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CENTER BEARING FOR RAILWAY CARS

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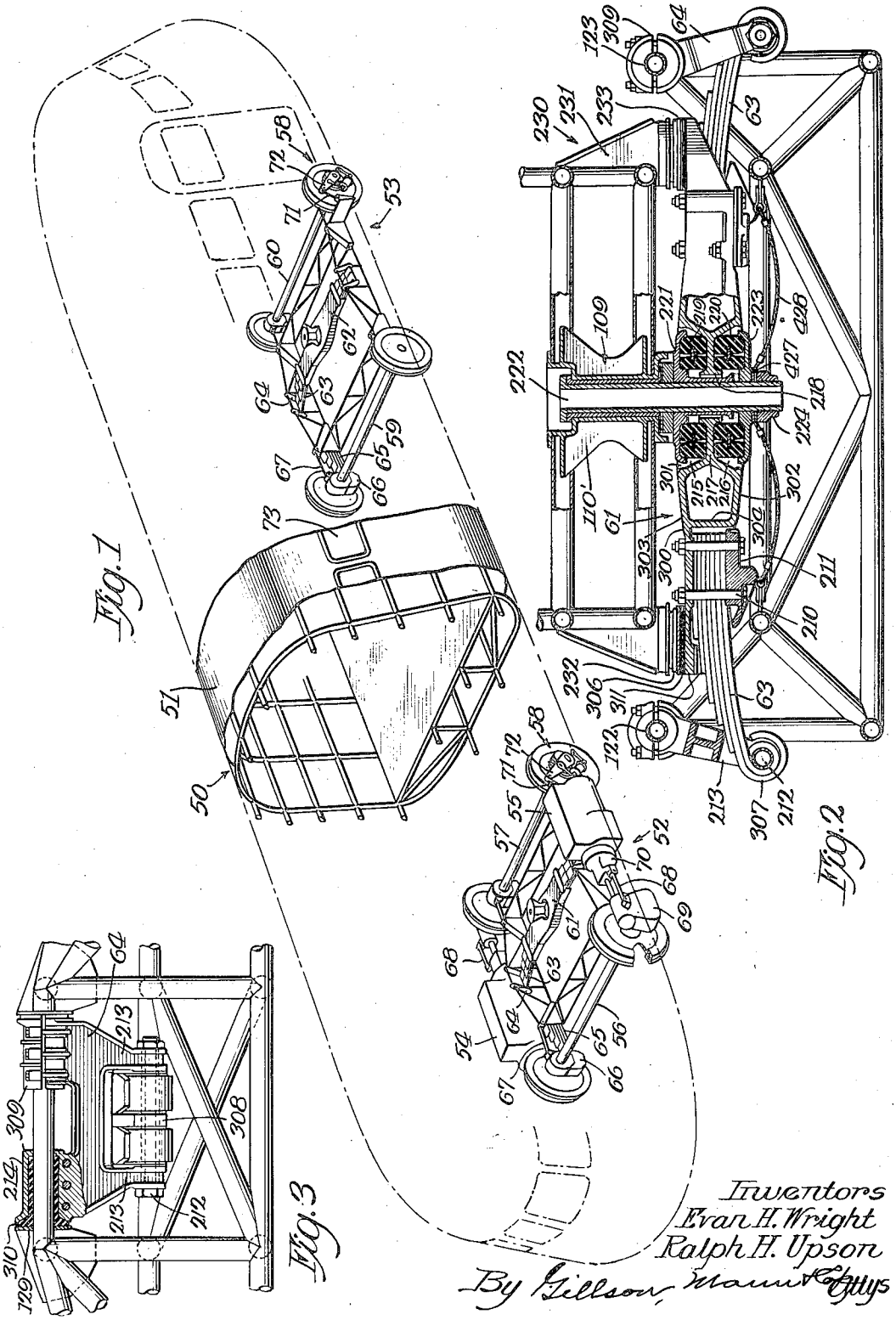


