto such that the stabilizing link resiliently resists displacement of the bolster from its normally centered position and acts to automatically center the bolster if it is temporarily displaced from its normally centered position.

It is still another object of this invention to provide a resilient end connection for a bolster lateral stabilizing link that provides a cushioned lateral suspension, at the same time offering negligible resistance to vertical displacement.

It is a further object of this invention to provide a shear rubber mount at one end of a bolster lateral stabilizing link that functions as a spring to provide a definite elastic resistance to lateral displacement of the bolster, the shear mount thereby acting to automatically center the bolster after any lateral displacement thereof.

Other objects and advantages of this invention will become readily apparent from a reading of the following description and a consideration of the related drawings wherein:

FIG. 1 is a top plan elevational view of a railway truck embodying this invention with portions of the truck being broken away and shown in section for puropses of clarity;

FIG. 2 is a side elevational view, partly in section of the truck shown in FIG. 1;

FIG. 3 is an enlarged fragmentary, plan elevational view taken along the line 3—3 of FIG. 1;

FIG. 4 is an enlarged, fragmentary, plan elevational view, partly in section, of the bolster lateral stabilizing link shown in FIG. 1;

FIG. 5 is a sectional elevational view of the bolster stabilizing thrust link, the view being taken along the line 5—5 of FIG. 4;

FIG. 6 is another sectional elevational view of the bolster stabilizing thrust link, the view being taken along the line 6—6 of FIG. 4;

FIG. 7 is a graph showing the increase in lateral deflection rate per bolster spring when a lateral stabilizing link of the disclosed type is added to the truck bolster controls;

FIG. 8 is a fragmentary sectional elevational view of a second form of lateral stabilizing link; and

FIG. 9 is a fragmentary sectional elevational view of a third form of lateral stabilizing link.

As can be seen from the accompanying drawings, this self-powered railway truck is of light weight, high speed, construction wherein the truck bolster **25** is directly supported on the truck side frames **11, 11** by means of the bolsted suspension spring units **29, 29**. This arrangement eliminates swing hangers and a separate spring plank and materially lightens the truck. Also rigid unitary truck frame **10** is used to interconnect the spaced axle assemblies **17, 17** and provide the spaced side frames **11, 11** that are resiliently supported on the journal boxes **16, 16**.



FIGS. 1 and 2 of the drawings show a rigid frame, floating bolster type, railway truck embodying this invention that is particularly adapted for transit truck use. This truck comprises the ladder-type truck frame **10** that is formed from transversely spaced side frames **11, 11** that are rigidly interconnected by longitudinally spaced transoms **13, 13**. The opposite ends of each of the side frames **11, 11** are formed with pairs of depending pedestal legs **15, 15** that are adapted to receive therebetween journal boxes **16** mounted on the ends of the wheel and axle assemblies **17, 17**. The truck frame **10** is resiliently supported on the wheel and axle assemblies **17, 17** by means of compression type coil springs **18, 18** that are seated on the upper sides of the axle journal boxes **16, 16**. Springs **18, 18** extend into seats **19, 19** formed in the underside of the side frames **11, 11**.

Connected between each transom **13** and the adjacent axle assembly **17** is a truck propelling electric motor and gear box assembly that is generally designated by the reference numeral **20**. The gear box assemblies **20, 20** that provide the motive power for the truck unit do not form a part of the invention so a detailed description will be omitted.

Floatingly mounted on the truck frame **10** and extending transversely thereof between the longitudinally spaced transoms **13, 13** is a truck bolster generally designated by the reference numeral **25**. Centrally of the length of the bolster **25** there is formed a center bearing formation **26** that is adapted to receive and journal a mating center bearing formation on the car body to be connected to the truck. At the ends of the bolster **25** on the underside thereof are formed spring receiving formations **27** (see FIG. 3) that each seat the upper end portions of a combination pneumatic and coil spring bolster suspension and leveling spring unit **29**.

