United States Patent [19]

Jackson

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[54] **PNEUMATIC RAILWAY CENTER BEARING**

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[73] Assignee: **General Steel Industries, Inc.,** St. Louis, Mo.

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[52] **U.S. Cl.** ..... **105/199 C,** 105/164, 105/197 B, 105/199 R, 280/115, 308/137

[51] **Int. Cl.** **B61f 3/08,** B61f 5/10, B61f 5/16

[58] **Field of Search** ..... 105/197 B, 199 C, 164, 199R; 280/44, 115; 308/137, 138

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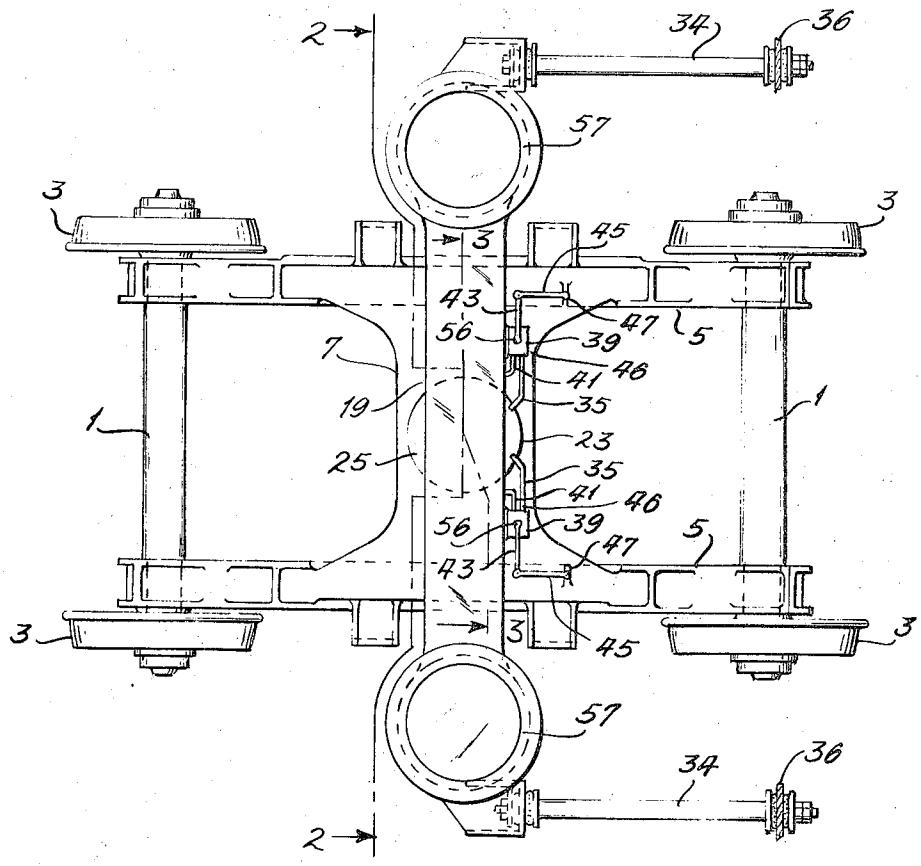
Assistant Examiner—Howard Beltran
Attorney, Agent, or Firm—F. Travers Burgess

[57] **ABSTRACT**

A pneumatic center bearing for slidably supporting a railway vehicle body on a swivel truck has a horizontal pad of friction material between opposed horizontal surfaces of the truck and body parts for the purpose of damping oscillations of the truck about its swivel axis. To reduce frictional resistance offered by the friction pad when the vehicle is rounding curves, one of the surfaces is apertured and means is provided for introducing compressed air into the apertures responsive to swivel movements of the truck and thereby partly support the body by the compressed air and thus reducing friction between the body part of the bearing and the truck part.