Fig. 1

Fig. 2

Fig. 3

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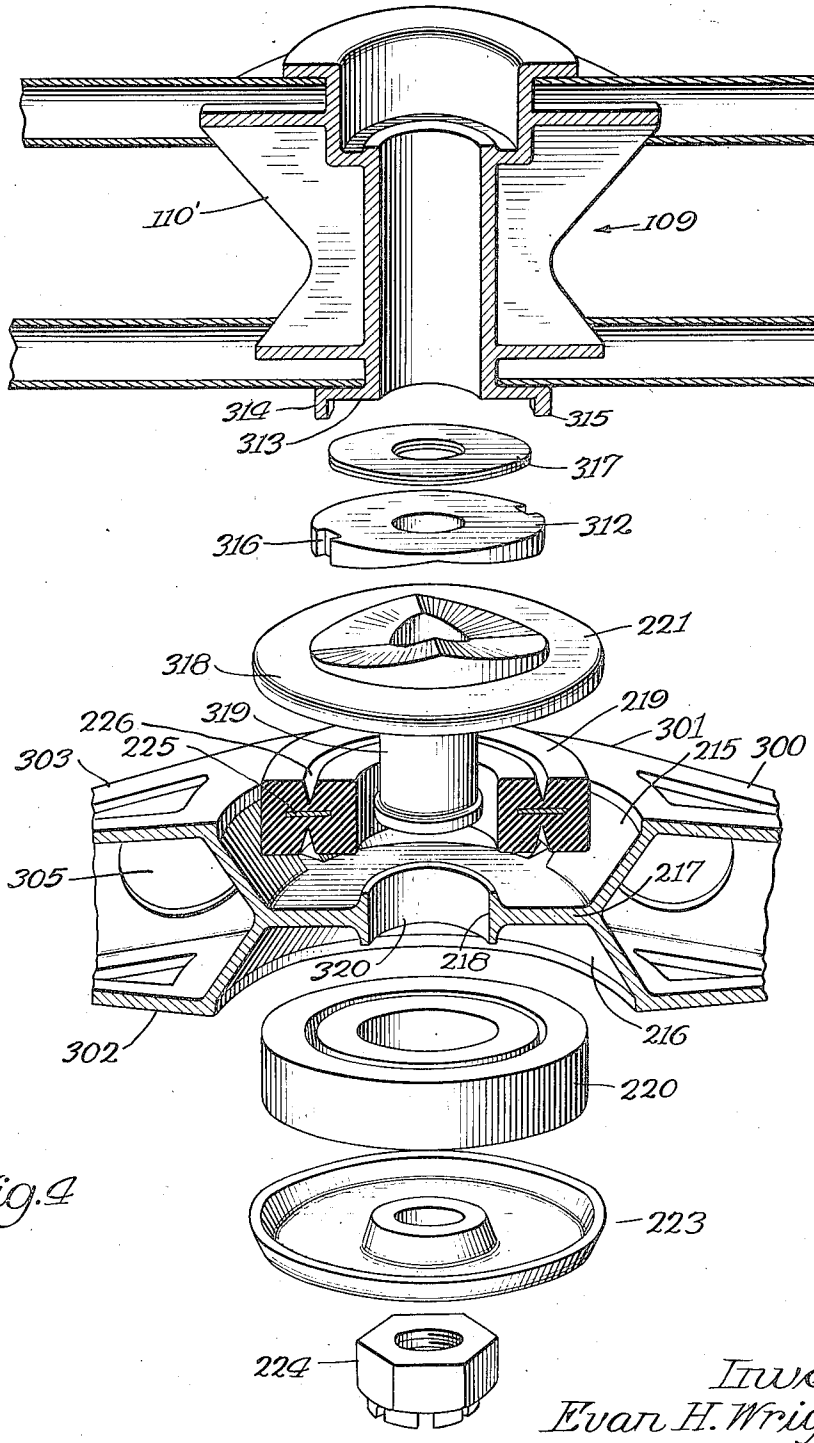


Fig. 4

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CENTER BEARING FOR RAILWAY CARS

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Application September 2, 1933, Serial No. 688,004

10 Claims. (Cl. 308—137)

The general trend in the fields of air, land and water transportation toward greatly increased speeds has brought about a demand for rail cars which are much faster than those now in use. But to obtain high speeds in railway transportation consistent with safety and economy, the entire organization of the conventional railway car must be altered to meet the new conditions of service.