The ends of the bolster **25** extend through window openings **28** in the side frame portions of the unitized frame, formed by the vertical columns **12, 12** which connect the upper and lower side frame members **11***c* and **11***a*. Wear plates **65, 66** attached to the mating surfaces of bolster and columns and having only minimum mechanical clearance, take all longitudinal forces acting between frame **10** and bolster **25** while permitting free vertical and lateral relative movements therebetween.

Each spring unit **29** comprises a bellows **31** of rubber-like material that extends vertically between upper and lower end caps **32** and **33**. The upper end cap **32** is mounted in the seat formation **27** on the underside of the end of the bolster **25**. The lower end cap **33** is anchored to the lower stringer **11***a* of the truck side frame portion **11**. Mounted concentrically within the bellows **31** and extending between the end caps **32, 33** is a compression type helical load spring **35**. The interior of the bellows **31** is arranged to be filled with a pressurized fluid or gas such as compressed air by means of the conduit **30** (see FIG. 3). A leveling valve, not shown, is associated with the fluid supply system for the springs **29** so that the elevation of the bolster **25** can be automatically maintained within specified narrow limits regardless of bolster load. The leveling of the bolster is distinct from the lateral stabilization so that the leveling valve details are not disclosed. From the foregoing description of the resilient load supports **29, 29** for the bolster **25**, it is thought to be obvious that the spring units **29** will not provide adequate lateral stability for the bolster unit **25**.

The disclosed type of resilient load support **29, 29** in-

herently lacks adequate stability in the horizontal plane. As previously noted the wear plates 65, 66 on adjoining bolster and frame column surfaces stabilize the bolster 25 against longitudinal forces. However, under even moderate lateral forces, that occur frequently, the vertical suspension units 29, 29 alone would have insufficient capacity to resist lateral bolster deflection. Moreover, with the limited maximum lateral displacement that can be tolerated in the intended type of truck operation, that is about one inch on each side, there would result frequent impact loads between the frame bumper stops 61, 62, with consequent discomfort to passengers. Accordingly, some supplementary lateral stabilizing means is required to provide satisfactory riding qualities. Such a stabilizing means is shown at 40.

The bolster lateral stabilizing means 40 embodies the invention herein disclosed and claimed and it will now be described in detail. Extending transversely of the truck side frames 11, 11 and arranged between each side of the bolster 25 and the adjacent transom member 13 is a bolster lateral stabilizing link 40. The pair of links 40 are identical in structure and, therefore, only one will be described in detail. Link 40 comprises a rigid strut portion 41 having an integral, transversely extending, cylindrical eye formation 42 at one end thereof. Eye 42 is lined with a resiliently backed bushing comprising the rubber sleeve 43 and the metallic bearing 44. Metallic bearing 44 is journaled on a pivot bolt 45 that is threadedly mounted or otherwise fixedly secured in a bracket formation 46 that forms an integral part of the associated transom 13. A lock nut 47 may be mounted on the threaded shank portion of pivot bolt 45 to provide for locked adjustable mounting of the bolt 45. From a consideration of FIGS. 4–6 in particular it is thought to be clear that the pivot bolt 45 and its supported bearing 44 will permit relatively free pivotal movement of the stabilizing link 40 about a horizontal axis extending longitudinally of the truck.

The end of the stabilizing link 40 opposite the pivot bearing eye 42 is formed with a flat, plate-like portion 47 that is adapted to seat a block of resilient rubber-like material 48. Resilient block 48 has flat mounting plates 49 and 50 bonded to its opposite faces to facilitate mounting it on the structures which it is designed to interconnect. Bolts 51 extend through the mounting plate portion 47 of the link 40 and anchor in the mounting plate 49. The mounting plate 50 on the opposite side of the resilient block 48 is connected to the bolster 25 by means of screws 54 that have their heads countersunk in an anchor plate 56. Anchor plate 56 is fixed to the side of the bolster 25 by the bolts 58.