20 Claims, 10 Drawing Figures



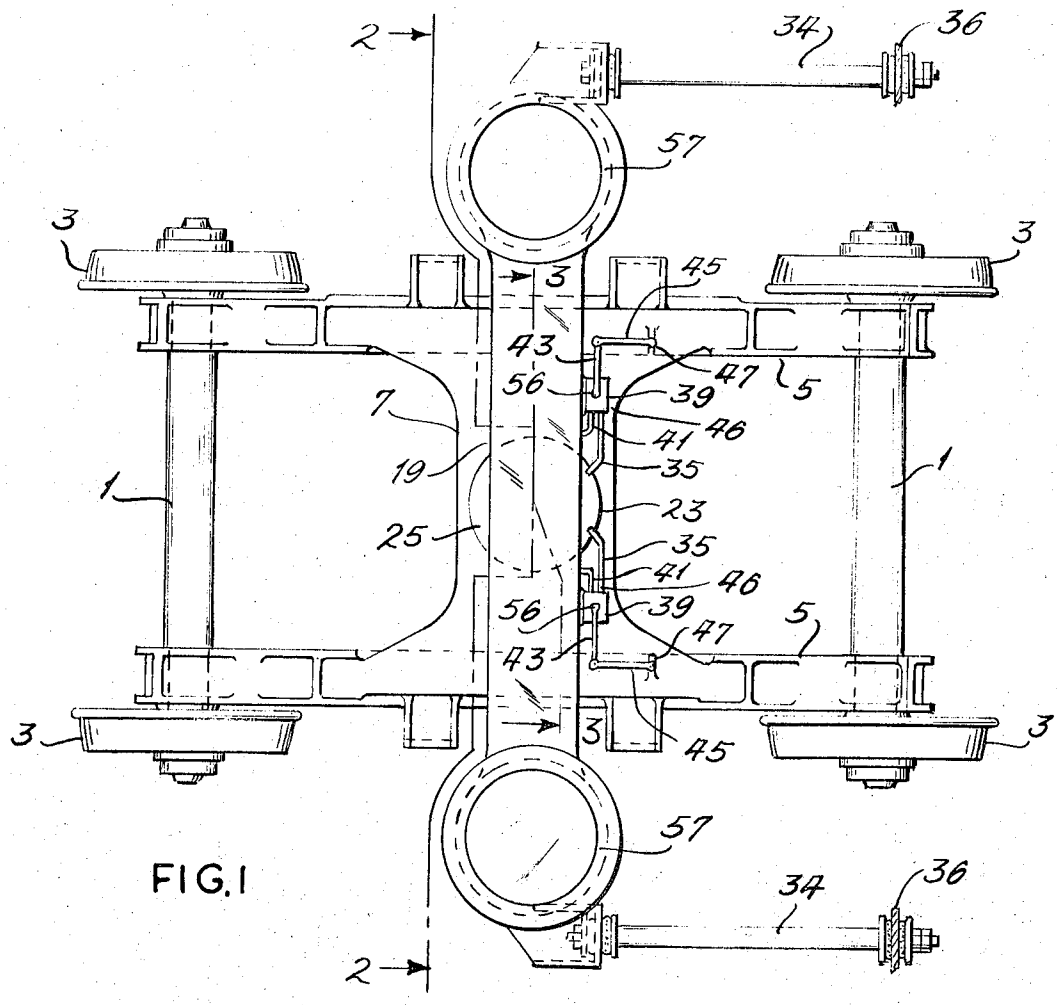

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FIG. 1

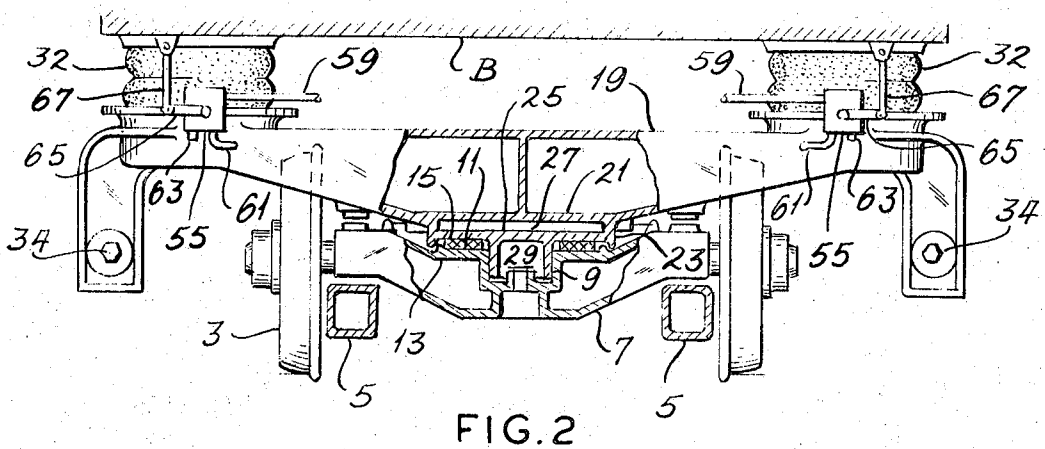
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FIG. 2

