United States Patent

Lich

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[54] **MOTORIZED RAILWAY LOCOMOTIVE TRUCK**

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[52] **U.S. Cl.**.....**105/136,** 105/196, 105/197 A, 105/199 F, 105/199 R

[51] **Int. Cl.**.....**B61c 3/00,** B61f 3/05, B61f 5/06

[58] **Field of Search**.....105/136, 182 R, 196, 197 A, 105/199 F, 197 A, 199 R

[56] **References Cited**

UNITED STATES PATENTS

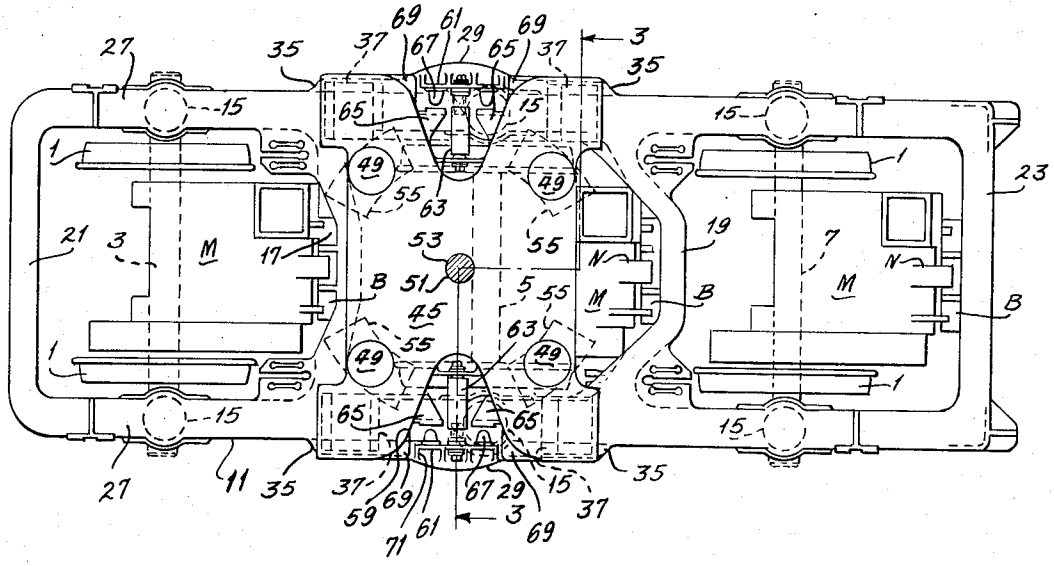
3,387,569	6/1968	Lich	105/196
3,521,569	7/1970	Muotka et al.	105/182 R
2,954,747	10/1960	Hirst et al.	105/196
2,782,026	2/1957	Hirst	105/197 A X
3,392,680	7/1968	Lich	105/136 X
3,447,483	6/1969	Lich	105/136

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[57] **ABSTRACT**

A multiple axle railway locomotive truck includes a rigid truck frame spring supported on the axles, and a bolster formed with a plurality of upwardly facing nonresilient body supporting surfaces spaced apart longitudinally and transversely of the bolster, the bolster being supported on the truck frame at each side by a pair of elastomeric pad devices each of which is upwardly and inwardly inclined longitudinally of the truck so that their normals converge at a low level, preferably at that of the rail, the combination of the longitudinal spacing of the body supports and the rail-level convergence of the pad normals ensuring elimination of weight transference resulting from tractive forces. Preferably all motor reaction connections to the truck frame are in the same direction longitudinally of the truck from the respective axles whereby to eliminate axle-to-axle weight transference resulting from opposite motor reactions on the truck frame.