With the stabilizing link 40 connected between the transom 13 and the bolster 25 in the manner shown it is thought to be obvious that any lateral movement of the bolster 25 will develop shear stresses in the resilient block 48 that resists the lateral displacement of the bolster. Not only do the shear stresses in the resilient block 48 resist any lateral movement of the bolster 25 from its normally centered position between the truck side frames 11, 11 but in addition the shear stresses function to automatically return the bolster to its normally centered position between the side frames 11, 11 in the event the bolster 25 should be laterally displaced. In addition, by properly proportioning the shear stiffness of the resilient block 48 in relation to the load on the bolster 25, the block 48 also serves to cushion the transmission of lateral shock forces to the bolster and associated car body resulting from lateral impacts applied from the track to the truck frame.

While the resilient block 48 resists and cushions lateral movement of the bolster 25, still, positive means for limiting the amount of relative lateral movement between the bolster 25 and the side frames 11, 11 is also provided. The side frames 11, 11 (see FIGS. 1 and 3) each include a bumper plate 61 that is arranged to be engaged by stop portions 62 on the ends of the bolster 25 after a predetermined amount of lateral movement of the bolster.

The side frame lower rails 11*a* include an ear portion 75 that mounts the lower end of a friction snubber 76 that has its upper end connected to an ear 77 on the end of the bolster 25. Snubbers 76 may be of the type shown in Robert N. Janeway et al. Patent 2,574,788.

Actual test measurements of torsional shear on the resilient blocks 48 and link bushings 43 show that negligible vertical force is required at the ends of the link 40 to produce the angular deflection corresponding to the maximum permissible dynamic vertical displacement of the bolster.

Test measurements on spring units of the type described, that are intended for installation in passenger service equipment, are shown in the curves of FIG. 7. It will be seen that the combined lateral deflection rate of the complete spring unit increases slightly with load but at maximum load of 16,000 pounds has an effective lateral deflection rate of only 1100 pounds per inch. This means that a lateral force less than 7% of the load (or acceleration of .07 g.) would be sufficient to displace the bolster 25 against the stops 61. The upper curves exemplify what is considered to be a minimum desirable resultant characteristic, which is obtained by adding the lateral stabilizing means 40 which embody this invention. The stabilizing means 40 substantially doubles the deflection rate of the bolster suspension units.

FIG. 8 shows a second form of this invention wherein shear in the resilient connection 80 at the bolster end of the lateral stabilizing link 81 functions to accomplish the many advantages previously pointed out with regard to the stabilizing link 40. The FIGURE 8 form of this invention differs from the FIGS. 4–6 forms primarily in that a rotational movement is utilized to stress the resilient element in shear during relative lateral movement between the bolster 25 and the truck frame 10. FIGURE 8 shows a cylindrical outer shell 82 fixed to a side of bolster 25 with the shell 82 having a resilient ring of rubber-like material 83 bonded to the internal surface of shell 82. Bonded to the inner peripheral surface of the resilient ring 83 is an inner cylinder 84 that has a crank arm 85 fixed thereto. Crank arm 85 carries a pivot pin 86 at its outer end that is connected to the link 81. Link 81 has its other end pivotally connected to the truck frame 10 by a bolt 45 such as is clearly shown in FIGS. 4–6.

From the foregoing description of the FIG. 8 form of this invention it is thought to be obvious that substantially unrestricted vertical bolster movement is possible whereas any relative lateral movement between the bolster 25 and frame 10 will tend to rotate cylinder 84 relative to cylinder 82 and this will stress the resilient ring 83 so that it will function in a manner similar to the resilient block 48 of the FIG. 4–6 forms. The FIG. 8 form has certain advantages due to the fact that the resilient ring 83 is enclosed in housings 82, 84 and, therefore, is protected against damage. Also, the FIG. 8 form permits use of the mechanical advantage of the crank arm 85 to stress the resilient ring 83 in shear.

