United States Patent [19]

Reynolds

[11] **3,785,298**

[45] **Jan. 15, 1974**

[54] **CUSHION MOUNTING BEARING ADAPTOR FOR RAILWAY TRUCKS**

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[73] Assignee: **Buckeye Steel Castings,** Columbus, Ohio

[22] Filed: **Feb. 16, 1972**

[21] Appl. No.: **226,698**

[52] **U.S. Cl.** ..... **105/218 R,** 105/224.1

[51] **Int. Cl.** **B61f 5/30,** B61f 5/38, B61f 15/02

[58] **Field of Search** ..... 105/218 R, 218 A, 105/222, 223, 224 R, 224 A, 224.1

[56] **References Cited**

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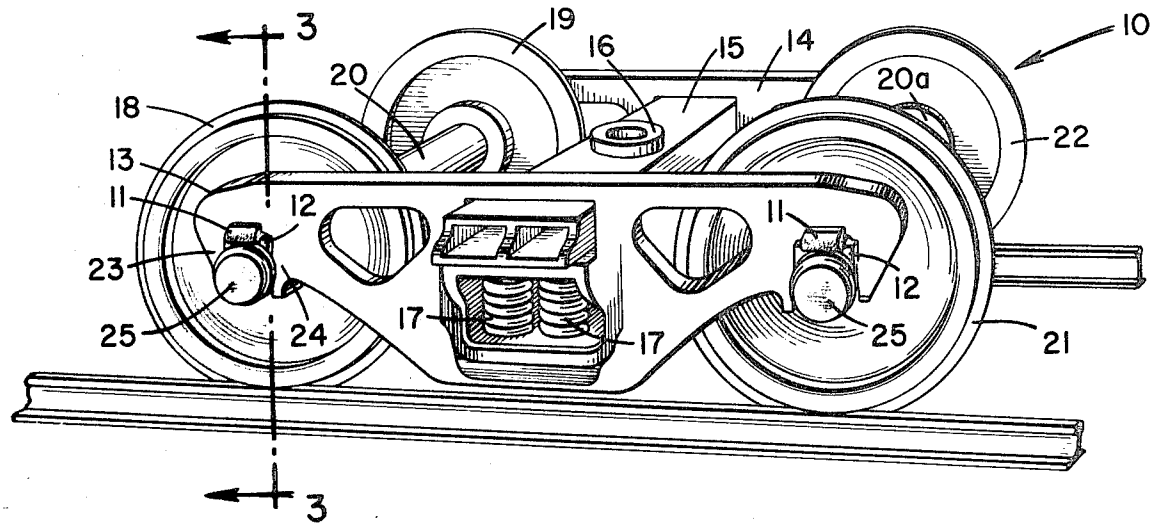
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Primary Examiner—Robert G. Sheridan
Assistant Examiner—Howard Beltran
Attorney—Richard K. Stevens et al.

[57] **ABSTRACT**

An elastomeric cushion is provided for a railway vehicle truck which allows for lateral movement between the bearing assembly and side frame of the truck only through shear of the elastomer. The cushion is disposed above the bearing assembly of a railway vehicle truck between the roof of the pedestal jaws and a novel adapter having a substantially flat upper surface and a flange extending axially along each edge thereof and about the edge of the cushion.

