

June 13, 1961

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2,988,015

RAILWAY CAR SUSPENSION SYSTEMS

Filed Oct. 7, 1957

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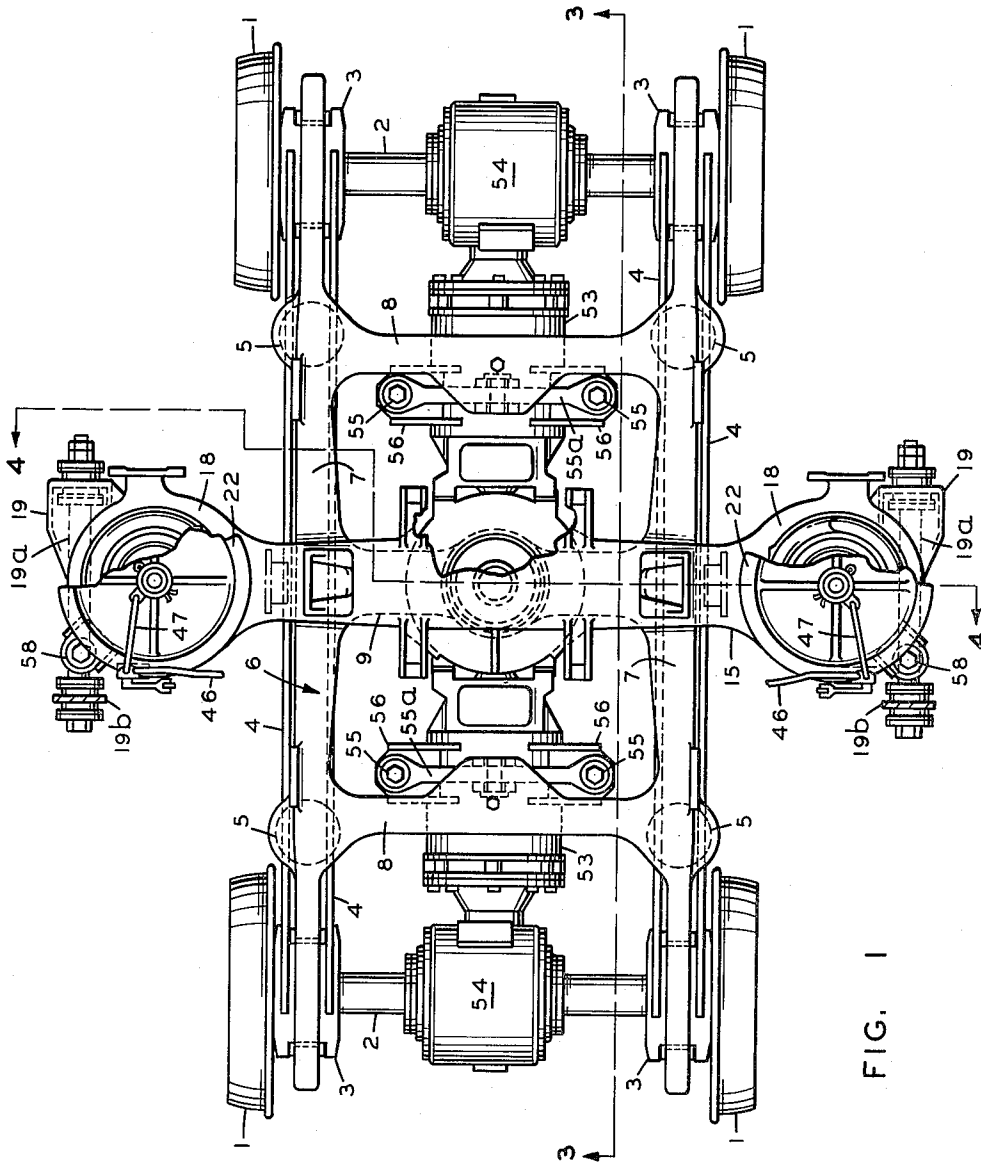


FIG. 1

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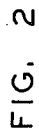
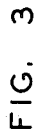
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7 Sheets-Sheet 2



