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Pelabon

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[54] **RAILWAY CAR BOGIE SUSPENSION SYSTEM**

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[52] **U.S. Cl.**..... **105/199 R;** 105/197 A; 105/200; 105/208

[51] **Int. Cl.²**..... **B61F 3/08;** B61F 5/12; B61F 5/20; B61F 5/52

[58] **Field of Search**..... 105/164, 197 R, 199 R, 105/200, 453, 197 A, 208; 280/112 A

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[57] **ABSTRACT**

A railway vehicle suspension utilizes a pair of helicoidal springs connected directly between the side frames of a bogie and the frame of the car so that the relative turning and horizontal displacement movements of the bogie relative to the pivot pin of the car are accomplished by deformation of the springs.

11 Claims, 4 Drawing Figures

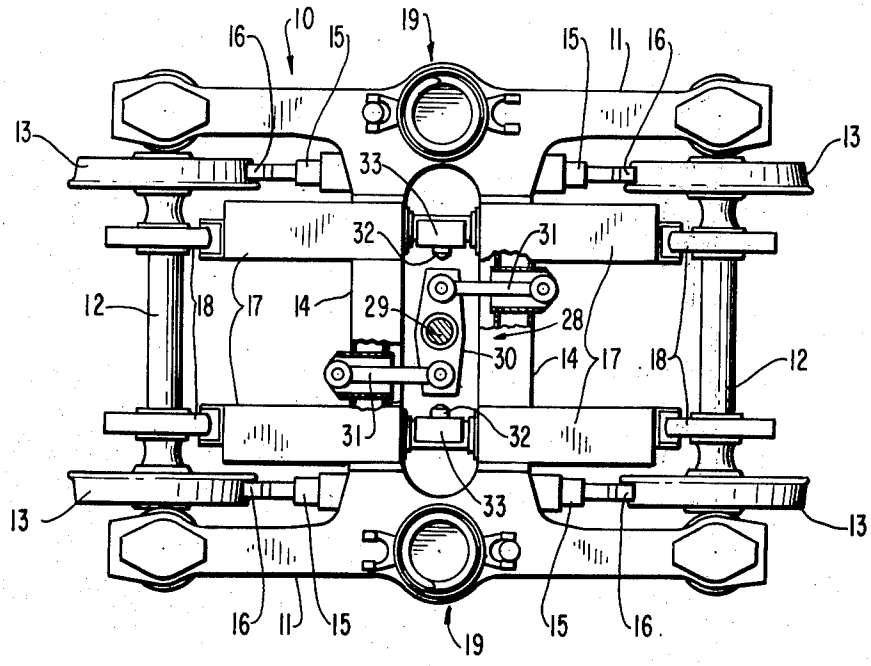
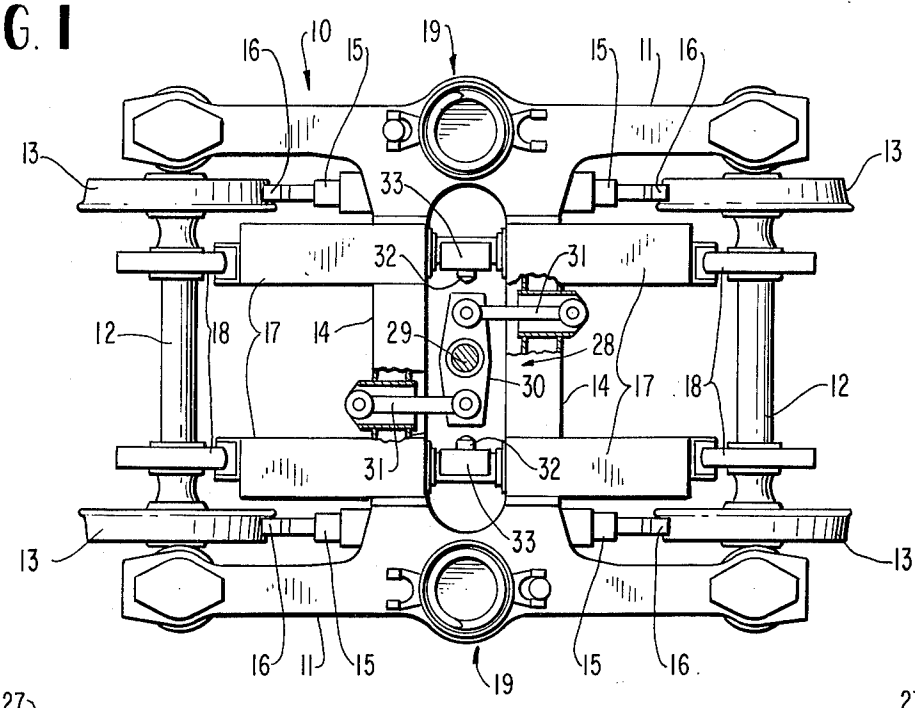