FIG. 9 shows a variation of the form of this invention shown in FIG. 8. In FIG. 9 the resilient ring assembly 80 is identical to that shown in and described relative to FIG. 8. FIG. 9 differs from FIG. 8 in that the link 81 and the pivot pin connection 45 have been eliminated. In FIG. 9 the crank arm pivot pin 86 is arranged to seat in a vertical groove 91 formed in the adjacent frame transom 13. To reduce friction between the crank pin 86 and the sides of groove 91 a sleeve baering 92 may be mounted on the crank pin 86. This form is very effective and a low cost version of the invention due to the elimination of the link 41 or 81.

I claim:

1. In a railway truck having a frame mounted on longitudinally spaced wheel and axle assemblies, said frame including transversely spaced side frame members interconnected by a transversely extending transom, a truck bol-

ster extending transversely of said side frame members adjacent said transom and floatingly supported on said side frame members for vertical and lateral movement by vertically extending spring units mounted on the side frame members, and bolster lateral stabilizing means comprising a rigid thrust link extending transversely of the side frame members having one end connected to said truck frame and the other end connected to said floating bolster, said thrust link end connections offering negligible resistance to vertical displacement of said spring supported bolster while resisting relatively free lateral movement of the bolster relative to the truck frame, one of the thrust link end connections including resilient means arranged to be normally free of direct compression loading but stressed in shear while elastically resisting and cushioning lateral bolster movement and reacting to said shear stressing to automatically center the bolster laterally of the truck frame.

2. In a railway truck having a rigid frame unit resiliently mounted on longitudinally spaced wheel and axle assemblies, said rigid frame unit including transversely spaced side frames rigidly interconnected by a transversely extending transom, a truck bolster extending transversely of said side frames adjacent said transom and floatingly supported on said side frames by vertically extending spring units mounted on the side frames, and bolster lateral stabilizing means comprising a rigid thrust link extending transversely of the side frames having one end connected to said rigid truck frame unit and the other end connected to said floating bolster, said thrust link end connections offering negligible resistance to vertical displacement of said bolster while resisting relatively free lateral movement of the bolster relative to the rigid truck frame unit, one of the thrust link end connections including resilient means arranged to be normally free of direct compression loading but stressed in shear while elastically resisting and cushioning lateral bolster movement and reacting to said shear stressing to automatically center the bolster laterally of the rigid truck frame unit, the other end connection on the rigid thrust link including pivot means having an axis extending longitudinally of the rigid truck frame unit to provide for relatively free vertical oscillation of the bolster and thrust link.

3. In a railway truck having a rigid frame unit resiliently mounted on longitudinally spaced wheel and axle assemblies, said rigid frame unit including transversely spaced side frames rigidly interconnected by longitudinally spaced transoms, a truck bolster extending transversely of said side frames between said transoms and floatingly supported on said side frames by vertically extending spring units mounted on the side frames, and bolster lateral stabilizing means comprising a rigid thrust link extending transversely of the side frames having one end connected to said rigid truck frame unit and the other end connected to said floating bolster, said thrust link end connections offering negligible resistance to vertical displacement of said bolster while resisting relatively free lateral movement of the bolster relative to the rigid truck frame unit, one of the thrust link end connections including resilient means arranged to be normally free of direct compression loading but stressed in shear while elastically resisting and cushioning lateral bolster movement and reacting to said shear stressing to automatically center the bolster laterally of the rigid truck frame unit, the other end connection on the rigid thrust link including pivot means having an axis extending longitudinally of the rigid truck frame unit to provide for relatively free vertical oscillation of the bolster, said other link end connection including resilient support means for said pivot means that cooperates with said resilient means on said one link end connection to provide a resiliently cushioned lateral suspension for the bolster.