12 Claims, 7 Drawing Figures



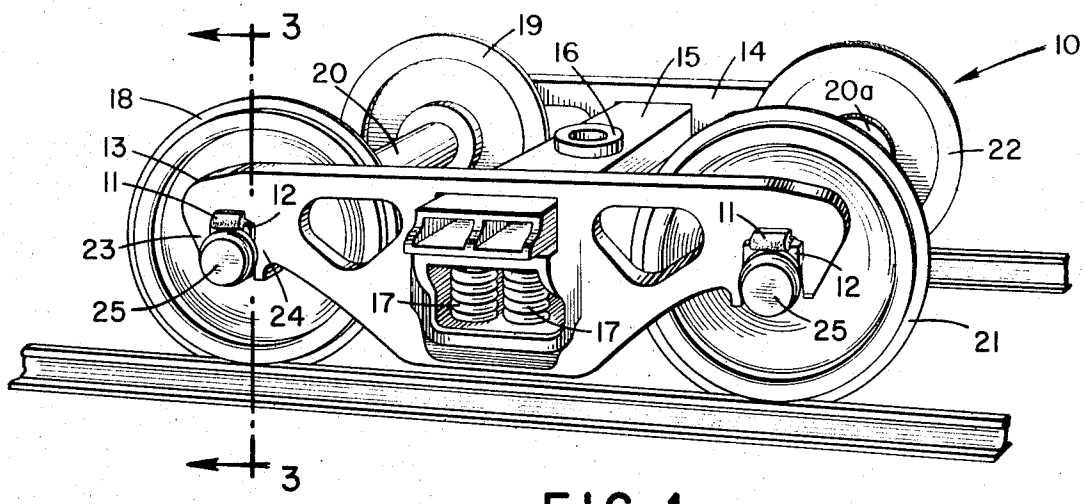

3
19
16
15
14
10
20
20a
18
22
13
11
12
11
23
12
25
24
17
17
25
21
3

FIG. 1

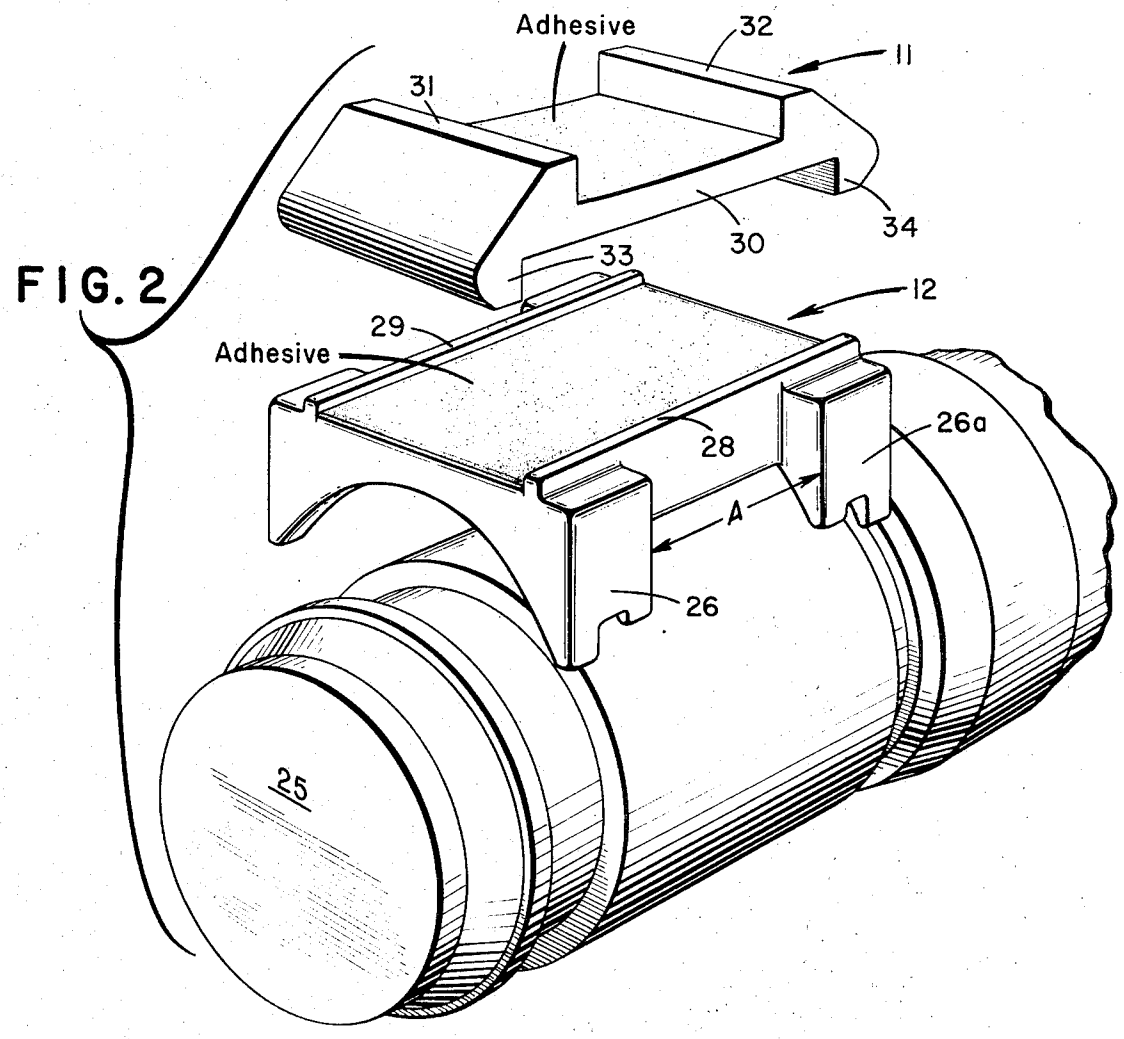

Adhesive
32
11
31
34
30
33
12
29
Adhesive
26a
28
A
26
25

FIG. 2

FIG. 3

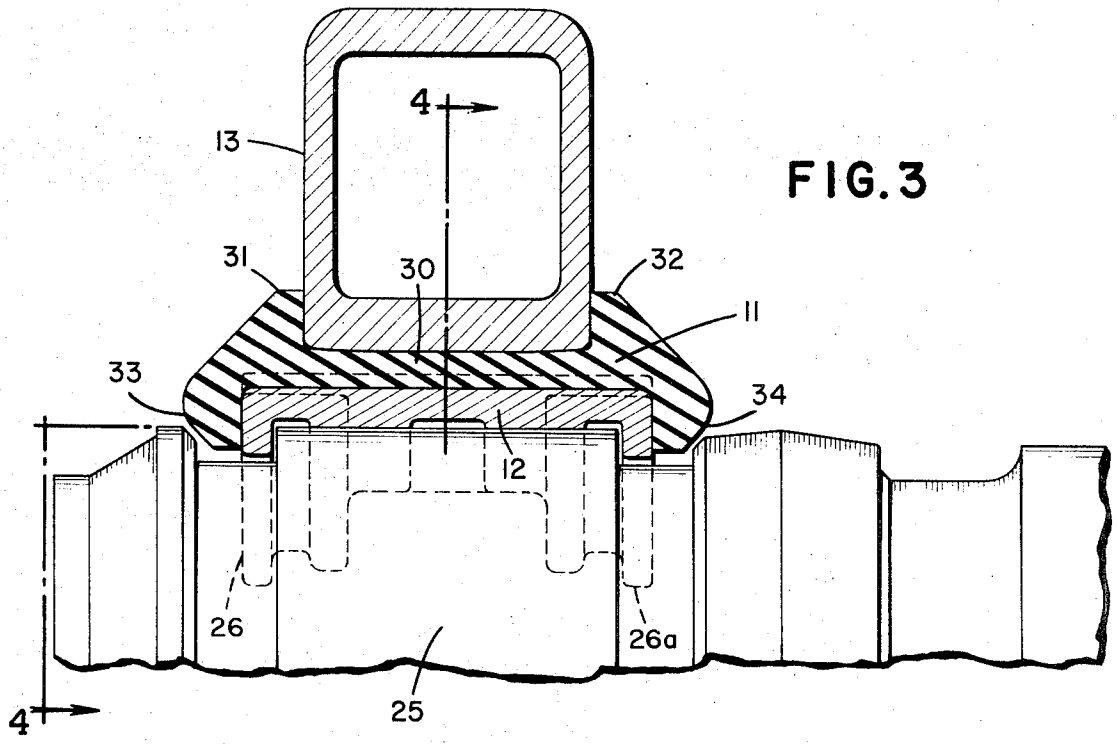

4
13
31
30
32
11
33
34
12
26
26a
25
4

FIG. 4

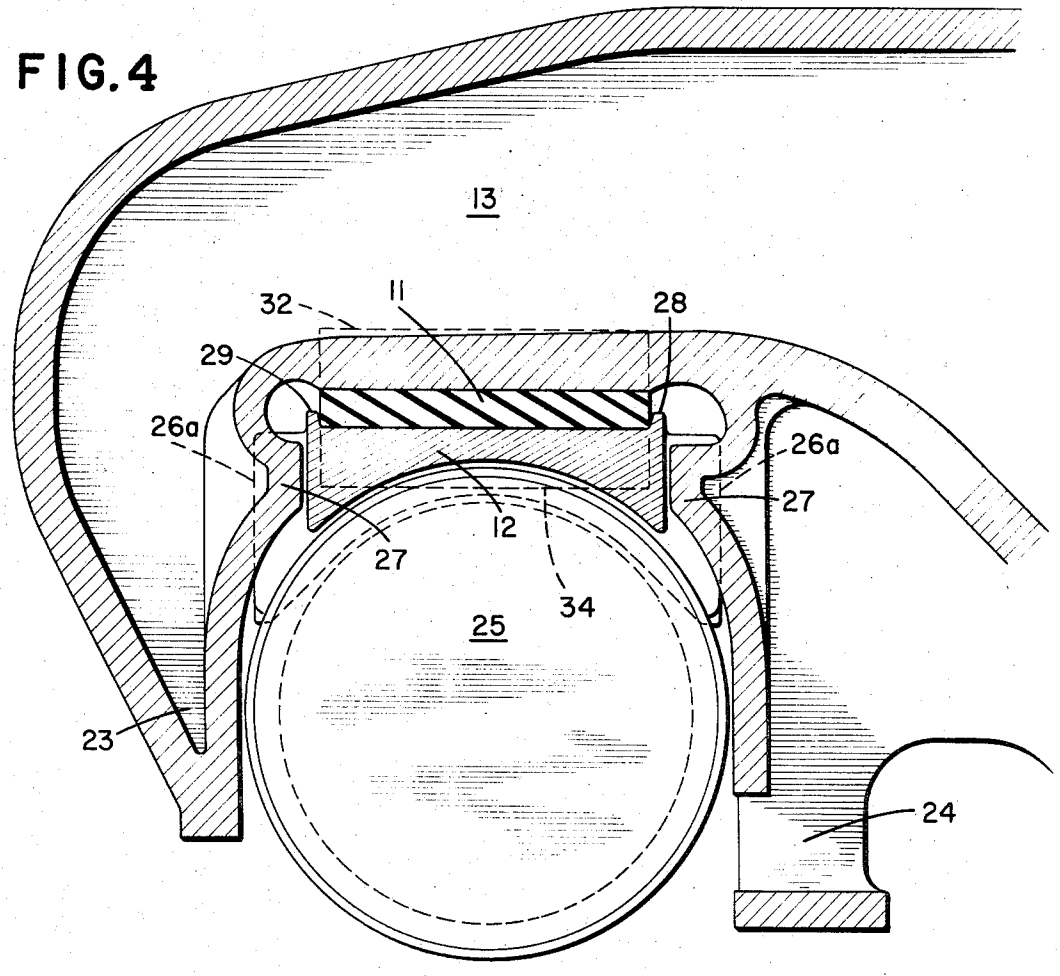

13
32
11
28
29
26a
26a
27
12
27
34
25
23
24

FIG. 5

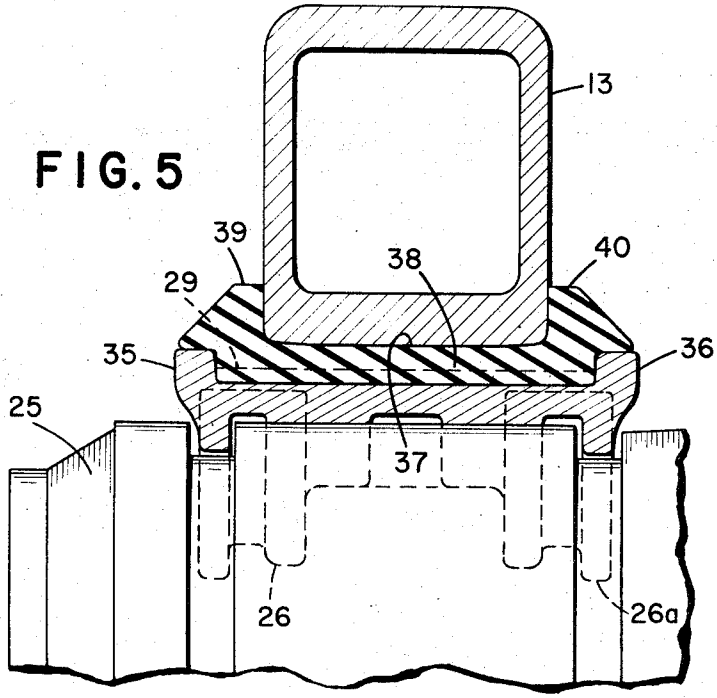


FIG. 7

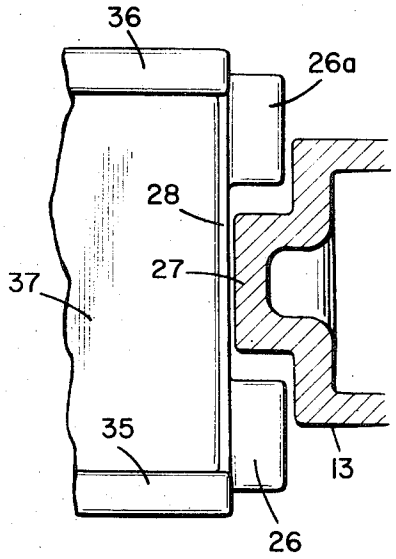
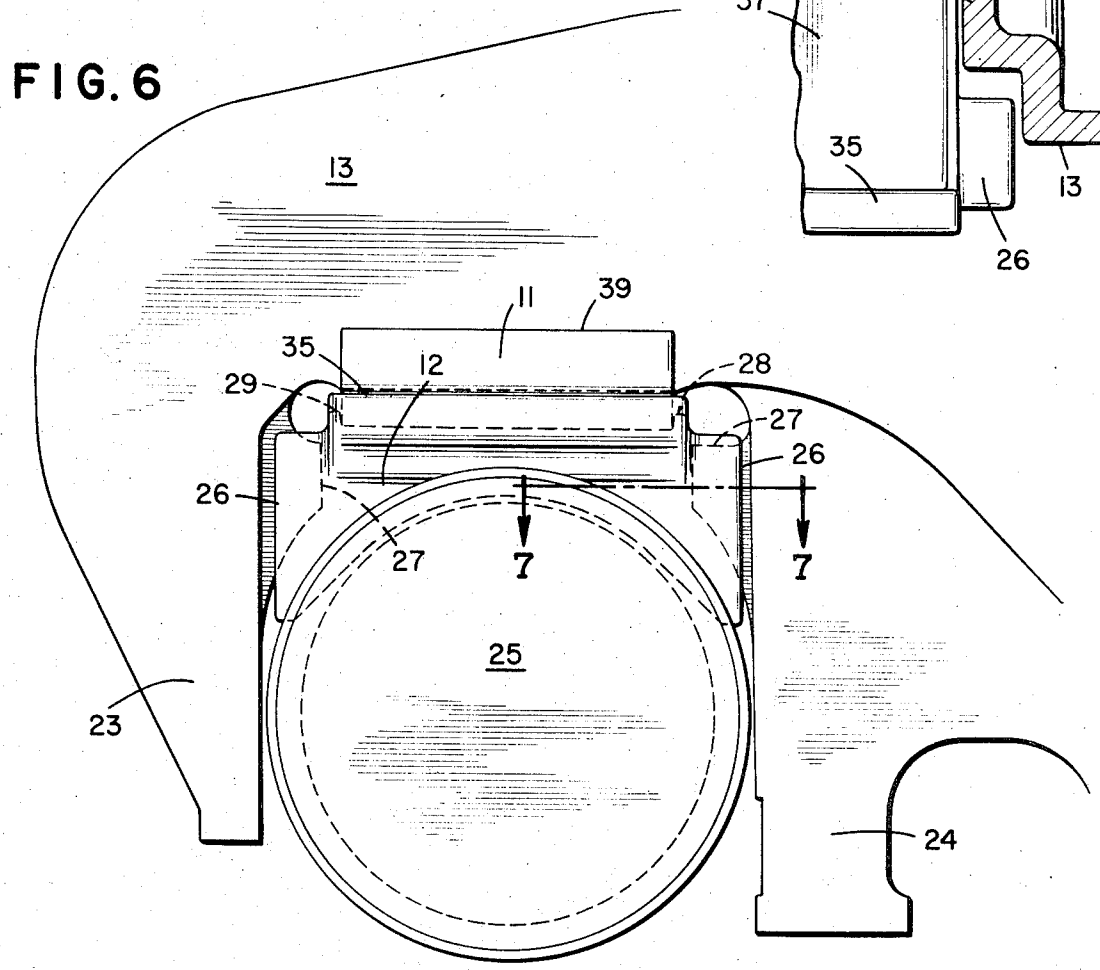


FIG. 6



CUSHION MOUNTING BEARING ADAPTOR FOR RAILWAY TRUCKS

This invention relates generally to trucks for railway vehicles and more particularly to an assembly including a resilient elastomeric cushioning element between each bearing assembly and the roof of the pedestal jaws of the side frame of the truck which