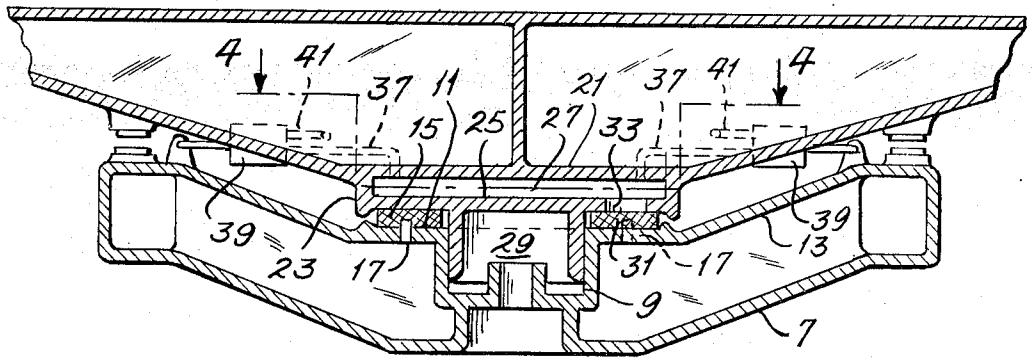

FIG. 3

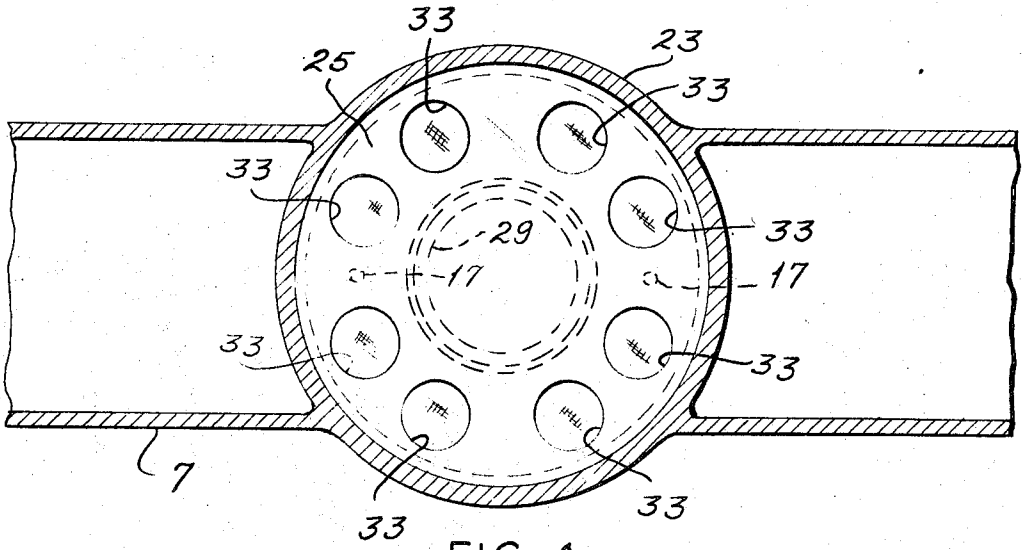

FIG. 4

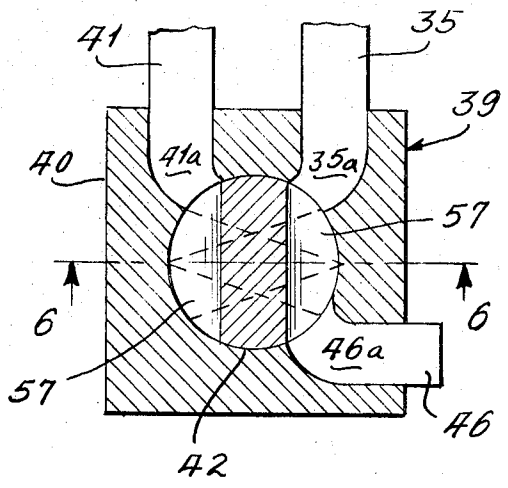

FIG 5

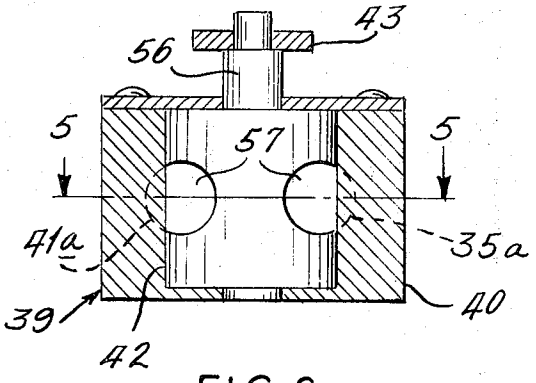

FIG. 6

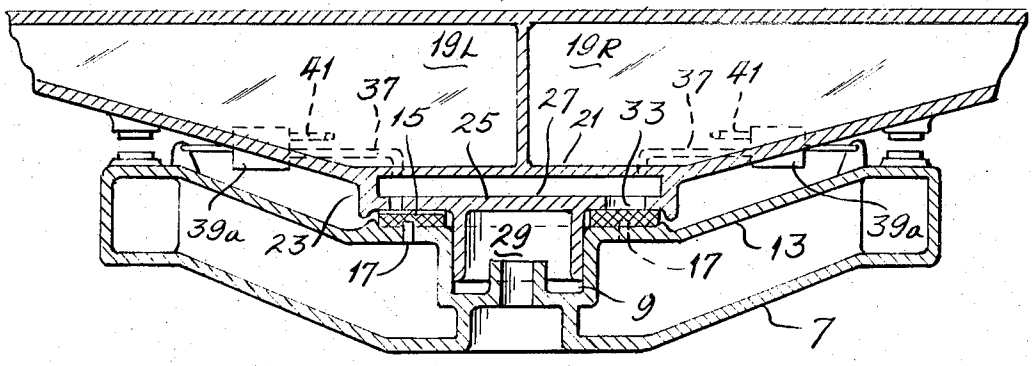

FIG. 7

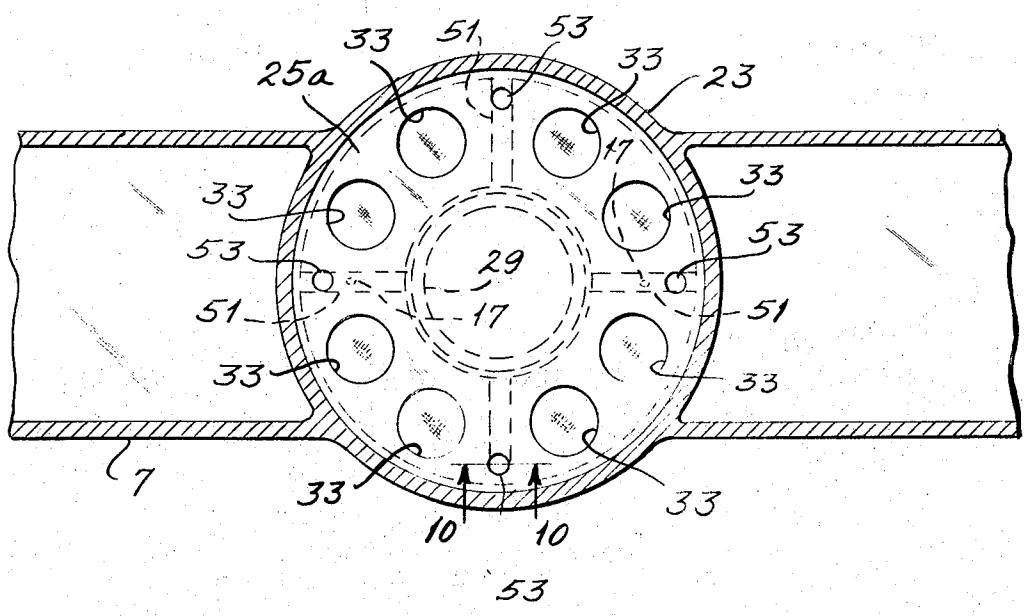

FIG. 8

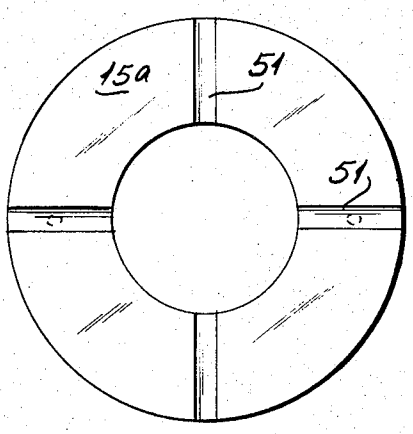

FIG. 9

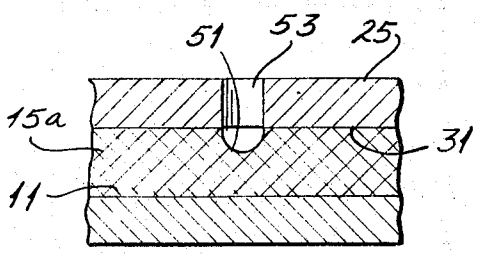

FIG. 10

PNEUMATIC RAILWAY CENTER BEARING

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to railway rolling stock and consists particularly in a variable friction bearing for slidably supporting a railway vehicle on its trucks.

2. The Prior Art

U. S. Pat. No. 2,655,117 to James C. Travilla discloses a railway central bearing in which a flat annular pad of friction material is interposed between opposed horizontal annular surfaces of truck and body parts of the bearing for the purpose of damping oscillations of the truck about its swivel axis. The same frictional resistance utilized to dampen these oscillations on tangent track opposed swivel movements of the truck on curved track.

SUMMARY OF THE INVENTION

The invention provides a bearing for supporting a railway vehicle body on a swivel truck, including means resisting oscillatory movements of the truck on tangent track while freely permitting swivel movements on curved track.

An object of the invention is to provide means for automatically reducing frictional engagement between opposed horizontal bearing surfaces of a railway vehicle central bearing when the vehicle is rounding curves.