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7 Sheets-Sheet 3

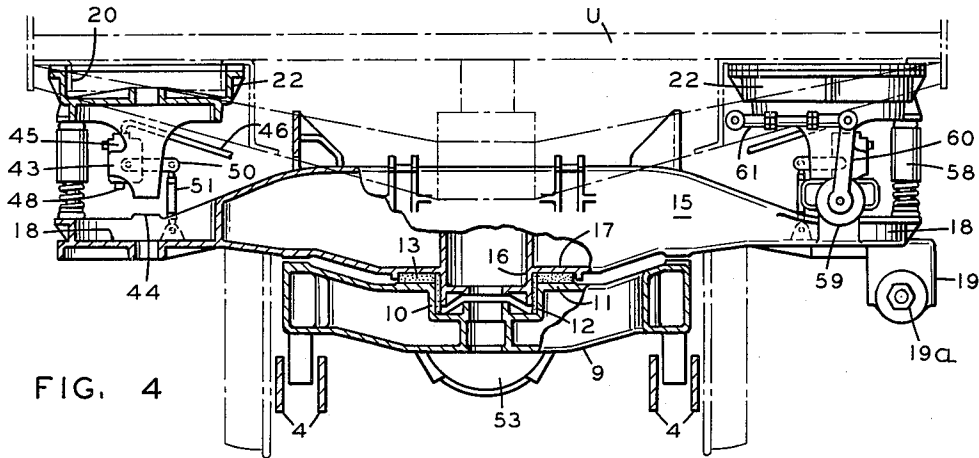


FIG. 4

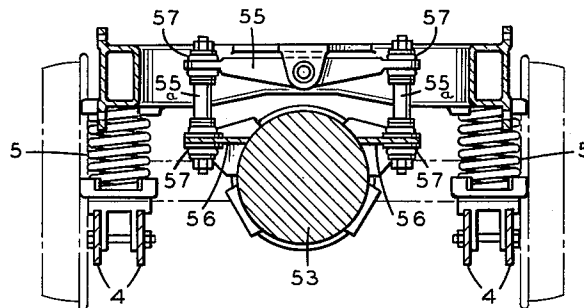


FIG. 5

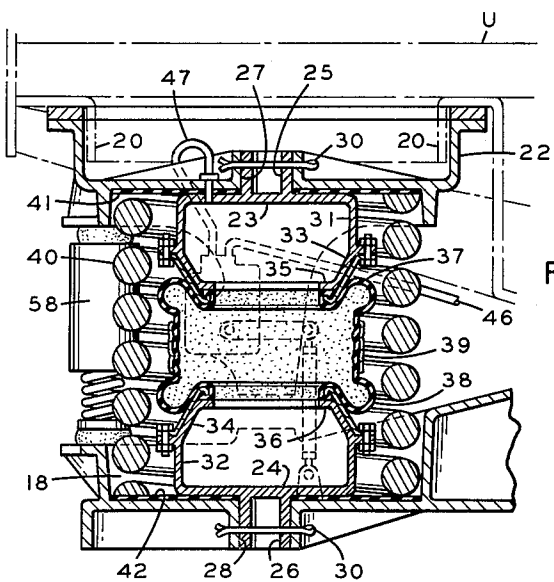


FIG. 6

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7 Sheets-Sheet 4

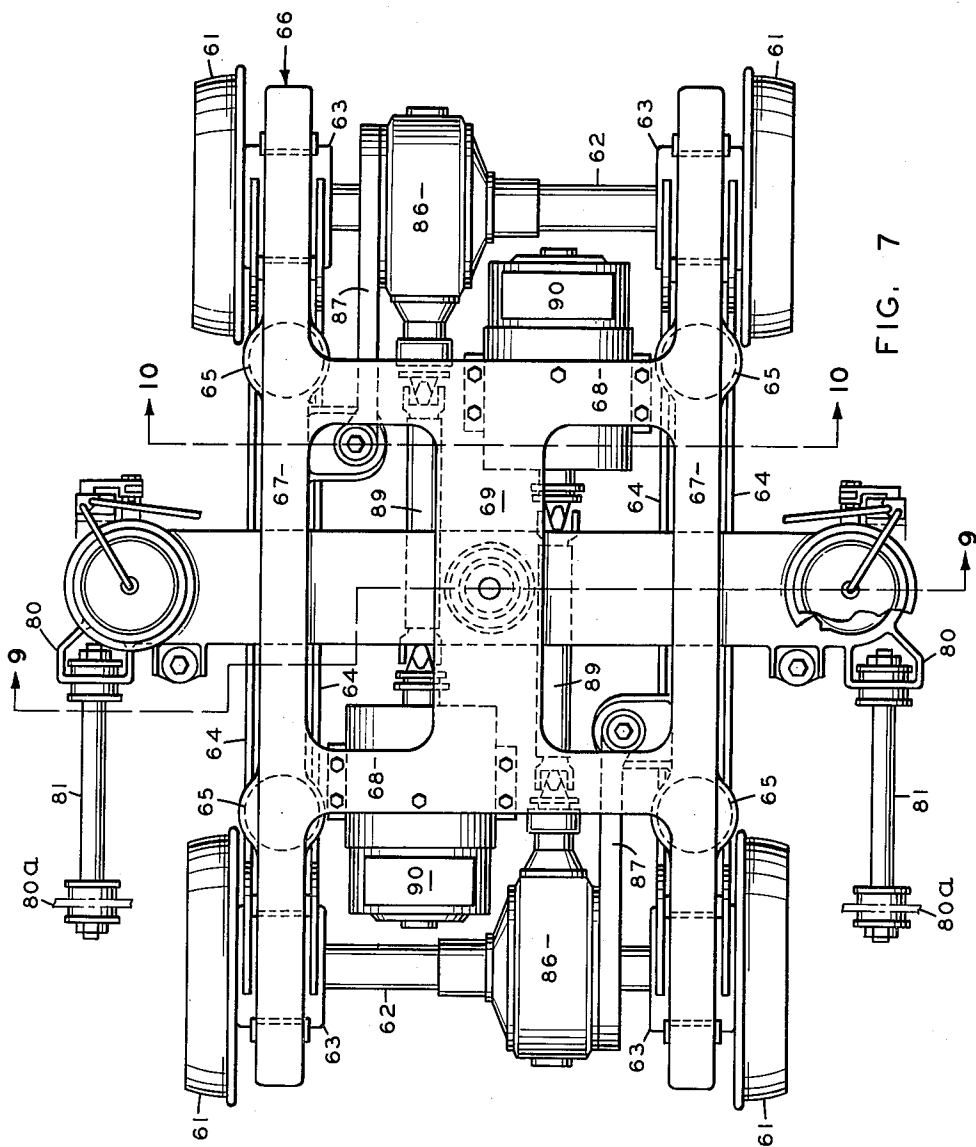


FIG. 7

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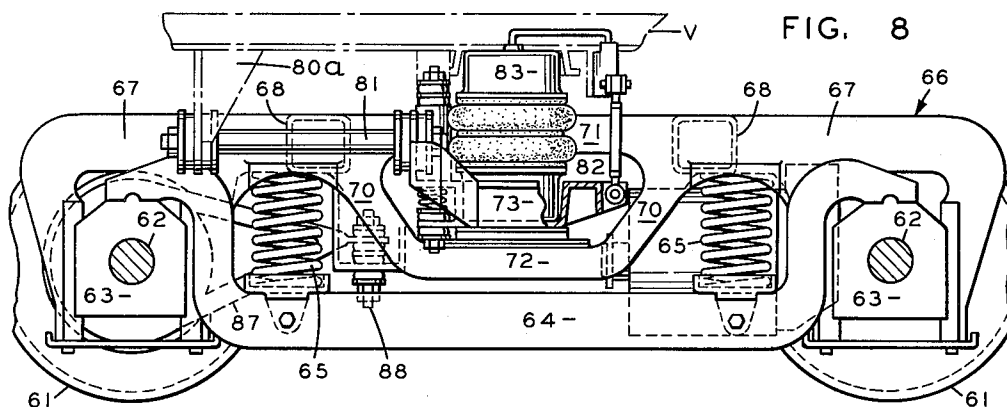
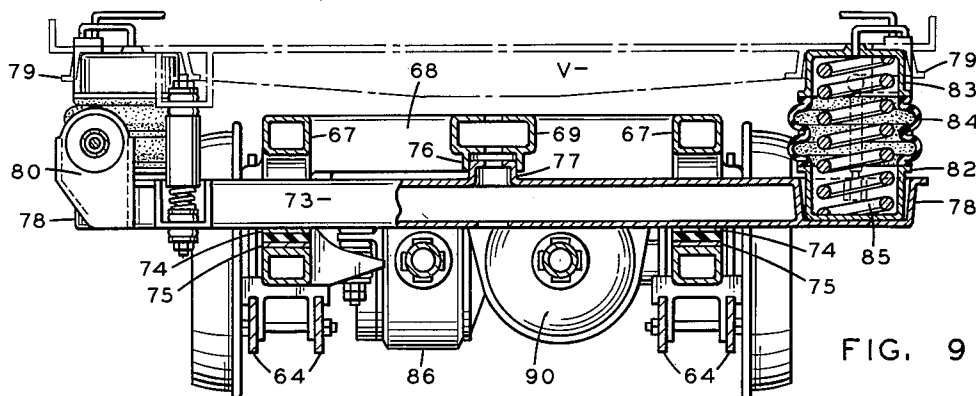