retards relative lateral movements between the bearing assemblies and the side frames to prevent lateral shocks and undesirable vibrations.

It has been proposed before to provide resilient means in association with the bearings of a railway truck which tend to cushion the side frames from lateral and vertical shocks originating as the wheels move over the track. As disclosed in the Jones U.S. Pat. 3,381,629, granted May 7, 1968, the wheels of a railway truck are rigid with the axle so a pair of wheels and the axle move as a unit transversely of the rails of the truck as spacing between the rails and the gap between the flanges of a pair of wheels varies. Very little movement can occur between the axle and bearing assemblies so the almost constant back and forth movement of an axle and its pair of wheels imparts a lateral movement to the truck frame and through the bolster to the vehicle body. While some lateral movement is necessary to compensate for such variations, it is desirable to limit or retard the extent of such relative lateral movement to avoid shocks and damage to the truck frame. It is proposed to provide a resilient pad between the roof of the pedestal jaws and the bearing assemblies of a railway truck in U.S. Pat. No. 3,211,112. The roof of the pedestal jaws and the upper surface of a bearing adapter are provided with parallel but inclined surfaces which contain the resilient pad. Friction between moving surfaces produces lateral snubbing as the side frame and bearing assemblies move laterally with respect to each other. Such an assembly is not entirely satisfactory, however, because the repeated movement between the pad and the roof of the pedestal jaws and between the pad and surface of the adapter causes wear on both surfaces of the pad. Moreover, the assembly requires a non-conventional side frame. The assembly disclosed in the Jones Patent also depends upon friction developed with movement of the adapter and roof of the pedestal jaws relative to the elastomeric pad to retard lateral movement. The Jones pad has metallic plates bonded to each surface which do not wear as rapidly as an elastomeric surface but such a pad has the disadvantage of requiring a side frame having a flange along the edges of the roof to retain the pad in position between the bearing assembly and side frame. A more recent development is disclosed in the Beebe U.S. Pat. No. 3,638,582. An adapter and resilient pad assembly similar to that disclosed in the Jones patent is used but metal plates of the pad are secured against relative movement with the adapter and side frame with pins or other means. Such an assembly also has the disadvantage of requiring a pad sealed to metal plates.