Another object is to provide automatic means for introducing compressed air between opposed horizontal surfaces of railway vehicle central bearings to relieve the frictional engagement between these surfaces when the vehicle rounds curves.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a truck and body-support bolster embodying the invention.

FIGS. 2 and 3 are transverse vertical sectional views along lines 2—2 and 3—3, respectively, of FIG. 1.

FIG. 4 is a fragmentary horizontal sectional view along line 4—4 of FIG. 3.

FIG. 5 is a horizontal sectional view of one of the central bearing control valves taken along line 5—5 of FIG. 6.

FIG. 6 is a vertical sectional view along line 6—6 of FIG. 5.

FIG. 7 is a transverse vertical sectional view, corresponding to FIG. 3, of a second embodiment of the invention.

FIG. 8 is a horizontal sectional view, corresponding to FIG. 4, of the embodiment illustrated in FIG. 7.

FIG. 9 is a top view of a modified central bearing friction element.

FIG. 10 is a fragmentary transverse vertical sectional view along line 10—10 of FIG. 8.

DETAILED DESCRIPTION

The truck includes a pair of longitudinally spaced axles 1 mounting transversely spaced flanged railway wheels 3, a pair of transversely spaced longitudinally extending side frames 5 respectively supported at their ends on axles 1, and a main frame 7 resiliently supported at its sides on side frames 5.

At its center main frame 7 is formed with the truck part of a central bearing comprising a vertical axis upwardly open cylindrical recess 9 surrounded by a horizontal annular surface 11 on the top wall 13 of main frame 7. A horizontal annular pad 15 of nonmetallic friction material is seated on surface 11 and keyed thereto at 17 against relative rotation.

A transverse bolster 19 has a bottom wall 21 on which is formed the upper or body part of the central bearing, comprising a depending vertical cylindrical rim 23 and a horizontal wall 25 spaced below bolster bottom wall 21 to define with the latter and with rim 23 a shallow air chamber 27. A cylindrical wall 29 depends from the center of wall 25 to form a spigot rotatably received within truck frame recess 9, and the downwardly facing annular horizontal surface 31 of wall 25 surrounding cylindrical wall 29 normally rests on friction pad 15 so that the frictional resistance between pad 15 and surface 31 opposes tendencies of the truck to oscillate about the common axis of spigot wall 29 and recess wall 9.

A vehicle body B is supported at its sides on bolster 19 by upright flexible wall pneumatic springs 32 and the bolster is held against swivel with respect to the body B by a pair of longitudinally extending anchors 34 each secured at one end to an end of bolster 19 and at its other end to a bracket 36 depending from body B.