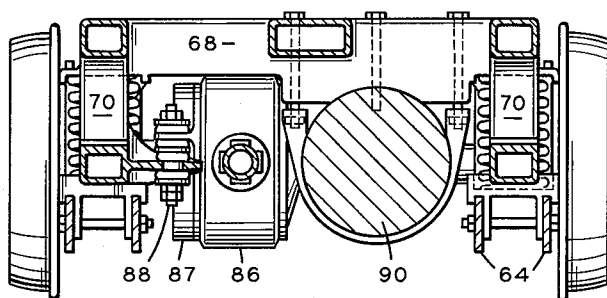
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RAILWAY CAR SUSPENSION SYSTEMS

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7 Sheets-Sheet 5



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RAILWAY CAR SUSPENSION SYSTEMS

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7 Sheets-Sheet 6

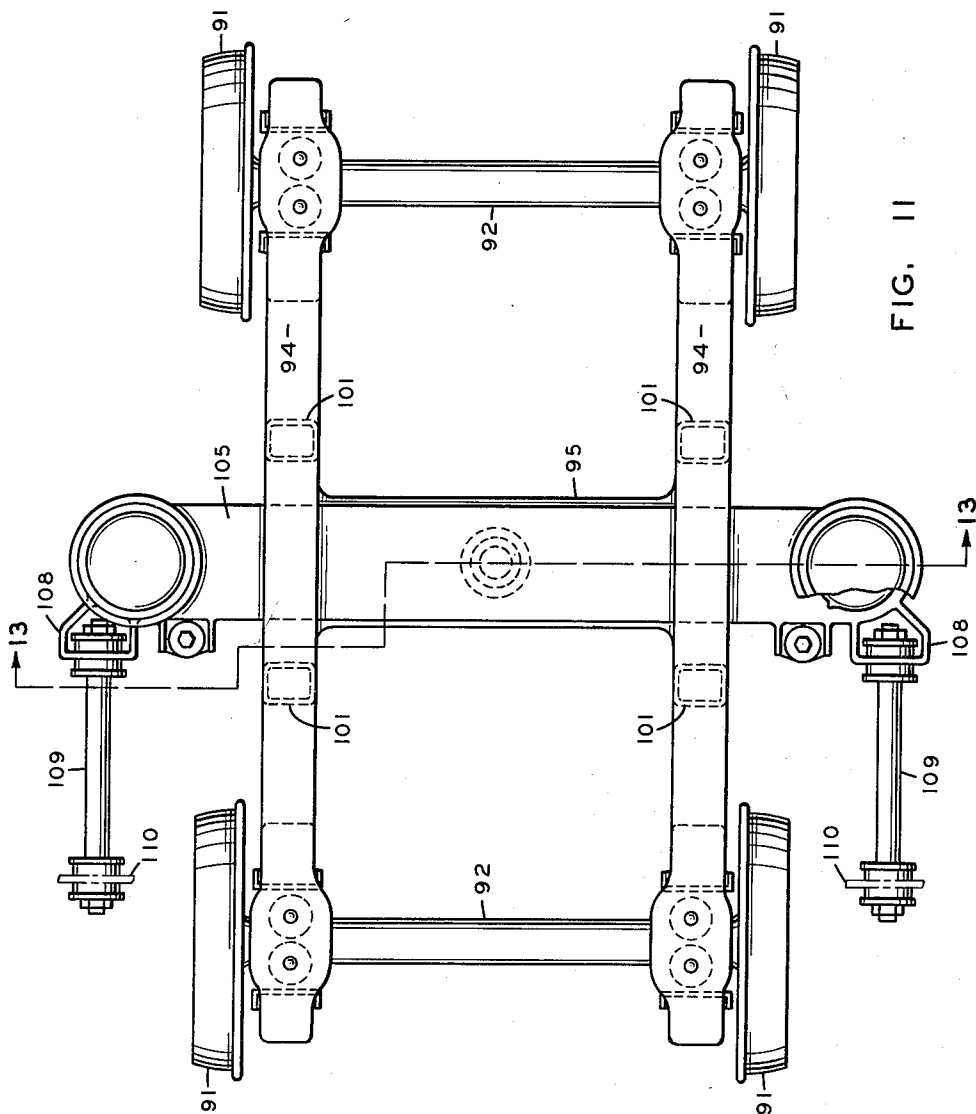


FIG. 11

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RAILWAY CAR SUSPENSION SYSTEMS