It is an object of this invention to provide an improved resilient cushioning element for retarding relative movement between the bearing assemblies and side frames of a railway vehicle truck. Another object of the invention is to provide resilient means for lateral movement between the bearing assemblies and side frames of a railway vehicle truck which does not depend upon friction between opposing surfaces for snubbing or limiting the extent of the lateral movement therebetween and thus avoids disadvantageous wear. Still another object of the invention is to provide a novel adapter and resilient pad assembly for association with the bearing assemblies and side frames of a railway truck which provides for lateral movement but prevents relative movement with the development of frictional forces between opposing surfaces of the parts of the assembly. A still further object of the invention is to provide an elastomeric pad and adapter assembly between the load bearing portion of the side frame of a railway truck and the bearing assembly in which the pad is secured against relative movement between its surfaces and the surfaces of the adapter and side frame so that the pad is stressed in shear with lateral movement between the side frame and bearing assembly.

Other objects will become apparent from the following description with reference to the accompanying drawing in which:

FIG. 1 is a perspective view of a truck for a railway vehicle embodying the invention;

FIG. 2 is an exploded perspective view of one embodiment of the cushioning unit and an adapter provided by the invention;

FIG. 3 is a partial section of the embodiment of FIG. 1 taken along the line 3—3;

FIG. 4 is a front elevation, partially in section, taken along the line 4—4 of FIG. 3;

FIG. 5 is a partial section of a second embodiment taken along the line 3—3 of FIG. 1;

FIG. 6 is a front elevation of the embodiment of FIG. 5; and

FIG. 7 is a section along the line 7—7 of FIG. 6.

The objects of the invention are accomplished, generally speaking, by providing between the pedestal jaws of a side frame and the bearing assembly of a railway vehicle truck, an adapter secured against relative lateral movement on the housing of the bearing assembly and having a substantially flat upper surface, and a resilient elastomeric pad secured to the upper surface of the adapter and to the roof of the pedestal jaws. The physical properties of the elastomer pad are such that it stresses in shear to accommodate lateral movement between the bearing assembly and side frame. The bearing adapter has a depending leg at each corner thereof and an upwardly projecting flange which extends substantially parallel to the axle of the truck along opposite edges of the adapter. The pad has a substantially parallelepiped body portion which lies between the roof of the pedestal jaws and the adapter and spaced flanges which project upwardly about the walls of the side frame. The pad may also have downwardly projecting flanges which extend about the ends of the bearing adapter. The spacing between the upper flanges is less than the cross-section of the roof of the pedestal jaws and the spacing between the depending flanges is less than the length of the adapter so the pad is stressed slightly in tension and the flanges firmly grip the side frame and adapter therebetween.

Referring now to the drawing, an elastomeric pad **11** and adapter element **12** are illustrated between the pedestal jaws of a side frame above each bearing assembly **25** of a railway truck **10**. The truck **10** is a typical four-wheel truck but the invention is equally applicable to trucks having any number of pairs of wheels and axles.

Truck **10** has side frames **13** and **14** and transverse bolster **15** connecting the side frames together. A bolster center plate **16** on bolster **15** receives the load of the railway vehicle from a body bolster center plate (not shown). The load is applied to side frames **13** and **14** through springs **17.** One pair of wheels **18** and **19** is rigidly mounted on an axle **20** and a second pair of wheels **21** and **22** is rigidly mounted on a second axle **20***a*. Pedestal jaws **23** and **24** of the side frames **13** and **14** accommodate a bearing assembly **25.**

The embodiment of the invention illustrated in FIGS. **2,3** and **4** has an adapter element **12** which fits over the housing of bearing assembly **25.** A pair of legs **26** and **26***a* at the corners on each side of adapter **12** is spaced laterally a distance A which is greater than the thickness of draft lug **27** of the side frame to provide a gap therebetween to allow for lateral movement of the side frame with respect to the bearing assembly **25** as shown in FIGS. **2** and **7.** Legs **26** and **26***a* have a substantially flat upper surface which is substantially flush with the upper surface of the adapter **12** to provide maximum surface for the thrust lug **27** to strike as the side frame moves laterally with respect to the bearing assembly. Adapter **12** has a substantially flat upper surface with spaced substantially parallel flanges **28** and **29** projecting upwardly therefrom and extending along opposite edges of the adapter **12.** Rubber pad **11** has a body **30** which is substantially parallelepiped shaped with upwardly projecting flanges **31** and **32** which firmly grip the roof of the pedestal jaws **23** and **24** therebetween. The cross-section of the cavity provided between the flanges **31** and **32** is less than the cross-section of the roof of the pedestal jaws **23** and **24** of the side frame **13** so the rubber body **11** is stressed slightly in shear to insure a firm grip of the side frame. Preferably, a suitable adhesive such as an epoxy based cement between the surface of the body **30** and the adjacent surface of side frame **13** adhesively binds the pad **11** to the side frame **13** and prevents relative movement. Flanges **31** and **32** are spaced laterally from each other and extend across the ends of pad **11.** Each of flanges **31** and **32** is substantially parallel to the longitudinal axis of the side frame **13.**