10 Claims, 3 Drawing Figures



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SHEET 1 OF 2

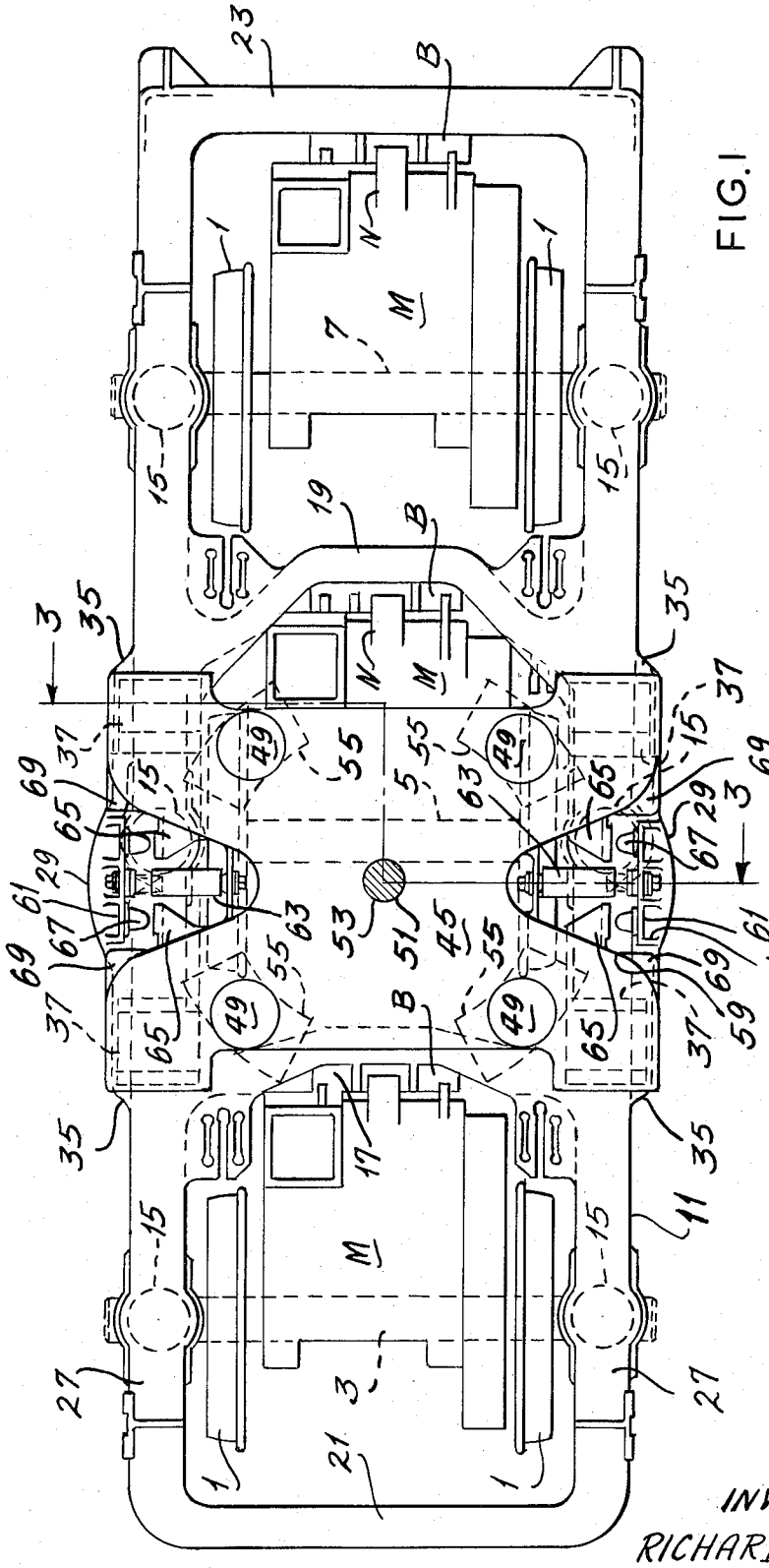


FIG. 1

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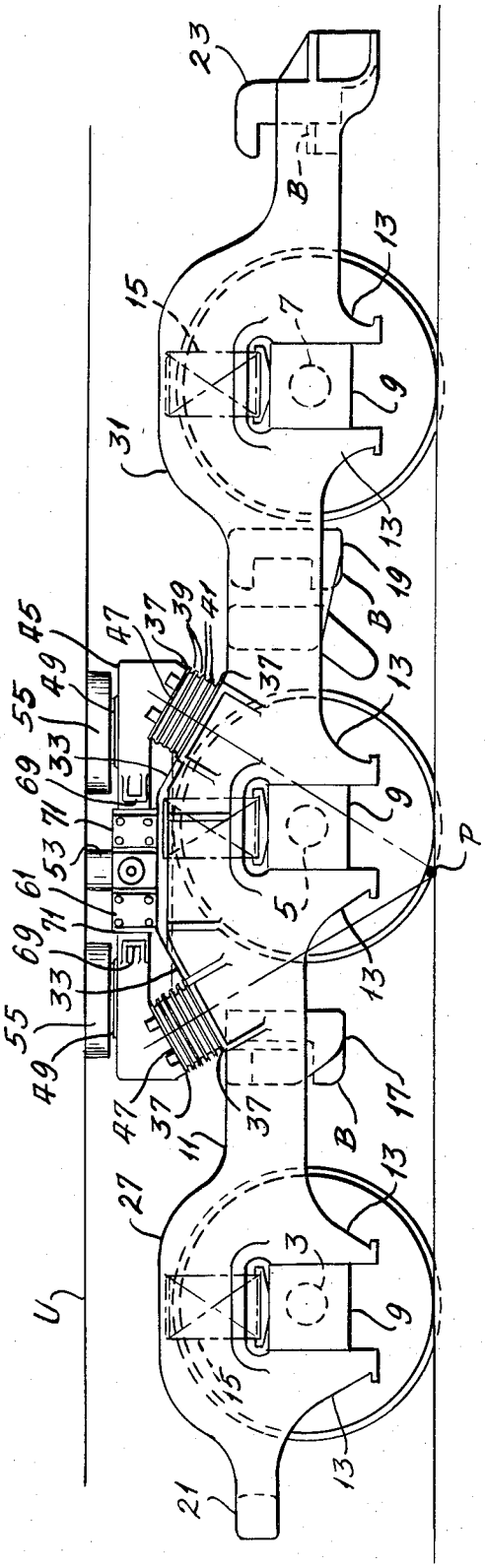


FIG. 2

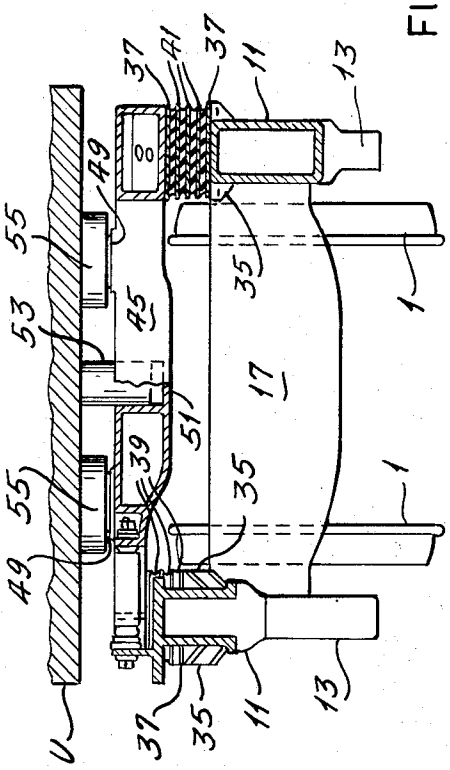


FIG. 3

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MOTORIZED RAILWAY LOCOMOTIVE TRUCK

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to railway rolling stock and consists particularly in a plural axle locomotive power truck in which tractive forces are transmitted to the locomotive body structure substantially at rail level whereby to substantially eliminate weight transference between the axles.