Light weight is one of the essentials of any car that is capable of traveling at relatively high speeds, for excessive weight requires additional power and there is no power to be wasted if speed is to be obtained.

Air resistance becomes an important factor in dealing with high speed cars. It is important not only as it impedes forward movement of the car, but also as it affects the stability of the car on the track.

In a broad sense, this invention has for its primary object to provide a rail car of a given load capacity, lighter without loss of strength and shock resistance, and faster with less power as compared with prior cars, and also able to hold the track in spite of the greater relative wind velocity at angles to the line of travel which arise from the increased speed, all with appropriate cost, and otherwise suited to existing conditions.

Generally speaking, lightness with ample strength is obtained:

First: By using tubes for all structural members and welding for all joints, whereby the metal is used to the greatest advantage and heavy joint fittings and localized strains are obviated, and the whole body is made one coordinate entity; and

Second: The motors and other weighty elements of the operating mechanism are mounted close to the rails and the parts to be driven or stopped, whereby the body, the center bearing, the side bearings, and all other parts in the line of force transmission, are relieved of much strain and may be made correspondingly lighter.

Being lighter, less power can handle the car as well as its best predecessor but, in addition, the air resistance (which increases rapidly with the speed, other things remaining the same) is tempered by lowering the car and reducing or eliminating suction areas, vortexes or whirls and reverse turbine effects between all parts of the car, the track and other stationary objects, whereby the speed can be increased out of all proportion to the power and speed of the past.

The greater speed increases the transverse component of all wind resistance (and with conventional forms would increase the resultant suction effects) and there would be greater tendency to overturning which the lighter weight would be less able to resist, but for the fact that the wind is passed easily and smoothly under and over the car and the flat upright surfaces are reduced to a minimum, whereby the pressure on the leeward side is kept close to that on the windward side.

In a narrower sense, it is the aim of this invention to provide a center bearing construction which is particularly suitable for a car having the above characteristics, although obviously it can be used with other cars and in other relationships.

Other objects of the invention include to provide means for normally holding the car truck in alinement with the car body; to eliminate the necessity of periodically lubricating the center bearing; to permit the body to have limited side sway without imposing harmful strains on the parts; to prevent truck noises and vibrations from being transmitted to the car body; to cushion both upward movement and downward movement of the car body relative to the truck; and to provide a construction which will have long life, is inexpensive to manufacture and has a minimum number of parts.

Further and other objects and advantages will become apparent as the disclosure proceeds and the description is read in conjunction with the accompanying drawings, in which

Fig. 1 is a diagrammatic, perspective view showing the general organization of a car made in accordance with this invention;

Fig. 2 is a sectional view taken through the center of the swing bolster;

Fig. 3 is an end elevational view showing the bolster supported on the spring hanger; and

Fig. 4 is an exploded, perspective view of the center bearing assembly.

At the outset, it should be understood that the selection of certain preferred and modified forms of the invention for illustration and description is merely for the purpose of disclosure, for the invention may be variously embodied within the scope of the appended claims. Limitations, therefore, are not to be read into the claims unless required by the prior art.

General organization (Fig. 1)

The illustrative embodiment of the invention, which is shown in diagrammatic perspective in Fig. 1, clearly shows the application of the several

fundamental concepts mentioned above to the general organization of the car.

The car body, it will be observed, comprises a space framework 50 of metal tubing that is welded together to form a rigid unitary body. The framework is covered by a metal skin 51 which is secured to the framework and assists in resisting torsional strain.

The body is supported by a front truck 52 and a rear truck 53, the former having internal combustion engines 54 and 55 mounted outboard on opposite sides of the truck. The front truck includes wheeled axles 56 and 57, diametrical ends of which are driven by the motors 54 and 55. The other diametrical ends of the axles 56 and 57 are equipped with brake operating mechanism, generally indicated at 58.

