United States Patent [19]

James

[11] **3,865,443**

[45] **Feb. 11, 1975**

[54] **RESILIENT SIDE BEARINGS**

[75] Inventor: **Raymond Frederick James,** Bradford-on-Avon, England

[73] Assignee: **Avon Rubber Co. Limited,** Melksham, Wiltshire, England

[22] Filed: **Sept. 4, 1973**

[21] Appl. No.: **394,272**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 198,237, Nov. 12, 1972, abandoned.

[30] **Foreign Application Priority Data**

Nov. 13, 1970 Great Britain 54124/70
Nov. 12, 1971 Canada 127475

[52] **U.S. Cl.** .... **308/138,** 105/197 DP, 105/199 CB, 267/9 A, 267/63 R

[51] **Int. Cl.** **B61f 5/14,** F16c 17/04, F16f 13/02

[58] **Field of Search** ... 105/199 R, 199 CB, 197 DP, 105/199 CB, 199 R; 308/138; 267/9 A, 63 R

[56] **References Cited**

UNITED STATES PATENTS

530,999	12/1894	Mather	105/199 R
575,723	1/1897	Mather	105/199 R
850,387	4/1907	Mather	105/199 R
2,327,954	8/1943	Barrows et al.	308/138
2,350,301	5/1944	Cottrell	308/138
2,547,852	4/1951	Bryan	308/138
2,698,208	12/1954	Dilg	308/138
3,719,154	3/1973	Reynolds	105/199 CB

FOREIGN PATENTS OR APPLICATIONS

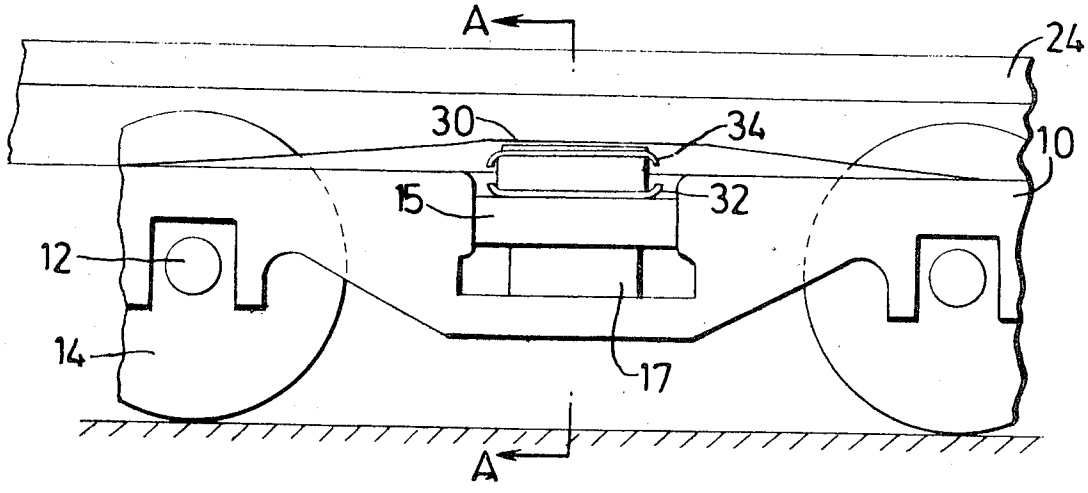
499,414	1/1939	Great Britain	267/63 R
535,095	3/1941	Great Britain	267/63 R
1,166,652	4/1967	Great Britain	105/197 A

Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Howard Beltran
Attorney, Agent, or Firm—Francis T. Carr

[57] **ABSTRACT**

A resilient bearer on a railway vehicle bogie has a resilient element in the form of a resiliently compressible hollow block of elastomeric material e.g., rubber. The block is a thick walled rubber tube and is mounted between plates. The ends of the plates are turned inwardly to give the bearer the desired longitudinal resilience. Also, a radially disposed sleeve attached to one of the plates and a spigot attached to the other of the plates the sleeve and spigot being movable telescopically, the spigot within the sleeve, and being separated by a resilient bush. This gives increased control of the behavior of the bearer against shear in the longitudinal (axial) direction of the radially compressed tube and against rolling shear of that tube.

8 Claims, 14 Drawing Figures



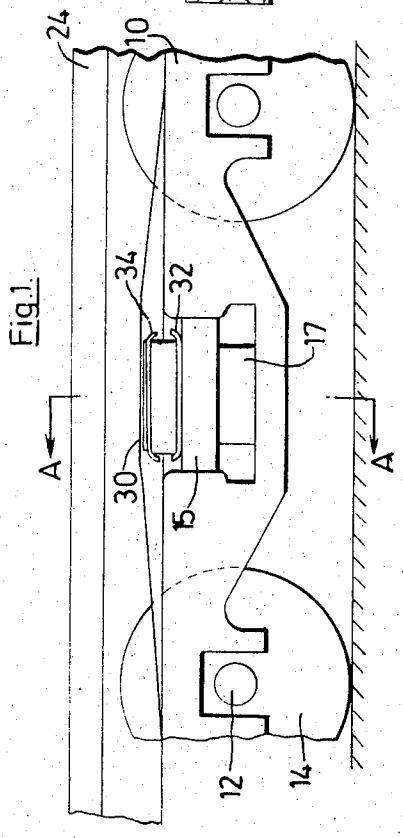


Fig.1.