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7 Sheets-Sheet 7

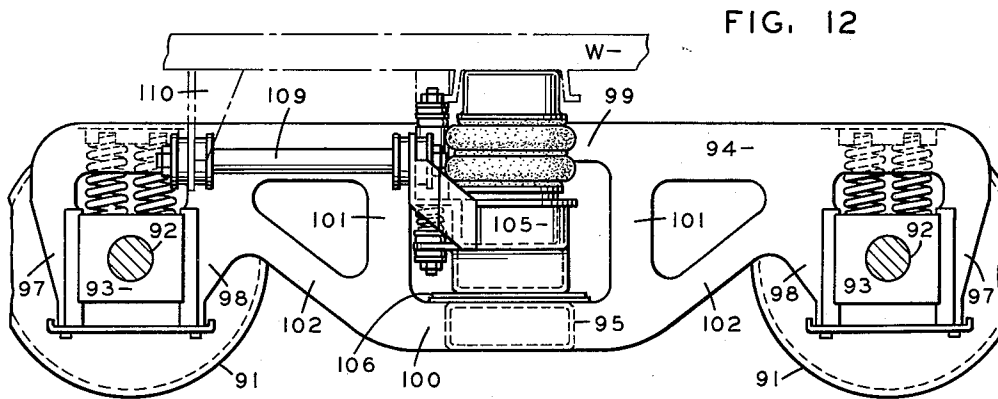
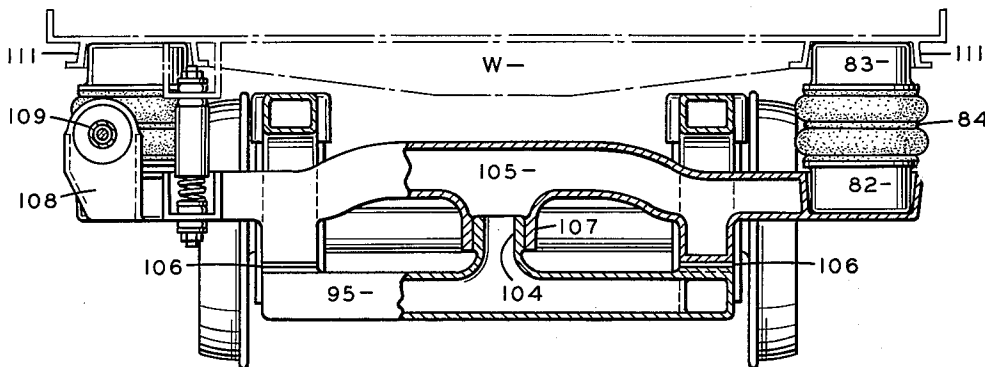


FIG. 13

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RAILWAY CAR SUSPENSION SYSTEMS

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16 Claims. (Cl. 105—182)

The invention relates to railway rolling stock and consists particularly in suspension systems for light weight passenger cars.

In light weight cars in which the ratio of loaded to light weight is very high, the use of springs of desirable softness has been considered incompatible with the maintenance of lateral stability (because of the necessarily close lateral spacing and low location of the springs in conventional trucks), and with the maintenance of uniformly good riding qualities and substantially constant coupler height throughout the vehicle loading range (because of the constant rate of conventional metal springs and their large deflection from light to loaded position). To provide uniform riding qualities and substantially constant coupler height under all load conditions pneumatic springs having a constant frequency throughout the vehicle loading range and arranged to maintain vehicle height constant regardless of load have been suggested and in some instances used. Pneumatic springs are disadvantageous in that they do not offer sufficient lateral resistance to control lateral movement of railway car bodies on their trucks, they require more space than is normally available for springs in the usual truck structure, and in the event of leaks or of inability to provide them with compressed air, they become inoperative.

Accordingly, it is an object of the invention to provide a laterally stable though very soft car suspension capable of maintaining uniformly good riding qualities and substantially constant coupler height throughout the vehicle loading range.

It is a further object to provide a car suspension structure in which the body load passes more directly from the load-supporting side walls of the car body to the rails than in conventional equipment, thereby permitting substantial lightening of transverse body and truck frame members.

It is an additional object to provide a compact, dependable spring device capable of maintaining uniform riding qualities and substantially constant coupler height throughout the loading range of a supported vehicle and of controlling lateral movements of the supported vehicle.