For reducing frictional resistance between pad 15 and bolster central bearing part annular surface 31 during operation on curved track, wall 25 is formed with a plurality of apertures 33 and chamber 27 is connected by conduits 37 to a pair of valve devices 39, mounted on the bolster at opposite sides of the central bearing, and valve devices 39 are connected respectively by inlet conduits 41 to a source of compressed air, preferably a pair of reservoirs 19*a* formed in the hollow interior of bolster 19. Each valve device 39 has a pivoted actuating arm 43 extending transversely outboard from the valve body and pivotally connected at its end to a longitudinally extending pitman, which in turn is pivotally connected to an upstanding bracket 47 on the truck frame, pitmen 45 will push and pull the respective valve actuating arms away from the centered position in which valve inlet conduit 41 is closed and outlet conduit 35 is exhausted by connection to exhaust outlet 46 through angled positions in which inlet conduit 41 is connected to outlet conduit 35. The latter condition causes compressed air to pass from the reservoir in bolster 19 to central bearing air chamber 27, and thence through apertures 33 to form air columns bearing against the upper surface of friction pad 15, so as to relieve the latter of part of the load and reduce the resistance offered by the pad to swivel of the truck.

Valve 39 (FIGS. 5 and 6) has a body 40 formed with a vertical central cylindrical recess 42 intersected by three horizontal ports 41*a*, 35*a* and 36*a*, connected respectively to inlet conduit 41, outlet conduit 35 and exhaust outlet 46. A cylindrical plug 54 pivotally received in recess 42 has an upstanding stem 56 on which operating arm 43 is fixed, and a pair of diametrally spaced horizontal grooves 57 on opposite sides of its axes parallel to operating arm 43, so that when the truck swivels in either direction beyond a predetermined angularity from the centered tangent track position shown in FIGS. 5 and 6 in which inlet port 41*a* is closed and outlet port 35*a* is connected to exhaust port 36*a*, the exhaust port will be closed and inlet port 41*a* and outlet port 36*a* will be connected to each other to admit air into chamber 27.

For exhausting the air from the space between friction pad **15** and surface **31** when the truck returns to its tangent track position, pitment **45** return valve actuating arms **43** to their median position as shown in FIGS. **1, 5** and **6,** causing valve plugs **42** to connect conduits **35** to valve exhaust outlets **46** and close inlet conduits **41,** and air between friction pad **15** and surface **31** will pass through holes **33** into chamber **27** and be exhausted therefrom through conduits **35** and exhaust ports **46.** When this occurs, the full load of the vehicle body will be carried by frictional engagement of the upper surface of pad **15** and downwardly facing annular surface **31** so that any tendencies of the truck to oscillate about the central bearing will be damped by the frictional resistance to turning.

Preferably the air pressure in bolster **19** is made proportional to the load of vehicle body B by leveling valves **55** which are mounted on the ends of the bolster adjacent body support pneumatic springs **32.** Leveling valves **55** have air inlet conduits **59** connected to a source of compressed air such as the air train line (not shown), an outlet conduit **61** connected to separate reservoirs **19L** and **19R** formed in the interior of bolster **19,** an exhaust port **63,** and an operating arm **65** connected by a vertical pitman **67** to body B so that when a load on springs **32** increases, arm **65** will put air inlet **59** in communication with outlet **61** and thus admit additional air to the bolster and as the body load decreases, inlet **59** will be closed and outlet **61** will be put in communication with exhaust port **63,** thereby keeping air pressure in the respective sides of the bolster proportional to body load on that side. With this arrangement, air pressure introduced into the central bearing as described above will also be proportional to the average body load on the bolster at any given time. On trucks in which a single reservoir supplies both springs, a single valve **39** will suffice.

Operation of the embodiment of FIGS. **1–4** is as follows: During movement of the vehicle along tangent track, with the truck frame **5, 7** and bolster **19** in the position shown in FIG. **1,** pitmen **45** act through valve operating arms **43** to close valve air inlets **41** and provide communication between valve air outlet **37** and exhaust ports **46.** Accordingly, bolster part bottom surface **31** is in full frictional engagement with friction pad **15** and the friction between these parts opposes tendencies of the truck to oscillate about the central bearing axis during such tangent track movements.