The rear truck 53 includes wheeled axles 59 and 60, each of which are braked by mechanism corresponding to the mechanism 58 of the front truck.

The axles of both front and rear trucks are equipped with what may be termed "resilient" wheels, and this term is intended to include all forms of wheels which are inherently resilient either by the interposition of rubber under shear, pneumatic tires, springs, or by any other means.

The car body rests upon spring bolsters 61 and 62 of the front and rear trucks, respectively, and, preferably, the bolsters are equipped with cantilever springs 63 which are shackled to swing hangers 64 pivotally suspended from the truck frames.

The truck frames of each truck are fabricated of metal tubing welded together in such manner as to produce space frameworks of necessary strength, and at the four corners of each frame, a leaf spring 65 projects toward the adjacent axle where it connects to a journal 66. The point of connection between the projecting spring and the journal, is underslung with respect to the axles.

Driving and braking forces applied to the car axles are transmitted to the truck frames by radius rod 67. Other radius arms 68 which connect the worm gear casing 69 to a fixed point on the car truck,—in this case, the transmission housing 70,—take the thrust of the driving worm. Braking forces are resisted by torque arms 71 which connect the brake housing 72 to the truck frame.

The car body, it will be seen, is elongated and has a tapering blunt nose and tail to reduce wind resistance. The outer surface of the car consists of smooth broad curves well blended together to produce a graceful appearance and at the same time directing the air currents around the car with minimum effort. The windows 73 are flush with the outer skin, and are made stationary as it is contemplated that a forced system of ventilation will be used.

The bottom of the car is uninterrupted in outline except for the wheels of the truck which project through the metal skin enveloping the body framework.

Swing bolster assembly

The swing bolster assembly shown in Figs. 2 and 3 is the same for both front and rear trucks, and for convenience, the showing in these figures will be considered as illustrating the bolster assembly of the front truck.

The bolster 61 comprises a hollow casting 300 having an enlarged central portion 301 provided with circular depressions 215 and 216 on its upper and lower faces, respectively. The dividing wall 217 between the two depressions forms an annular ledge which is substantially half way between the top and bottom walls of the bolster. The inner margin of the ledge is enlarged, as indicated at 218 to form a wearing surface for the center bearing assembly.

The bottom wall 302 of the bolster is joined to the top wall 303 by an intermediate vertical wall 304 leaving suitable openings at the bottom of the bolster for inserting the springs 63 at each end thereof.

Two quarter-elliptical springs are mounted in the recesses at the ends of the bolster and are clamped in place by bolts 210 which draw retaining plates 211 tightly against the bottoms of the spring.

The bolster is cored out wherever possible as, for example at 305, to reduce weight. The ends of the bolster are slightly enlarged to receive arcuate chrome-plate steel plates 233, which cooperate with the side bearings 230 on the car body. The plates 233 are suitably spaced from the bolsters by shims 306.

The ends of the spring 63 are provided with double eyelets 307 adapted to engage a bolt 212 which joints adjacent arms 213 of the spring hanger 64. In case the bottom leaf of the spring breaks, the adjacent leaf will support the spring on the spring hanger.

Each of the swing hangers 64 consists of a casting having depending arms 213 through the ends of which the bolt 212 is adapted to pass. The two springs suspended from each hanger are separated by a spacer 308 telescoped on the bolt.

The upper ends of the swing hangers 64 are bifurcated and are adapted to be pivotally clamped to the bearings 122 and 123 by bearing caps 309. Rubber bushings 214 interposed between the swing hanger bearings and the tubular bearing supports 122 and 123 resist side sway of the car body by being placed in shearing strain. The bushings are enlarged as indicated at 310 to bearing against the disks 129 and cushion the truck frame from side thrusts.

The extreme ends 311 of the bolster are so spaced with reference to the springs 63 that when the car body tilts one way or the other beyond a given angle the end of the bolster forms a new fulcrum for the springs with shorter leverage. This arrangement assists in preserving the life of the springs.