2. The Prior Art

The use of inclined elastomeric pad devices to support a truck bolster on the truck frame, with the normals of the pad devices converging at axle level, has been proposed in the past, in combination with a bolster which supports the vehicle or locomotive body structure through a single swivel bearing at the center of the bolster. In such trucks, the resistance to weight transference is limited by the effectiveness of the swivel bearing to prevent tipping of the bolster longitudinally of the truck. In such trucks too, the motors are usually arranged with the reaction connections of the motors on the end axles to the frame inwardly from the end axles, i.e., in opposite directions. If a middle axle is provided, its motor reaction connection to the frame must of necessity be in the same direction as that of one of the end axles so that, even though the opposite motor reactions of the end axles are balanced by equal and opposite reactions in the springs supporting the truck frame on the end axles, the middle axle will be additionally loaded or unloaded depending on the direction of rotation of the motors.

SUMMARY OF THE INVENTION

The invention provides a motor truck in which weight transference from axle to axle resulting from tractive forces is substantially eliminated by providing means for maintaining the truck bolster parallel, longitudinally of the truck, with the supported locomotive body, and supporting the bolster on the sides of the truck frame by pairs of elastomeric pad devices inclined upwardly and inwardly longitudinally of the truck, whereby their normals or compressive axes intersect at rail level to provide an effective point of traction transmission from the truck to the locomotive body at that level. Additional weight transference resulting from opposite motor reactions on the truck frame is eliminated by locating the reaction connections of the motors to the frame in the same direction, longitudinally of the truck from the respective axles.

The invention also provides normally disengaged positive longitudinal stop means between the bolster and frame spaced to become engaged whenever normal tractive forces are exceeded.

In addition to eliminating weight transference from axle to axle, the elastomeric mounting of the bolster on the frame provides effective longitudinal cushioning, permits the frame to tip about a transverse axis with respect to the supported locomotive body structure to accommodate to vertical track curvature, and provides substantial insulation of the bolster and supported locomotive body structure from vibrations of the truck frame.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of a truck embodying the invention.

FIG. 2 is a side elevational view of the truck illustrated in FIG. 1.

FIG. 3 is a transverse vertical sectional view along line 3—3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The truck comprises flanged wheels 1, pairs of which are rigidly mounted on spaced axles 3, 5 and 7, the ends of which are rotatably mounted in journal boxes 9.

A rigid truck frame comprising transversely spaced longitudinally extending side members 11, formed with spaced pairs of depending pedestal legs 13, between which are vertically slidably received journal boxes 9, is supported on the latter by means of upright coil springs 15. Intermediate middle axle 5 and end axles 3 and 7, frame side members are rigidly connected to each other by longitudinally spaced transversely extending transom members 17 and 19 and at their ends the frame side members are connected to each other by end transom members 21 and 23.

For propelling the truck and locomotive structure supported thereby, traction motors M are mounted on each axle with their noses N supported on cooperating brackets B respectively on transoms 17, 19 and 21, so that the reaction connections of the motors M to the truck frame, provided by motor nose N and transom brackets B, are all in the same direction from the respective axles, thus eliminating any tendency of the frame to tilt longitudinally and vary the load distribution on the axles, as occurs in trucks in which the motors are conventionally mounted with the end axle motor noses being connected to intermediate transoms, i.e., in opposite directions, while the middle axle motor nose is of necessity in the same direction as one of the end axle motor noses.

Frame side members 11 are upwardly arched as at 27, 29 and 31 over pedestals 13 and are there downwardly open to receive journal box supported springs 15, and intermediate transoms 17 and 19 are connected to side members 11 in the regions of the latter between arched portions 27 and 29, and 29 and 31, respectively.

In order to provide space for traction motors M, intermediate transoms 17 and 19 are bowed toward the right, as viewed in FIGS. 1 and 2, and motor mounting end transom 23 is spaced a substantially greater distance from end axle 7 than opposite end transom 21 is from the adjacent end axle 3.