4. In a railway truck having a rigid frame unit resiliently mounted on longitudinally spaced wheel and axle assemblies, said rigid frame including transversely spaced side frames rigidly interconnected by longitudinally spaced transoms, a truck bolster extending transversely of said side frames between said transoms and floatingly supported on said side frames by vertically extending spring units mounted on the side frames, and bolster lateral stabilizing means comprising a rigid thrust link extending transversely of the side frames having one end connected to said rigid truck frame unit and the other end connected to said floating bolster, said thrust link end connections offering negligible resistance to vertical displacement of said bolster while resisting relatively free lateral movement of the bolster relative to the rigid truck frame unit, one of the thrust link end connections including resilient means arranged to be normally free of direct compression loading but stressed in shear while elastically resisting and cushioning lateral bolster movement and reacting to said shear stressing to automatically center the bolster laterally of the rigid truck frame unit, the other end connection on the rigid thrust link including pivot means having an axis extending longitudinally of the rigid truck frame unit to provide for relatively free vertical oscillation of the bolster, and said bolster supporting spring units including pressure fluid operated springs variable in height in accordance with load thereon to maintain the normal vertical position of the bolster irrespective of load variation.

5. In a railway truck having a rigid frame unit mounted on longitudinally spaced wheel and axle assemblies, said rigid frame unit including transversely spaced side frames rigidly interconnected by a transversely extending transom, a truck bolster extending transversely of the side frames and floatingly supported vertically and laterally on said side frames by vertically extending, laterally flexible, spring units mounted on the side frames, and bolster lateral stabilizing means comprising a rigid thrust link extending transversely of the side frames having one end connected to said rigid truck frame unit and the other end connected to said floating bolster unit, said thrust link end connections including one end having a seat supporting a block of resilient rubber-like material fixed thereto with an opposite portion of the resilient block connected to one of the units interconnected by the link, the other end of the thrust link being pivotally connected to the other unit interconnected by the thrust link to provide for oscillation of the thrust link in a vertical plane extending transversely of the truck side frames, said block of rubber-like material being initially free of direct compression loading while elastically resisting lateral displacement of the bolster relative to the side frames by internal shear stressing that reacts to automatically center the bolster between the side frames and also provides a cushioned lateral suspension for the bolster.

6. In a railway truck having a truck frame unit mounted on and interconnecting the truck wheel and axle assemblies, a bolster unit extending transversely of and floatingly mounted on said rigid truck unit by vertically extending, laterally flexible, resilient supports, and a bolster unit lateral stabilizing means comprising a rigid thrust link having a block of resilient rubber-like material with a portion fixed to one end of the link and another portion of the block fixed to one of said units, said block being initially free of direct compression loading, the other end portion of the thrust link being formed with a pivot pin receiving means that is connected to the other unit by a pivot pin offering negligible resistance to vertical displacement of the thrust link in a vertical plane extending transversely of the truck frame unit whereby movement of the bolster unit laterally of the truck frame unit is resisted by shear stresses developed in the resilient block which stresses react to automatically center the bolster laterally of the truck frame unit.

7. In a railway truck having a rigid truck frame unit mounted on and interconnecting the truck wheel and axle assemblies, a bolster unit extending transversely of and floatingly mounted on said rigid truck unit by vertically

extending, laterally flexible, resilient supports, and a bolster unit lateral stabilizing means comprising a rigid thrust link having a block of resilient rubber-like material with a portion fixed to one end of the link and another portion of the block fixed to one of said units, said block being initially free of direct compression loading, the other end portion of the thrust link being formed with a pivot pin receiving means that is connected to the other unit by a pivot pin offering negligible resistance to vertical displacement of the thrust link in a vertical plane extending transversely of the truck whereby movement of the bolster unit ltaerally of the truck unit is resisted by shear stresses developed in the resilient block which stresses react to automatically center the bolster laterally of the frame unit, said other end portion of the thrust link including an eye formation lined with a resiliently backed bearing bushing that journals and resiliently cushions said pivot pin means.



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