The bolts 212 which connect the arms 213 of the swing hanger casting are fitted with anti-friction bushings comprising porous metal impregnated with oil and known in the trade as "Oilite", so that proper lubrication is provided for the ends of the spring.

Lateral travel of the swing bolster is limited by cables 428, which extend between the cable anchors 427 on the bottom of the bolster and adjacent joints on the truck frame.

Center bearing

In conventional center bearing constructions, the car truck is swiveled to the body by a center pin which passes through the body bolster and the truck bolster, and the weight of the body is carried by some kind of an anti-friction device that is interposed between the truck and body center plates. In the present invention, there is no body bolster, but instead, the center pin passes through a collar 109 welded into the understructure of the car body, and through a semi-floating truck center plate which is adapted to absorb

much of the vibration and noise that is ordinarily transmitted from the truck to the car body.

The center bearing assembly is best shown in Figs. 2 and 4 and comprises essentially a body center plate 312, a truck center plate 221, two rubber annuli 219 and 220, a retaining cap 223 and a center pin 222 which receives a nut 224 on its lower end.

The collar 109 which is provided with laterally extending reinforcing ribs 110' has a round bottom face 313 which is flanked by a downwardly extending flange 314. At one or more points on the flange 314, a lug 315 is provided which is adapted to engage a cut-away portion 316 in the body center plate 312. The outside diameter of the body center plate corresponds to the inner diameter of the flange 314 so that the former fits snugly within the bottom of the collar 109 and is held against rotation by the lug or lugs 315. Shims 317 are provided for adjusting the height of the car body with reference to the truck bolster, as this is necessary to enable the side bearings 230 to function properly.

The truck center plate 221 is more or less mushroom shaped and has a flange 318 adjacent its top which is adapted to seat upon the rubber annulus 219 in the top cavity 215. The shank 319 of the center plate extends through the opening 320 in the truck bolster, but normally does not contact with the wear surface 218. The truck center plate is clamped in place by retaining cap 223 which engages the underside of the annulus 220 and forces it against the annular ledge 217. A nut 224 which screws upon the center pin 222 holds the parts in assembled relation.

The customary use of roller or ball bearings between the truck and center plates is rendered unnecessary in the present construction; first, because the car body is extremely lightweight; secondly, because the rubber annulus yields sufficiently to permit a certain amount of relative angular movement between the center bearing and bolster, and thirdly, because the body center plate 312 is made of a self-lubricating material comprising porous metal impregnated with oil, and known to the trade as "Oilite." This material is a porous metal impregnated with oil, and it not only eliminates the necessity for lubrication, but in addition is extremely tough and wear resistant.

The contacting surfaces of the body and truck center plates are cut with complementary double helical surfaces, as shown most clearly in Fig. 4, in order to normally maintain the car truck in alinement with the car body. When a car is travelling at high speeds, there is a tendency for the truck to weave in and out between the rails of the track, thereby causing danger of derailment and wear on the wheel flanges. By providing the mating faces of the truck and body center plates with complementary surfaces, as shown in Fig. 4, any tendency of the truck to turn with reference to the car body is resisted by the weight of the car, for any relative rotation between the truck and the body slightly lifts the latter and is opposed by gravity.

The truck center plate 221 which is resiliently supported by the annulus 219 is capable of limited movement from its normal vertical axis and is fully insulated from the car truck against the noise and shock. The lower annulus 220 absorbs the rebound.

It will be noticed that the rubber annuli each have a flat metal ring 225 embedded in the rubber, the ring serving to materially stiffen the annulus and assist in preserving its shape. The grooves 226 permit the rubber to expand laterally with greater effect.

Side bearings

The bolsters 61 and 62 are each equipped at their ends with side bearings generally designated 230 which consist essentially of a side bearing bracket 231 securely welded to the body framework, and which carries on its underface a rubber backed plate 232 of self-lubricating material which is adapted to slide upon a chrome-finished wear plate 233 carried at the end of the bolster.

The side bearings, it will be understood, limit side sway of the car body with respect to the car trucks.