I achieve the foregoing and additional objectives as may hereinafter appear by providing inside bearing trucks having a rigid frame spring-supported from the axles, and supporting a transverse bolster on the truck frame, for movement with respect thereto solely about a central vertical pivotal axis; at its ends, well outboard of the truck frame wheel pieces, the bolster mounts springs on which are supported the vehicle body, the bolster being connected to the vehicle body by longitudinally extending links or anchors so that relative lateral and vertical movements are permitted between the bolster and the body but the bolster is retained against swiveling or longitudinal movements relative to the body. By supporting the body near its load-bearing side walls instead of on its longitudinal center line and by supporting the truck frame on the axles inboard of the wheels, vertical bending moments on the body bolster and the transverse framing of the truck are substantially reduced, thus permitting the use of much lighter members. The inboard location of the truck frame makes it possible to keep the bolster height sufficiently low that objectionable eccentricity between the bolster and the axles, and objectionable intrusion of the springs upwardly into the

2

body, are avoided; it also makes possible the use of relatively large diameter body-supporting springs. The low bolster height is achieved by depressing the rigid frame between its spring supports from the axles and extending the bolster through the frame depressions. In this connection, the inboard location of the frame makes it possible to minimize the length of the frame depression, and hence of the truck wheel base, without restricting the amount of swivel, since the arc described by the bolster for any given angle of swivel will be shorter where the bolster overlies the inboard frame side members than it would be outboard of the wheels. In order to utilize the soft springing which the high location and wide spacing of the springs makes possible, combination air and coil springs are used. In these springs, a soft coil spring surrounds the pneumatic spring and is arranged to support the body unaided by the pneumatic spring during light load conditions. The pneumatic spring is provided with a valve connecting the spring to a source of compressed air for maintaining spring height substantially constant.

In the accompanying drawings:

FIGURE 1 is a plan view of a preferred embodiment of the truck and spring arrangement.

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

FIGURE 3 is a longitudinal vertical sectional view along the line 3—3 of FIGURE 1.

FIGURE 4 is a transverse vertical sectional view along the line 4—4 of FIGURE 1.

FIGURE 5 is a transverse vertical sectional view along the line 5—5 of FIGURE 3.

FIGURE 6 is a transverse vertical sectional view of the body supporting spring illustrated in the truck shown in FIGURES 1—5.

FIGURE 7 is a plan view of a modified form of the invention.

FIGURE 8 is a side view of the truck shown in FIGURE 7.

FIGURE 9 is a transverse vertical sectional view along the line 9—9 of FIGURE 7.

FIGURE 10 is a transverse vertical sectional view along the line 10—10 of FIGURE 7.

FIGURE 11 is a plan view of another modified form of the invention.

FIGURE 12 is a side view of the truck illustrated in FIGURE 11.

FIGURE 13 is a transverse vertical sectional view along the line 13—13 of FIGURE 11.

Referring now to the drawings the truck shown in FIGURES 1—5 includes wheels 1, axles 2, journal boxes 3 rotatably mounted on axles 2 inboard of wheels 1, drop equalizers 4 supported at their ends on journal boxes 3 and extending longitudinally therebetween, coil springs 5 supported on the drop portions of the equalizers, and a rigid frame 6, comprising longitudinally extending wheel pieces 7 supported on coil springs 5, and transversely extending transoms 8 connecting wheel pieces 7 so as to form a rigid framework. Intermediate the equalizer springs 5, wheel pieces 7 are depressed as at 7a, and are connected by a transversely extending center transom 9, which is of box section and forms, intermediate its ends, a generally upwardly facing central bearing comprising a vertical cylindrical recess 10 and a flat annular surface 11 surrounding recess 10. A cylindrical sleeve 12 of friction material is received within recess 10 and an annular pad 13 of similar material is seated on annular surface 11.

Transverse bolster 15 is of box section, and its bottom wall includes a downwardly facing central bearing comprising depending central cylindrical member 16, which is adapted to be pivotally received within recess 10 in the truck frame transom 9, and an annular horizontal

surface 17 surrounding element 16 and seated on the upper surface of pad 13 whereby the vertical load carried by the bolster is supported on the truck frame. The bolster 15 is thus free to pivot relative to the truck frame, but oscillations about the vertical pivotal axis, formed by the mating cylindrical members 10 and 16 will be opposed by the frictional resistance offered by sleeve 12 and pad 13.

The end portions of the bolster extend outwardly through the wheel pieces depressions 7a and are widened outboard of the wheel pieces to form relatively large-diameter cup-shaped upwardly facing spring seats 18 on each of which is seated a combination coil and air spring device, best illustrated in detail in FIGURE 6. Spring seats 18 are each provided with a depending bracket 19 to which is resiliently secured a longitudinally extending anchor rod 19a of the type disclosed in Re. Patent No. 21,987, the other end of anchor rod 19a being secured to a bracket 19b depending from vehicle underframe U, so that lateral and vertical movements are permitted between the body and the bolster, but the bolster is restrained against longitudinal or swiveling movements relative to the underframe. The underframe U is provided at its sides with depending cylindrical flanges 20 which register with cooperating upstanding cylindrical flanges 21 on the spring cap 22. Each of the spring devices shown in FIGURE 6 includes a pneumatic spring consisting of an air-tight vertically-yieldable chamber comprising substantially identical inverted top and upright bottom cups 23 and 24, each provided with respectively upstanding and depending elements 25 and 26 which are received within cooperating openings 27 and 28 respectively in spring caps 22 and spring seats 18 and are held against rotation therein by cotter pins 30. Cups 23 and 24 are partially cylindrical as at 31 and 32 but are provided at their lower and upper portions respectively with frusto-conical wall portions 33 and 34 terminating in horizontal inwardly extending flanges 35 and 36, each of which forms a circular opening in the cup walls. Flanges 35 and 36 are connected by a flexible wall of rubber-like material comprising flexible upper and lower convolutions 37 and 38 respectively and a connecting rigid, substantially cylindrical portion 39 of greater diameter than the cylindrical portions 31 and 32 of the upper and lower cups 23 and 24. It will be seen that during axial movements, convolutions 37 and 38 will flex and roll on or away from contact with the conical outer surfaces 33 and 34 of the upper and lower cups respectively, the proportion of the convolutions being in contact with the frusto-conical surface of the cups and the radius of curvature of the remaining portion being a function of the height of the spring at any given time. The cup-shaped portions of the spring seat and spring caps 18 and 22 respectively are of substantially larger diameter than pneumatic chamber top and bottom cups 23 and 24 and provide a seat and cap for a coil spring 40 which completely surrounds and encloses the pneumatic chamber. It will be noted that the spring seats and caps each include a thin pad of rubber-like material 41 and 42 on their spring supporting and supported surfaces, respectively, for the purpose of deadening sound. Under light load conditions coil springs 40 would carry the entire body load.