When the vehicle moves onto curved track and pitmen **45** act through valve operating arms **43** to provide communication between valve inlet conduits **41** and outlet conduits **35** and to terminate communication between the latter and exhaust ports **46,** thereby admitting compressed air from the interior of bolster **19** to chamber **27** and apertures **33** in bottom wall **25** thereof. The compressed air in apertures **33** acts against friction pad **15** to form air columns partially supporting the weight of the bolster and car body and thus relieving the load applied to friction pad **15** by surface **31,** with consequent decrease in frictional resistance to necessary truck swivel as the vehicle continues movement through the track curve. If the vehicle is provided with pneumatic spring leveling valves **55,** air pressure within bolster **19** will be directly proportional to vehicle load and so will the pressure introduced into central bearing chamber **21** to form the load relief air columns through apertures **33.**

When the vehicle returns to tangent track, pitmen **45,** acting through valve operating arms **43,** will terminate communication between valve inlet conduits **41** and outlet conduits **35,** thus stopping the admission of compressed air to central bearing chamber **27,** and will connect valve outlet conduits **35** to exhaust ports **46** to permit the escape of air from chamber **27** to the ambient atmosphere. When this occurs the entire load will be supported by friction pad **15,** and the full amount of the frictional resistance between the latter and surface **31** will be utilized to oppose objectionable oscillation or shimmy of the truck about its swivel axis.

In the form of the invention shown in FIGS. **5–8,** a valve and exhaust system different from that of FIGS. **1–4** is utilized. In this embodiment, valves **39***a* do not have an exhaust port and are each constructed so that as the operating arm **43** moves in one direction longitudinally of the truck from the median position of FIG. **1** due to swivel of the truck in one direction, communication will be provided between valve inlet **41** and outlet **35** to admit air from the reservoir to the central bearing chamber **27,** but as arm **43** moves in the opposite direction longitudinally of the truck, communication will not be provided between valve inlet **41** and outlet **35.** With this arrangement, one of the valves will admit air to the central bearing when the truck swivels in one direction but will be closed when the truck swivels in the opposite direction, and the other valve will admit air to the central bearing when the truck swivels in the opposite direction but will be closed at all other times.

For exhausting the central bearing chamber **27** of the second embodiment when the truck returns to its tangent track position, friction pad **15***a* is formed with four radial grooves **51** oriented respectively transversely and longitudinally of the truck and wall **25***a* is formed with four exhaust holes **53** on the longitudinal and transverse diameters, i.e., adapted for registry with grooves **51** when the truck is aligned with the vehicle body for operation on tangent track, so that the compressed air will escape from chamber **27** through holes **53** and grooves **51** into the atmosphere where the grooves intersect the exposed periphery of pad **15***a.* When this occurs, the full load of the vehicle body will be carried by frictional engagement of the upper surface of pad **15***a* and downwardly facing annular surface **31***a* so that any tendencies of the truck to oscillate about the central bearing will be damped by the frictional resistance to turning.

Although the invention is shown herein as part of a railway truck central bearing, in which the pivot-forming and load-bearing functions are combined, it is equally applicable to a loaded friction side bearing in which the load-bearing function is separate from the pivot-forming function.

While the truck part of the bearing is shown herein formed directly on the truck frame and the bolster on which the body part of the bearing is formed is shown herein as supporting the vehicle body by means of springs, it will be understood that the truck part of the bearing may be mounted or formed on a truck bolster and the bolster on which the body part of the bearing is formed may be incorporated in the body underframe, as in many conventional truck and body arrangements.

The details of the bearing described herein may be modified 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. A bearing for supporting a railway vehicle body on a swivel truck normally longitudinally aligned with the body for tangent track operation and swivelly movable out of such alignment during curved track operation, comprising a truck part having an upwardly facing substantially horizontal surface, a body part having a downwardly facing substantially horizontal surface normally in frictional engagement with said truck part surface, aperture means through one of said surfaces, and normally closed air supply means operable responsive to swivel movements of the truck from its normal tangent track position of longitudinal alignment with the body for introducing compressed air into said aperture means to form an air column therethrough partially supporting said truck part on said body part and thereby reducing friction between said body and truck parts during operation on curved track, said air supply means being closable responsive to longitudinal realignment of the truck and body for terminating the introduction of compressed air into said aperture means.

2. A bearing according to claim 1 including means responsive to longitudinal realignment of the truck and body for exhausting compressed air therefrom.

3. A bearing according to claim 1 wherein a pad of nonmetallic friction material provides one of said horizontal bearing surfaces, said aperture mean being in said other surface.