We claim as our invention:

1. In a center bearing for railway cars, a body center plate non-rotatable with respect to the car body and having at least a portion of its bottom face inclined to the horizontal, a truck center plate provided with a complementary upper face in bearing engagement with the bottom face of the body center plate, a rubber annulus supporting the truck center plate on the truck, said truck center plate being substantially non-rotatable with respect to the car truck, and a center pin passing through the said plates and rubber annulus, the inclined portions of the truck and body center plates being arranged so that relative rotational movement between the truck and the car body will cause the plates to move away from one another in parallel planes though still maintaining substantial areas of contact on opposite sides of the plate centers.

2. In a center bearing assembly, a truck bolster having a vertical opening therein, a resilient annulus seated on the bolster concentrically with respect to said opening, a truck center plate resting upon the annulus, a resilient annulus beneath the bolster, a retaining cap engaging the bottom of said last named annulus, and a center pin for holding the parts in assembled relation.

3. In a center bearing for pivotally connecting a car truck to a car body, a truck bolster having a vertical opening therein, a resilient annulus on the bottom side of the truck bolster, a retaining cap adapted to hold the last named annulus against the truck bolster, and a center pin passing through the center plates and the retaining cap for holding the parts in assembled relation.

4. A center bearing for pivotally connecting a car truck to a car body, including means interposed between the body and the truck for yieldingly maintaining the truck in alinement with the car body, said means comprising mated center plates engaging each other and having complementarily inclined bearing surfaces arranged so that relative rotation of the plates will cause the two to move away from one another in parallel planes though still maintaining substantial areas of contact on opposite sides of their centers, and an annular rubber block for supporting said plates.

5. A center bearing for pivotally connecting a car truck to a car body, including means interposed between the body and the truck for yieldingly maintaining the truck in alinement with the car body, said means comprising mated center plates each of which is provided with complementarily matched, oppositely inclined bearing faces forming peaks and valleys on opposite sides, respectively, of the plate centers so that the slightest relative rotation between the two plates in

either direction will cause a sharp elevation of said body and a block of rubber for supporting said bearings and for resiliently resisting initial turning movement of the car truck relative to the body.

6. A center bearing for pivotally connecting a car truck to a car body, said bearing including a center pin adapted to pass through cooperating apertures in the body and the truck, means interposed between the body and the truck for yieldingly maintaining the truck in alinement with the car body, said means comprising a pair of center plates, the lower one of which is provided with oppositely inclined surfaces intersecting to form V-shaped valleys on opposite sides of the plate centers, the upper plate being provided with portions which normally rest in the said valleys and which ride upwardly on the inclined surfaces of the lower plate whenever the truck is relatively rotated with respect to the car body, and an annular rubber element for supporting said plates and for yieldingly resisting the turning of the car truck relative to the body.

7. In a railway car, a body member, a truck member, a center bearing between said members comprising a body center plate, a truck center plate, said plates being provided with cooperating peaks and valleys, and a rubber element between one of said plates and one of said members, whereby said element will resiliently resist the relative rotation of said members.

8. In a railway car, a body member, a truck member, a center bearing between said members comprising a body center plate, a truck center plate, said plates being provided with cooperating peaks and valleys, means for retaining said plates in axial alignment, means for resiliently resisting the initial relative turning of said members, and means for resiliently resisting the separation of said plates.

9. In a center bearing for pivotally connecting a car truck to a car body, a body center plate, a truck center plate, a resilient annulus supporting the truck center plate, means for retaining said plates in axial alignment and providing a swivel connection between the car truck and the car body, and resilient means for absorbing rebound.

10. In a center bearing for pivotally connecting a car truck to a car body, a truck bolster having a vertical opening therein, a rubber annulus seated on the bolster concentrically with respect to said opening and spaced therefrom, a truck center plate resting upon the annulus and insulated from the truck bolster and having a downwardly extending hub portion which loosely fits within the opening in the truck bolster and is normally held out of contact with said bolster, a body center plate in bearing engagement with the truck center plate, a rubber annulus seated against the under side of the bolster and surrounding said opening, and a center pin for holding the parts in assembled relation and having means therein for engaging said last-named annulus for resiliently resisting the upward movement of said body.

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