Spring caps and spring seats 22 and 18 respectively are provided with opposing depending brackets 43 and upstanding bosses 44 for abutting engagement in the event of spring failure. One of the depending brackets 43 on each spring cap supports a valve device 45, which is connected by a conduit 46 to a source of compressed air (not shown) and by another conduit 47 to the upper cup 23 of the pneumatic spring. A third bottom opening 48 in valve 45 communicates with the atmosphere. The operation of the valve 45 is regulated by arm 50 which is connected by a pitman 51 to the spring seat portion 18 of the bolster, so that valve 45 is responsive to changes in height between the spring seat and spring

cap. The valve is so arranged that during light load conditions the entire vehicle body load will be supported on coil springs 40, as pointed out above; when the vehicle is loaded in excess of light load conditions so that coil spring 40 is compressed, pitman 51 will urge the connected end of arm 50 upwardly thereby causing valve 45 to connect conduit 47 to conduit 46 and admit additional air to the pneumatic chamber. As soon as the additional air in the pneumatic chamber has extended the spring to its predetermined normal height, valve 45, actuated by pitman 51 and arm 50 will close the communication between conduits 47 and 46 until there is additional load on the spring compressing it further. In converse, when load is removed from the vehicle and the spring expands beyond the predetermined normal height, pitman 51 will cause the outer end of arm 50 to move downwardly thereby venting conduit 47 to the atmosphere and permitting the discharge of excess air from the pneumatic chamber until the chamber again reaches its predetermined height, at which time the valve will be closed.

It will be evident from the foregoing that since the normal light load of the vehicle is supported solely by the coil spring, a smaller air spring can be used in combination with the coil spring than if the air spring were the sole support of the vehicle load. By supplementing the coil spring with the air spring a very soft coil spring can be used which will provide the proper spring rate and frequency for light load conditions. If such a coil spring were used by itself, under loaded conditions the spring would be substantially compressed and the vehicle height would be substantially reduced due to the softness of the spring. If a stiffer coil spring were used by itself it would be too stiff to provide satisfactory riding qualities under light load conditions. On the other hand, by providing the pneumatic spring, with its constant frequency characteristic and its ability to operate at constant height regardless of load, in combination with a soft coil spring capable of carrying the light load by itself, the result is a compact spring device having a substantially constant frequency over a relatively wide loading range, with resultant good riding qualities. Moreover the combination of the coil spring with the air spring provides positive control of relative lateral movement between the bolster and the car underframe since the relatively slight resistance of the air spring to lateral distortion is supplemented by the high resistance of the coil spring to such distortion. Further advantages of the combination are safety in operation which would not be achieved by an air spring solely, because of the possibility of failure of air pressure. As a corollary to the last mentioned advantage this combination spring would offer much greater ease of yard movement, in that the air springs would not have to be charged prior to such movements as they would have to be in a straight air spring system.

The truck is provided with a pair of motors 53 which are each rigidly connected to a gear box 54 mounted on an adjacent axle. To accommodate lateral play of the axles and vertical movements of the frame on the equalizer springs the motors are suspended from intermediate transoms 8 by means of a transverse rocker arm 55 pivoted from the transom and carrying at each of its ends an anchor 55a to the lower ends of which are secured laterally extending ears 56 on the motor. Anchors 55a are of the type disclosed in Re. 21,987 and include resilient end connections 57 whereby some slight angularity is permitted between the anchor rods and the ends of the rocker arm and motor ears 56 respectively. It will be evident from this construction that the motor will be free to accommodate itself to any position which the axle may take relative to the frame either occasioned by angularity of the frame caused by unequal depression of the opposite equalizer springs or by lateral play of the axle in its journal boxes.

5

For damping vertical movement of the body supporting springs 18, vertically arranged friction snubbers 58 are connected between spring seats 18 and spring caps 22, and for damping lateral movements between underframe U and the bolster, a conventional hydraulic snubber 59 mounted on spring seats 18 and having a crank 60 connected by a laterally extending rod 61 with underframe U, is provided.

A second embodiment of the truck, shown in FIGURES 7 to 10, includes the usual flanged wheels 61, axles 62, journal boxes 63 rotatably mounted on axles 62 inboard of wheels 61, drop equalizers 64 extending longitudinally of the truck between the axles and supported at their ends on journal boxes 63, equalizer springs 65 and a rigid truck frame 66, including longitudinally extending wheel pieces 67 resiliently supported on equalizer springs 65, transverse transoms 68, and a central longitudinally extending member 69 connecting both transverse transoms 68. Intermediate equalizer springs 65, wheel pieces 67 are split vertically to provide a structure of isosceles trapezoidal shape and consisting of inclined legs 70, top chord 71 co-linear with the top of the wheel piece, and a horizontal longitudinally extending bottom chord 72. A transversely extending bolster 73 passes through the wheel piece windows formed by members 70, 71, and 72 and is supported on the bottom chords 72 thereof by slidable bearings comprising frictionally engaging wear plates 74 and 75. Longitudinally extending member 69 of the truck frame is provided with a central depending cylindrical bearing member 76, in which is pivotally received a cooperating upstanding cylindrical member 77 on the upper surface of the bolster. The bolster is of box section except for its spring seat end portions 78, the top wall portion of the bolster being removed adjacent its ends to form an upwardly open cup. Springs are seated in seats 78 and their upper ends are received in downwardly open cup-shaped spring caps 79 which are provided on underframe V. The spring seat portions 78 of bolster 73 are each provided with upstanding brackets 80 to which are resiliently secured longitudinally extending anchor rods 81 of the type disclosed in Re. 21,987, the other ends of anchor rods 81 being connected resiliently to a bracket 80a depending from the vehicle underframe V whereby to restrain the bolster against swiveling or longitudinal movements relative to the underframe V while at the same time accommodating relative vertical and lateral movements therebetween.