4. A bearing according to claim 1 wherein one of said parts includes a chamber having a wall closely spaced vertically from the respective horizontal bearing surface and communicating with said surface via said aperture means.

5. A bearing according to claim 4 in which said air source includes a reservoir and means responsive to the vehicle body load for regulating the pressure in said reservoir.

6. A bearing according to claim 4 wherein said air supply means comprises a source of compressed air, a valve, valve inlet means connected with said source, valve outlet means connected with said chamber, said valve having truck swivel-responsive operating means closing said inlet means during tangent track operation and providing communication between said inlet and outlet means during curved track operation.

7. A bearing according to claim 6 wherein said valve means includes an exhaust port, said operating means providing communication between said valve outlet means and said exhaust port during tangent track operation and interrupting such communication during curved track operation.

8. A bearing according to claim 6 wherein said truck part has a vertical central cylindrical recess and said body part has a depending vertical cylindrical spigot pivotally received in said recess, said opposing horizontal surfaces being of annular shape surrounding said recess and spigot, said aperture means comprising a plurality of apertures generally uniformly spaced through the respective surface.

9. A bearing according to claim 6 wherein a circular pad of nonmetallic friction material forms the horizontal surface of one of said bearing parts.

10. A bearing according to claim 9 wherein said apertures are through the horizontal surface of said other bearing part and said other bearing part includes said air chamber.

11. A bearing according to claim 10 wherein said pad has a groove in its surface opposing said other bearing part and said other bearing part has a hole through its surface, said hole being in registry with said groove during tangent track operation and out of registry with said groove during curved track operation, said groove intersecting the periphery of said pad.

12. In a railway vehicle, a swivel truck, a vehicle body mounted thereon, said truck being in longitudinal alignment with said body for tangent track operation and swivelly movable out of such alignment during operation on curved track, a bearing for supporting said body on said truck comprising a truck part having an upwardly facing substantially horizontal surface, and a body part having a downwardly facing substantially horizontal surface normally in frictional engagement with said upwardly facing surface, aperture means through one of said surfaces, normally closed air supply means openable responsive to swivel movements of said truck away from its normal tangent track position in longitudinal alignment with said body for introducing compressed air into said aperture means to form an air column therethrough partially supporting said body part on said truck part and thereby reducing friction between said parts while said truck is operating on curved track, said air supply means being closable responsive to longitudinal realignment of the truck and body for terminating the introduction of compressed air into said aperture means and exhausting compressed air therefrom.

13. In a railway vehicle according to claim 12, means responsive to longitudinal realignment of the truck and body for exhausting compressed air therefrom.

14. In a railway vehicle according to claim 13, said air supply means comprising a source of compressed air, a valve, valve inlet means connected with said source, valve outlet means connected with said chamber, said valve having truck swivel-responsive operating means closing said inlet means during tangent track operation and providing communication between said inlet and outlet means during curved track operation.

15. In a railway vehicle according to claim 14, a transverse bolster structure supporting said body, said body part of said bearing being on said bolster, said truck including wheel-supported structure, said valve operating means comprising a horizontally projecting operating arm, and a generally horizontal pitman connected at its one end to said operating arm and at its other end to the other of said structures.

16. In a railway vehicle according to claim 15, spring means supported from said truck and supporting said body, said air source comprising an air reservoir, additional valve means connected respectively to said air supply and to said reservoir and responsive to changes in the height of said spring means caused by variations in the body load to introduce additional air into said reservoir when body load increases and remove air from said reservoir when said body load decreases, said valve inlet means being connected to said reservoir whereby air pressure admitted to said bearing apertures is proportional to variations in body load.

17. In a railway vehicle according to claim **16** wherein said bearing truck part includes a vertical central cylindrical recess in said truck structure and said body part includes a vertical cylindrical spigot depending from said bolster and pivotally received in said truck part recess, said opposing horizontal surfaces being of annular shape surrounding said recess and spigot, there being a plurality of said apertures generally uniformly spaced through the area of the apertured surface.

18. In a railway vehicle according to claim **17**, said

spring means being carried by the ends of said bolster, said reservoir being formed in said bolster.

19. In a railway vehicle according to claim **18**, said apertures being through said body part horizontal surface of said bearing, there being a shallow air chamber within said bolster immediately above said downwardly facing surface.

20. In a railway vehicle according to claim **19** wherein an annular pad of nonmetallic friction material forms the horizontal surface of said truck part.

* * * * *