FIG. 1



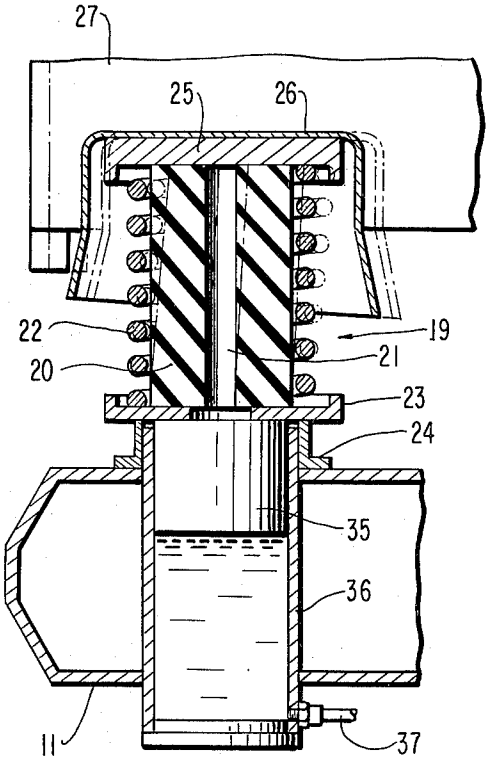


FIG. 2

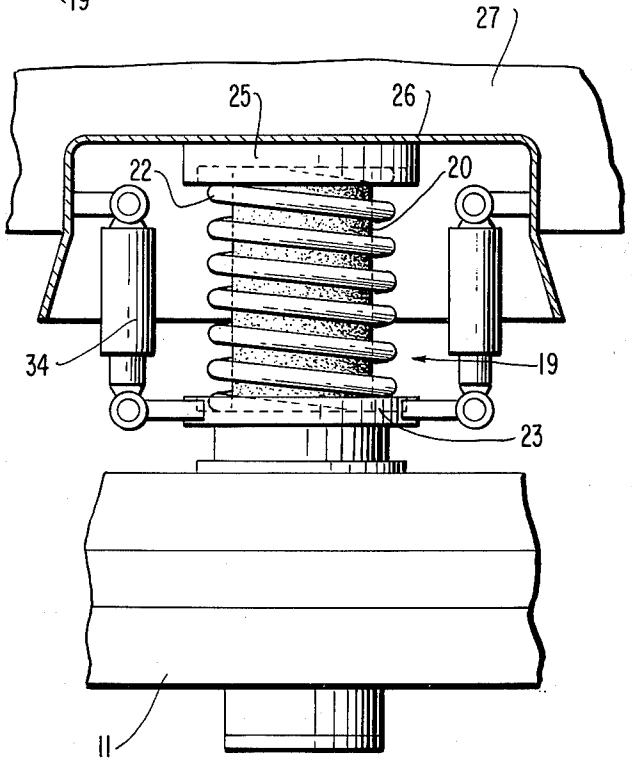
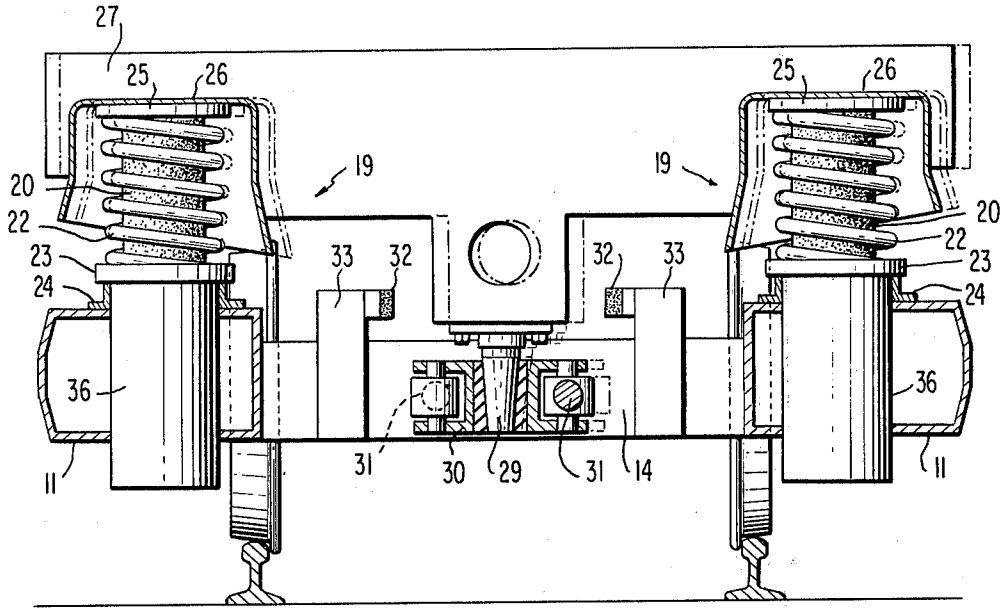