The spring utilized in this arrangement comprises a lower cup 82, seated in spring seat 78 on the bolster, an upper inverted cup 83 recessed within and supporting the spring cap portion 79 of car underframe V, and a two-convolution flexible wall 84 of rubber-like material connecting the lower and upper cups and forming therewith an air tight chamber. A coil spring 85 seated on the bottom of the lower cup 82 and normally bearing against the top of the upper cup 83 carries the vehicle body load under light load conditions. The spring is connected to a source of compressed air by a valve device of the type described in connection with the first modification of the invention and the valve device is similarly actuated. Accordingly the valve device and its actuating structure are not described in detail in connection with this embodiment of the invention.

Each axle of the truck carries a driving gear box 86 having a longitudinally extending torque arm 87 secured by means of a bolt and resilient washer assembly 88 to a bracket extending inwardly from one of the wheel piece inclined members 70. Gear box 86 is connected by the usual longitudinally extending Cardan shaft 89 to a motor 90, motor 90 being suspended in known manner from the transom 68 at the opposite end of the gear box from which it is connected. Each axle is provided with a similar mo-

6

tor and gear box arrangement, the gear boxes being supported at opposite ends of the individual axles whereby to permit arrangement of the motors and connecting drive shafts at opposite sides of the truck.

A third embodiment of the invention is shown in FIGURES 11 through 13. The truck includes the usual flanged wheels 91, axles 92, and journal boxes 93 rotatably mounted on axles 92 inboard of wheels 91. A truck frame comprising longitudinally extending wheel pieces 94, connected by a transom 95, is spring supported as at 96 on journal boxes 93 which are vertically slidably received between wheel piece pedestal legs 97 and 98. Intermediate the inner pedestal legs 98 the wheel piece is divided vertically into a truss structure comprising a top chord 99 and a bottom chord 100 connected by vertical columns 101 and diagonal members 102. Transom member 95 extends between and is integral with bottom chord 100, and is formed with a central upstanding cylindrical element 104. A transversely extending bolster 105 extends outwardly of the wheel pieces through the windows therein formed by wheel piece top chords 99, bottom chords 100 and columns 101, 101, and is supported on the bottom chords 100 by a longitudinally slidable bearing 106. The bolster 105 is provided with a depending cylindrical element 107, in which is pivotally received the upstanding cylindrical element 105 on transom 95, so that the bolster is free to pivot about member 105. The ends of the bolster are recessed downwardly to receive a combination coil and air spring 82, 83, 84 of the type shown in the previous embodiment; operation of the spring is identical to that in the previous embodiment. The bolster is similarly provided at its ends with upstanding brackets 108, to which are resiliently secured anchor rods 109 of the type used in the other embodiments, which extend longitudinally of the truck and are connected at their opposite ends to a depending bracket 110 from the car underframe W whereby to prevent relative longitudinal and swiveling movements between the bolster and car underframe and at the same time accommodate such vertical and lateral movements therebetween as may be permitted by the bolster springs 82, 83, 84 which support the underframe W through suitable spring cap structures 111.

The usual lateral and vertical shock absorbers, or snubbers, are provided in this embodiment as well as in the previous embodiment.

The details of the structure may be varied substantially without departing from the spirit of the invention, and the exclusive use of those modifications as come within the scope of the appended claims is contemplated.

What is claimed is:

1. A railway vehicle truck comprising wheels, axles, equalizers supported on said axles and extending longitudinally therebetween, a rigid frame spring supported from said equalizers, a bolster mounted on said frame to pivot about a vertical axis substantially at the center line of the truck, upright vehicle-supporting pneumatic springs seated on said bolster and spaced transversely of the truck from said axis, each of said pneumatic springs comprising an axially and transversely distortable flexible wall chamber, separate normally-closed valves each having an exhaust outlet and conduit connections with one of said chambers and a source of compressed air, a linkage connected to said bolster in the region of the associated chamber and to the valve and moving the valve to connect the associated chamber with said source when the level of the supported vehicle body decreases to less than a predetermined height and to connect the associated chamber with said exhaust outlet when the vehicle body level exceeds a predetermined height.

2. A railway vehicle truck according to claim 1 in which the equalizer springs are spaced apart lengthwise of the truck, said frame including side members supported on said equalizer springs and having elongated depressions extending between said equalizer springs, said bolster extending through said depressions.

3. A railway vehicle truck comprising wheels and axles, longitudinally extending equalizers supported from said axles, springs on said equalizers adjacent said axles, a rigid frame comprising longitudinally extending side members supported on said springs and transversely extending transom members, the portion of said frame longitudinally intermediate said springs being at a lower level than the portions of said frame overlying said springs, a bolster mounted directly on said intermediate portion of said frame to pivot about a fixed vertical axis substantially at the center of the truck, upright springs seated on said bolster and spaced transversely of the truck from said axis, said upright springs being adapted to directly support a vehicle body and being transversely as well as axially yieldable whereby the accommodate transverse as well as vertical movements of the supported vehicle body relative to said bolster, said upright springs providing the sole resistance to substantial lateral movement between said bolster and the supported vehicle body, and connections between said bolster and the supported vehicle body for preventing swiveling movements about a vertical axis relative to the vehicle body.