A pair of laterally spaced depending flanges **33** and **34** extend downwardly about the ends of adapter **12.** The distance between the flanges **33** and **34** is slightly less than the length of adapter **12** so the pad is stressed in shear slightly and the adapter **12** is gripped firmly by pad **11.** The substantially flat surface forming the underside of pad **11** is cemented to the surface of adapter **12** to prevent relative movement therebetween.

In the embodiment illustrated in FIGS. **5** and **6,** adapter **12** not only has flanges **28** and **29** extending along the sides thereof but also has spaced flanges **35** and **36** projecting upwardly and across the ends of adapter **12.** The four flanges **28, 29, 35** and **36** are joined at their ends to enclose a rectangular shaped pocket **37.** The body portion **38** of rubber pad **11** substantially fills pocket **37** and the facing surfaces of pad **11** and adapter **12** are preferably cemented together to insure that there is no relative movement therebetween. The roof of the pedestal jaws is gripped by spaced upwardly projecting flanges **30** and **40.** The distance between flanges **39** and **40** is sufficiently less than the cross-section of the roof that the pad **11** is stressed slightly in shear and the flanges grip the side frame tightly. The facing surfaces of the pad **11** and side frame **13** are cemented together to prevent relative movement therebetween.

Lateral movement between the side frames and the bearing assembly **25** occurs only because of the elasticity of the rubber pad because relatively movement between the adapter **12** and side frame **13** is prevented except through shear of the rubber pad. Pad **11** must be free from an embedded metal plate or a metal plate secured to the surface thereof to provide the required elasticity. The prior art pads which are secured to a rigid metal plate or have such a plate embedded therein can be used only when there are tolerances and gaps between them and the adjacent parts of the truck. Forces acting upon the pad are low, especially when the car is not loaded, and the rubber is comparatively stiff. Consequently, the laminated metal and rubber pad as a whole tends to slide within the tolerances. It moves both laterally and longitudinally and relative to the side frame and adapter. This small motion is repeated many times and causes wear on the upper and lower surfaces. Relative movement and wear are eliminated by the pad **11.** All of the relative movement must take place as shear in the rubber of the pad. The elasticity of the rubber is used in two ways. First, to grip the mating parts so as to eliminate movement of the surfaces; and, secondly, to allow the desired controlled lateral movement.

The particular properties of the elastomer used for the pad **11** are selected to accommodate the amount of lateral movement of the truck to be allowed. In practice, the standard gap between the flange separation of opposite new wheels and the edge separation of new rails is usually about ¾ inch. The gap may be as much as 1½ inches on curves or with worn wheels or on worn rails. Hence, for freight service, it is usually preferred to provide for from about ¾ inch to about 1½ inches lateral movement. It has been found that a pad having a body thickness of from about ¾ inch to about 1½ inches provides the best results from the viewpoint of compression and lateral movement.

It is also the practice to keep the natural frequency of a rail vehicle in lateral movement under two cycles per second. This may be achieved in accordance with this invention by providing a pad **11** having a shear stiffness of from about 7,000 pounds per inch to about 12,000 pounds per inch or a restoring force at full travel within the range of from about 2,500 to about 8,000 pounds.

The superficial area of the pad should conform to the area of support of the side frame and the bearing adapter. This area is about 50 square inches for the standard 100 ton car. This area must support the weight of a loaded car which is about 30,000 pounds per axle. A rubber pad having a verical stiffness of from about 270,000 to about 170,000 pounds per inch will avoid excessive compressive strain.

It has been found that an elastomer having a shear stiffness of from about 7,000 to about 12,000 pounds per inch, a shear modulus G of from about 130 to about 210 pounds per square inch, a vertical stiffness of from about 170,000 to about 270,000 pounds per inch and a Young's Compression Modulus of from about 600 to about 1,000 pounds per square inch is most advantageous for making the pads **11** so pads made from such an elastomer are preferred. Any suitable elastomer such as natural or synthetic rubber, polyurethane or the like having suitable properties may be used.