FIG. 3

FIG. 4


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RAILWAY CAR BOGIE SUSPENSION SYSTEM

The present invention relates to the utilization of a helicoidal spring railway bogie suspension system movable in lateral deformation to accommodate the rotation and horizontal displacement movements of the bogie with respect to the car it supports.

In its standard form, the bogie is usually coupled to a railway vehicle by means of a bolster attached to the bogie frame.

In this kind of bogie, longitudinal control is achieved through a dual set of coupling rods, one set connecting the bogie bolster to the vehicle chassis and the other set connecting the chassis to the axle compensators.

In another version, this control is achieved by a single set of tie rods connecting the bogie bolster to the axle compensators.

Due to the fact that the two sets of connecting rods are at different levels, the first set tends to produce a cant in the chassis, thereby imparting a galloping motion to the bogie.

The second set of connecting rods is insufficient to deaden the noise produced by the rolling of the train, notable when it passes over railway tie joints; in the first device this noise is absorbed by the bogie mass.

The purpose of the present invention is to produce a bogie coupling obviating the use of bolsters on the bogie and connection rods. This method offers, on the one hand, ease of adaption of a cant-compensation device and, on the other hand, affords improved stability of the vehicle on its bogies due to the higher elevation of the supporting surfaces of the secondary lateral suspension springs in the body. The helicoidal springs are perpendicular to the side members, and are located in the center of the bogie wheel base.

The description below will provide an understanding of the invention in connection with the appended drawing which depicts, as a nonlimitative example, a railway bogie suspension system based on the invention in which:

FIG. 1 is a plan view of a preferred form of bogie constructed in accordance with the invention;

FIG. 2 is a fragmentary cross-section of one of the helicoidal spring devices as viewed in direction of movement of the bogie;

FIG. 3 is a fragmentary side elevation of the device shown in FIG. 2, and;

FIG. 4 is a transverse vertical cross-section through the center line of pivot pin 29 of FIG. 1.

In the drawings, numeral 10 indicates generally a main frame for a railway bogie which consists of a pair of side members 11 provided at their extremities with journal means for the ends of a pair of axles 12 carrying the track-engaging wheels 13. At medial locations along their lengths the side members are connected together by a pair of spaced transverse beams 14 so that the bogie frame as a whole resembles an "H". These beams support the actuator means 15 for a set of clasp type brake shoes 16 as well as the operating mechanisms 17 for a pair of disc brakes 18 mounted on each axle.

Positioned on top of each side member 11, at its midpoint is a cusioning means, indicated generally by numeral 19, each of which consists of an elongated cylindrical block 20 of an elastomeric material, such as rubber, having an open core 21, surrounded by a helicoidal metal spring 22. One end of the resilient block 20 and coil spring 22 is supported on a cup-shaped base 23,

resting on a collar 24 welded to the side member. The other end of the block and coil spring is received within a cup-shaped cap 25 contained within a downwardly and outwardly flaring protective shroud 26, and the cap and shroud are rigidly secured to the under frame 27 of the railway vehicle (not shown). In the basic form of the invention the base 23 is welded to the collar 24, or otherwise fixedly secured to the side member 11 so that relative movement between the bogie and car in a vertical direction takes place by axial deformation in contraction and expansion of the elastomeric block 20 and metal coil 22, while any horizontal displacement between the bogie and car caused by irregularities in track alignment or rotation occurring when rounding a curve, is effected by a twisting, or bending, deformation of elements 20 and 22, as exemplified by the dotted line positions in FIGS. 2 and 4. While only one position of deformation is shown, it should be evident that, in the absence of any other restraint, the angular direction of possible displacement extends throughout the entire horizontal arc of 360°.

However, for all practical purposes, it is essential to prevent any fore-and-aft displacement of the bogie as a whole with respect to the vehicle so that when the brakes are applied, the decelerating force of the wheels will be transmitted to the car body. Similarly, if the bogie is a driving bogie, having power driven wheels, the propulsion force must be transmitted to the vehicle.

Lateral displacement of the bogie can be limited by the attachment of a pair of oppositely disposed resilient bumpers 32, mounted on brackets 33, so that they will come into abutting engagement with an element depending from the underframe of the vehicle in the event of excessive sidewise displacement of the bogie.