4. A railway vehicle truck according to claim 3 in which one of said transoms is at the longitudinal center of said truck and includes, intermediate its ends, a central bearing comprising a vertical cylindrical element and a horizontal annulus surrounding said vertical cylindrical element, there being a second mating vertical cylindrical element on said bolster and a cooperating horizontal annulus surrounding said mating cylindrical element, said cooperating annulus being seated in load supporting engagement on said first named annulus.

5. A railway vehicle truck comprising wheels, axles, longitudinally extending equalizers supported at their ends from said axles, springs on said equalizers adjacent said axles, a rigid frame including longitudinal side members supported on said springs and structure connecting said side members, said side members including window-forming structure between said springs, said window forming structure comprising an upper chord and a lower chord, said lower chord being at a level substantially below the top of said side members, a vertical pivot-forming element on said transverse connecting structure substantially central of the frame, a transversely extending bolster having an upstanding pivot-forming element in pivotal engagement with said first name pivot-forming element, said bolster extending transversely of the truck through said windows and being slidably supported on the lower chords of said window forming structure whereby to accommodate pivotal movements of said bolster relative to said frame about the vertical pivotal axis formed by said engaged pivot-forming elements, and springs seated on said bolster outboard of said frame side members, said springs being adapted to support a vehicle body.

6. A railway vehicle truck according to claim 5 in which the transverse structure connecting said truck frame side members comprises a pair of longitudinally spaced transversely extending transoms and a central longitudinally extending member connecting said transoms, said first named pivot forming element depending from said longitudinally extending member.

7. A railway vehicle truck according to claim 5 in which the vehicle body supporting springs include co-axial pneumatic and metallic coil springs, there being a valve device responsive to changes in spring height pneumatically connected with said pneumatic springs for admitting and discharging air thereto and therefrom whereby to maintain the spring height substantially constant throughout the vehicle loading range.

8. A railway vehicle truck comprising wheels, axles, a truck frame including longitudinally extending side members directly spring supported from said axles, each of said side members comprising a top chord, a bottom chord, and a pair of longitudinally spaced vertical columns connecting said top and bottom chords and forming there-

with a substantially rectangular window intermediate said axles, a transversely extending transom rigidly connecting said side members and including intermediate its ends vertical pivot-forming structure, a transversely extending bolster having cooperating pivot-forming structure in vertical pivotal engagement with said first-named pivot-forming structure, said bolster extending transversely of the frame through said window and having bearing elements in slidable engagement with the upper surfaces of said bottom chords, there being springs seated on the outer end portions of said bolster, said springs being adapted to support a vehicle body for movement vertically and transversely of the truck, and connections between said bolster and the supported vehicle body for preventing swiveling movements therebetween about a vertical axis.

9. A railway vehicle truck according to claim 8 in which said transom connects said bottom chords.

10. A railway vehicle truck comprising wheels, axles, a rigid frame supported from said axles, a bolster mounted on said frame to pivot about a vertical axis substantially at the center of the truck, and structure for supporting a vehicle body on the truck consisting solely of upright springs seated on said bolster and supported solely thereby and spaced transversely of the truck from said vertical axis, each of said springs comprising an axially and transversely distortable flexible wall chamber, separate normally closed valves each having an exhaust outlet and connections with one of said chambers and a source of compressed air, a separate linkage connected to each valve and to said bolster adjacent the associated spring and positioning the valve to connect the associated chamber with said source when the level of the supported vehicle body decreases to less than a predetermined height and to connect the associated chamber with said exhaust outlet when the vehicle body level exceeds a predetermined height, said springs each including a coil spring concentric with and surrounding said chamber and seated on said bolster and normally adapted to be in load-supporting engagement with the supported vehicle body.

11. A railway vehicle truck comprising wheels, axles, upright springs supported from said axles and spaced apart lengthwise of the truck, a rigid truck frame including side members spaced apart transversely of the truck and each supported on said springs, said side members having portions depressed between the spring supports of said side members to a level substantially below said spring supports, a bolster mounted directly on said frame to pivot about a vertical axis substantially at the center of the truck and extending laterally outwardly therefrom and over said depressed portions of said side members, said depressions being substantially longer lengthwise of the truck than the width of the portion of the bolster passing through them whereby to accommodate swivel of the bolster relative to the frame, and upright spring devices seated on said bolster outwardly of said side members at a lower level than the support of said side members on said upright springs, said upright spring devices being adapted to support a vehicle body.

12. A railway vehicle truck according to claim 11 in which journal boxes are carried by the ends of said axles and said upright springs are seated on top of said journal boxes, and each of said frame side members includes a top portion spaced vertically from said depressed portion of the frame side members and forming with said depressed portion a truss, said bolster extending through the space intervening between said side member top and depressed portions

13. A railway vehicle truck according to claim 12 in which said bolster is supported on said frame through sliding engagement between bottom surfaces of the bolster and the top surfaces of said side member depressed portions.

14. A railway vehicle truck according to claim 11 in which longitudinally-extending drop equalizers are carried

by and extend between the axles at each side of the truck, said upright springs being supported on said equalizers longitudinally inwardly of the truck from said axles, and in which each of the frame side members includes a top member spaced vertically from said depressed portion, said bolster passing through the space between said top member and said depressed portion.

15. A railway vehicle truck according to claim 14 in which said bolster is wholly supported on said side member depressed portions.

16. A railway vehicle truck according to claim 11 in which said upright spring devices each comprises a coil spring and a pneumatic spring, said coil springs being adapted to form the sole support of the weight of an unloaded vehicle, said pneumatic springs being adapted to provide additional support for vehicle loads in excess of the unloaded vehicle weight.

5

10

15

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