The invention has been described with respect to an adapter and pad combination with side frame **13** but it is to be understood that similar combinations may be used with side frame **14.** Any suitable adhesive, such as an epoxy resin or the like may be used to secure the pad surfaces to the roof of the pedestal jaws and to the adapter.

Although the invention has been described in detail for the purpose of illustration it is to be understood that such detail is solely for that purpose and that variations may be made by those skilled in the art without departing from the spirit and scope of the invention except as it may be limited by the claims.

I claim:

1. A resilient elastomeric cushion for installation between a bearing adapter and the roof of pedestal jaws of a side frame of a railway vehicle, said cushion having a body portion consisting of elastomer and adapted to have one side thereof bonded directly on the adapter for movement therewith, and an opposite side adapted to be bonded directly to said roof, said body portion having on its opposite side a pair of spaced upwardly projecting flanges with a space therebetween to receive the roof of pedestal jaws of a side frame therein, the distance between the flanges being slightly less than the width of the roof so the cushion is stressed slightly in tension and the flanges firmly grip the side frame when installed on the railway truck, said cushion having an elasticity which permits lateral movement by shear therein between the bearing assembly and side frame.

2. The cushion of claim **1** having a pair of depending flanges having a longitudinal axis substantially parallel with the longitudinal axis of the upwardly projecting flanges, said depending flanges being spaced apart a distance slightly less than the length of the adapter along its longitudinal axis whereby said flanges will firmly grip the adapter and secure the adapter and cushion against relative movement therebetween.

3. The cushion of claim **1** wherein said body portion is adapted to be adhesively secured in a pocket on an adapter.

4. The cushion of claim **1** of rubber having a shear stiffness of from about 7,000 to about 12,000 pounds per inch and a shear modulus of from about 130 to about 210 pounds per square inch.

5. In a truck for a railway vehicle, a set of wheels and an axle joining the wheels, a bearing assembly at each end of the axle, a pair of side frames each having pedestal jaws accommodating therebetween one of said bearing assemblies, an adapter element disposed on said bearing assembly for lateral movement therewith, a resilient elastomeric cushion disposed between the adapter and the overlying roof of pedestal jaws of the side frame, said cushion having a body consisting of elastomer with a surface bonded to the adapter and an opposite surface bonded to the roof, and a pair of flanges integral with the body extending upwardly along opposite walls of the side frame, the spacing of said flanges being less than the width of the roof enclosed therebetween whereby said cushion is under tension and the flanges firmly grip the side frame while the truck is at rest.

6. The truck of claim **5** wherein the adjacent surfaces of the cushion body and the side frame are bonded together.

7. The truck of claim **6** wherein the cushion has a pair of spaced depending flanges which extend over the ends of the adapter, the space between the depending flanges being less than the dimension of the adapter therebetween whereby the cushion body is under tension and the flanges firmly grip the adapter.

8. The truck of claim **5** wherein the adapter has a pair of spaced upwardly projecting flanges along opposite edges thereof and about the edges of the cushion, the longitudinal axis of the flanges lying in a plane substantially parallel with the truck's axle.

9. The truck of claim **8** wherein the adapter has a second pair of axially spaced flanges which combine with the first said pair of flanges to enclose a substantially rectangular shaped pocket adapted to receive the body portion of the cushion.

10. The truck of claim **5** wherein the cushion is rubber and has a shear stiffness of from about 7,000 to about 12,000 pounds per inch and a shear modulus of from about 130 to about 210 pounds per square inch.

11. In a truck for a railway vehicle having a side frame with pedestal jaws, a bearing adapter overlying and secured to a bearing assembly and an elastomeric pad adhesively secured to the adapter and to the roof of the pedestal jaws of the side frame, an improved bearing adapter having an upper substantially flat surface and an opposite substantially arcuate shaped surface corresponding substantially to the contour of the top of the bearing assembly and carrying a depending leg at each corner thereof which extends downwardly along the side of the bearing assembly, said legs being spaced axially a distance greater than the thickness of the said pedestal jaws, the upper surface of each leg being disposed substantially in the same plane as the upper surface of the adapter, and a flange projecting upwardly from said upper surface along each side of the adapter which carries said legs.

12. The truck of claim **11** wherein the adapter has flanges around each edge thereof enclosing a pocket which is adapted to receive the elastomeric pad.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,785,298 Dated January 15, 1974

Inventor(s) DAVID J. REYNOLDS

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Line 63, column 3, "30 and 40" should read ---39 and 40---.

Line 5, column 4, "relatively" should read ---relative---.

Line 54, column 4, "verical" should read ---vertical---.

Line 55, column 4, "about 270,000 to about 170,000" should read ---about 170,000 to about 270,000---.

Signed and sealed this 9th day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334.