Accordingly, the load supporting connections of the body underframe U to the truck are slightly offset longitudinally of the truck frame toward transom 21.

For supporting the body on the truck frame and transmitting traction and braking forces from the truck frame to the body, the central arched portions 29 of side members 11 are correspondingly asymmetrically disposed longitudinally of the truck frame, and are formed with transversely flat sloping sides 33 similarly inclined upwardly toward each other longitudinally of the truck, and their upper surfaces are widened by transversely inwardly and outwardly extending shelves

35, the inclinations of which are such that their normals intersect substantially at rail level, at point P.

Elastomeric pad devices, in the form of sandwiches comprising top and bottom metal plates 37 bonded to the top and bottom of several stacked flat rubber pads 39 interleaved by and bonded to metal plates 41, are seated by means of bottom plates 37 on shelves 35 and are retained against movement thereon, so that their compression axes coincide with the normals of shelves 35 and intersect at point P.

A bolster 45 of generally rectangular configuration in plan is formed at its corners with flat bottom surface portions 47 inclined parallel to shelves 35 and in alignment with the latter whereby bolster inclined surface portions are seated on the top plates 37 of the elastomeric pad devices.

The compression axes or normals of the pad devices generally approximate the resultants of vertical and longitudinal forces (body load and traction or braking forces) on the pad devices 37, 39, 41, provided bolster 45 is restrained against tilting longitudinally, and accordingly the intersection of these axes at rail level (point P) causes traction forces to be transmitted to the bolster at the level at which they are applied to the truck.

For stabilizing bolster 45 against tilting longitudinally with respect to locomotive underframe U, the top of the bolster is formed with four upwardly facing horizontal bearings spaced apart longitudinally of the truck a substantial distance, preferably similar to the longitudinal spacing of pad devices 37, 39, 41, and spaced apart transversely of the truck a sufficient distance to stably support the body.

Preferably bearings 49 are of circular shape in plan and, to minimize friction, are surfaced with the synthetic resin polymer "Teflon" or other material having similar surface characteristics.

At its center, bolster 45 is formed with an upwardly open cylindrical recess 51, and underframe U is provided with a depending vertical cylindrical boss 53 which is pivotally received in recess 51, whereby traction and braking forces are transmitted from bolster 45 to the body and swivel of the truck relative to the body is permitted.

For transmitting body loads to the truck, underframe U is provided with four depending downwardly facing horizontal bearings 55 concentric with bolster bearings 49 when the truck and body are longitudinally aligned and elongated tangentially with respect to pivot elements 51, 53, a sufficient distance to maintain full contact with bolster bearings 49 throughout the maximum angle of swivel. Both bolster bearings 49 and underframe bearings 55 are substantially nonresilient so as to positively oppose any substantial tilting of the bolster relative to the underframe.

At its sides bolster 45 is centrally indented as at 59 and, in registry with indentation 59, the upper flat surface of central arched portion 29 of the frame side members are formed with upwardly longitudinally extending abutments 61.

To dampen transverse movements of the bolster on the truck frame, permitted by transverse shear in the elastomeric pads 39, transverse snubbers 63 are positioned centrally in indentations 59 and are connected at their outer ends to frame abutments 61 and at their inner ends to bolster 45.

To limit lateral movements of the bolster, the sides of indentations 59 mount outwardly facing lateral stop brackets 65, which are normally spaced transversely inwardly from "beehive" rubber bumper elements mounted on the inner surfaces of abutments 61.

In order to prevent excessive longitudinal movement of bolster 45 relative to the truck frame through shear in pads 39, in the event that excessive traction forces are applied to the truck frame, transverse stop abutments 69 are formed on the sides of the bolster indentations 59 and are in longitudinally spaced relation with opposing transverse abutments 71 on the ends of frame abutment 61.

Operation of the truck is as follows: When motors M are energized to move the truck and supported locomotive to the left, for example, in FIGS. 1 and 2, the equal motor reactions transmitted to the frame by motor noses N and brackets B will all be downward and of the same magnitude, thereby not tilting the frame longitudinally, nor unequally loading springs 15.