Fore-and-aft displacement of the bogie in the direction of travel with respect to the vehicle is restricted by a pivot means, indicated generally by numeral 28, which confines such displacement to rotation about a central vertical axis which lies in a vertical axis transverse to the direction of travel of the bogie while permitting side-to-side displacement and tilting motions about a horizontal axis parallel to the direction of travel. Various types of such pivots are known, but a specific example is disclosed and claimed in my copending application, Ser. No. 350,804 filed concurrently herewith.

In my copending application there is shown a downwardly projecting pivot pin 29 attached to the underframe of the vehicle, to which a crossarm 30 is attached, as by means of an elastomeric sleeve, which permits a certain amount of relative rotation. The extremities of the crossarm are secured by a pair of force transmitting links 31 to the beams 14, these connections all including elastomeric inserts to allow limited pivotal movement.

The extremitiies of the crossarm, in this case, are also utilized to serve as the reaction member against which the resilient bumpers 32, mounted on brackets 33, abut to limit the extent to which side-to-side displacement of the bogie can take place. In addition, the cushioning means may also be provided with one or more conventional shock absorbers 34, connected between the base 23 and shroud 26.

In case it is desired to employ means to adjust the angle of cant, or sidewise inclination, of the supported vehicle such means may be incorporated into the bogie by mounting the bases 23 of the cushioning means 19

on pistons **35** which are slidable in cylinders **36**, vertically arranged in the side members **11** and concentric with collars **24**. In this instance, the base merely rests on top of the collar in its lowermost position so that when a fluid, such as oil, is introduced into the cylinder, as by means of the port **37**, the entire cushioning means can be elevated to whatever extent is desired. Systems for controlling the angle of inclination of vehicles by the introduction and withdrawal of fluid into one or more piston-and-cylinder arrangements are well known and need not be described in detail.

I claim:

1. In a suspension system for supporting a railway car, said car having an underframe to transmit the weight of the car to at least one downwardly projecting pivot pin, said bogie having a rigid frame means mounted on at least two pairs of track-engaging wheels; the combination including a pair of vertically elongated resilient cushioning means having their respective one ends horizontally fixedly attached at opposite sides of said bogie frame means and their respective other ends horizontally fixedly secured at spaced locations to said under frame, each of said cushioning means being vertically deformable to permit limited independent vertical displacement of each side of the bogie with respect to the car, each of said cushioning means being also laterally deformable to permit limited rotation of the bogie with respect to the car about the vertical axis of the pivot pin means and also to permit limited translatory displacement of the bogie with respect to the car in all directions in a horizontal plane, and linkage means connected between the pivot pin means and the bogie frame means to prevent said translatory displacement with respect to the longitudinal axis of the car.

2. The invention according to claim **1** wherein said suspension system also includes a pair of shock absorbers connected respectively on opposite sides of said pivot pin means between said under frame and main bogie frame means.

3. The invention according to claim **1**, wherein each of said resilient cushioning means comprises two elements composed of materials having different moduli of elasticity.

4. The invention according to claim **1**, wherein said suspension system also includes a pair of power-operable expansible and contractible means connected respectively on opposite sides of said pivot pin means between said under frame and bogie frame means to control lateral inclination of the car.

5. The invention according to claim **4**, wherein said power-operable expansible and contactible means comprises a hydraulically operable piston and cylinder means.

6. The invention according to claim **5**, wherein the one ends of each of said cushioning means is mounted on a piston means, and said cylinder means is attached to said bogie frame means.

7. The invention according to claim **1**, wherein said bogie frame means and said pivot pin means include two respective elements which are movable relative to each other when a bogie is laterally displaced with respect to the car, at least one of said two elements being provided with resilient bumper means engageable with the other respective element to limit the amount of said lateral displacement.

8. The invention according to claim **7**, wherein said bogies comprise two pairs of wheels mounted on two axles, said frame means includes a pair of side bogie frame means extending between the ends of said axles, said side frame means being connected by a pair of spaced transverse beams, and said pivot pin means includes a transverse crossbar positioned between said pair of transverse beams, and a crossbar comprising one of said two relatively movable elements, the side frame means including the other of said two elements.

9. The invention according to claim **8**, wherein each of said side frame means includes a cup-shaped base for one end of said cushioning means and said under frame includes a cup-shaped cap to receive the other end of the cushioning means.

10. The invention according to claim **9**, wherein said under frame comprises essentially an inverted channel-shaped beam.

11. The invention according to claim **9**, wherein said side frame means includes a vertically disposed hydraulic cylinder, and said base is mounted on a piston movable in said cylinder.

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