The tractive forces applied to the truck at rail level are transmitted to the bolster at the same level because of the inclination of elastomeric pad devices 37, 39, 41, through which they act on the bolster, and since bolster 45 is prevented from tilting longitudinally with respect to underframe U by the engagement of bolster bearings 49 with underframe bearing 55, their effect on the underframe is the same as on the bolster, i.e., there is in effect no vertical arm through which traction forces act on the underframe to cause reduction in loading on the forward axle and increased loading of the rear axle.

When vertical track curvature is encountered, truck frame 11, 17, 19, 21, 23 can freely tilt longitudinally to accommodate to it without substantially varying the loading on springs 15, through shear in pad devices 37, 39, 41.

Transverse irregularities in the track, transmitted to the truck frame by the wheels, axles, journal boxes and pedestal jaws, are cushioned from the bolster and underframe by the transverse shear yieldability of pad devices 37, 39, 41, whereby the bolster is permitted limited lateral movements on the frame. Such movements are dampened by snubbers 63 and are limited by the engagement of lateral stop brackets 65 and beehive bumpers 67.

In the event of abnormally high tractive forces, movement of the bolster longitudinally of the frame which might result therefrom through shear in pads 39, is prevented by the engagement of longitudinal stop brackets 69 on the bolster and abutments 71 on the frame.

For rounding curves, the swivel center is defined by mating underframe boss 53 and bolster recess 51, and swivel is accommodated by sliding of underframe bearings 55 on bolster bearings 49.

The details of the structure 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.

I claim:

1. In a railway locomotive power truck having at least two wheeled axles spaced apart lengthwise of the truck, a rigid frame resiliently supported on said axles, a pair of upwardly facing surfaces on each side of said frames inclined upwardly toward each other longitu-

dinally of the truck, elastomeric pad devices seated on said frame inclined surfaces, said surfaces being spaced from each other longitudinally of the truck such that the normals of said pad devices converge at a substantially lower level than said axles, a bolster having downwardly facing surfaces parallel to said frame upwardly facing surfaces and seated on said pad devices, said pad devices forming the sole support of said bolster on said truck frame and the sole means for transmitting longitudinal forces between said rigid frame and said bolster, means on said bolster for pivotally connecting said bolster to a supported underframe, and nonresilient horizontal bearing surface means on said bolster spaced apart longitudinally thereof substantially as far as said pad devices for positively preventing substantial longitudinal tilting of said bolster with respect to the supported underframe.

2. In a railway locomotive power truck according to claim 1, the normals of said pad devices converging substantially at rail level.

3. In a railway locomotive power truck according to claim 1, a third wheeled axle spaced from and positioned intermediate said pair of wheeled axles.

4. In a railway locomotive power truck according to claim 3, traction motors supported on said axles and all having their reaction connections to said frame in the same direction longitudinally of the truck from their respective axles.

5. In a railway locomotive power truck according to claim 3, said frame having longitudinal side members with upwardly arched portions over said middle axle, said upwardly facing inclined surfaces being on said upwardly arched portions.

6. In a railway locomotive power truck according to claim 5, said bolster having a plurality of upwardly facing bearings, some of said bearings being spaced apart lengthwise of the truck and being adaptable for sliding engagement with underframe bearings.

7. In a railway locomotive power truck according to claim 1, said bearings being constructed for nonresilient engagement with opposing bearings on the supported underframe.

8. In a railway locomotive power truck according to claim 1, there being at least three of said bearings on said bolster.

9. In a railway locomotive power truck according to claim 8, there being four of said bearings on said bolster.

10. In a railway locomotive power truck according to claim 1, cooperating means on said bolster and truck frame for limiting relative longitudinal movements therebetween, said cooperating means being spaced apart longitudinally of the truck a sufficient distance to become operatively engaged only when normal traction forces are exceeded.

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