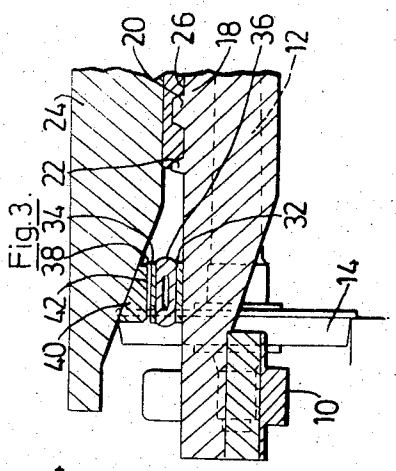


Fig.3.

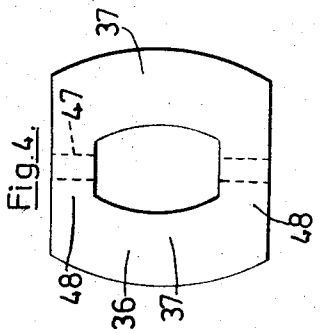


Fig.4.

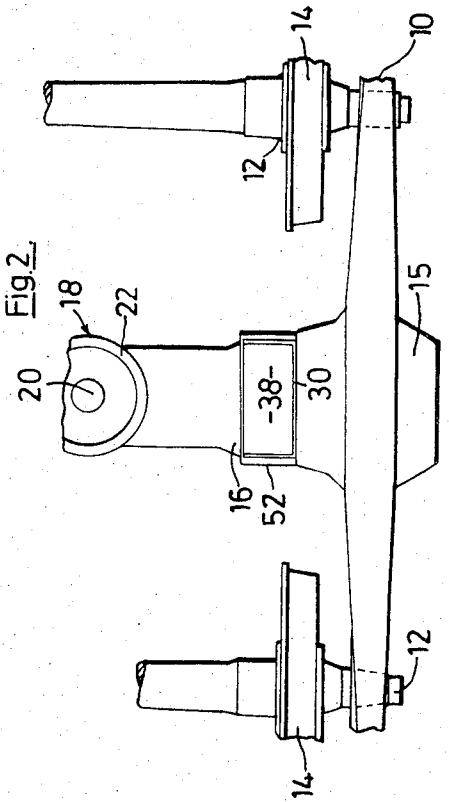


Fig.2.

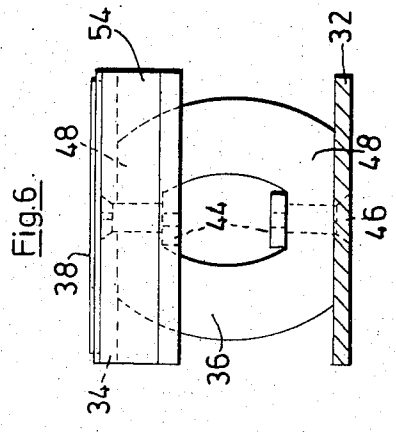


Fig.6.

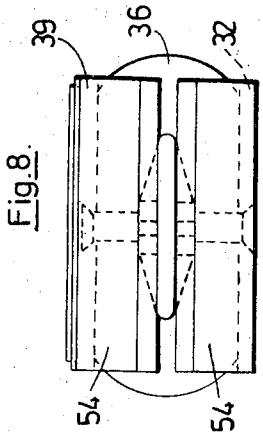


Fig.8.

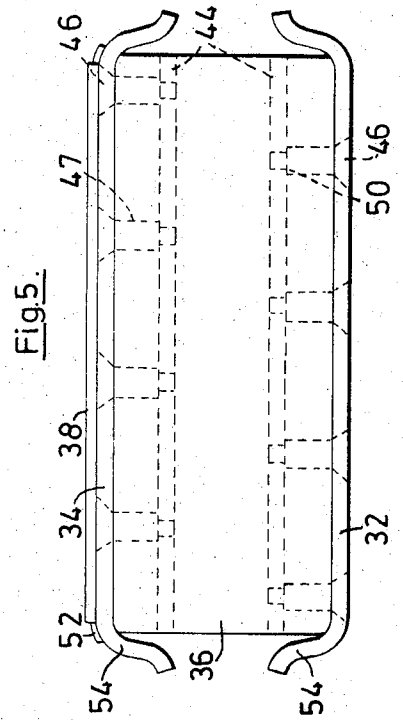


Fig.5.

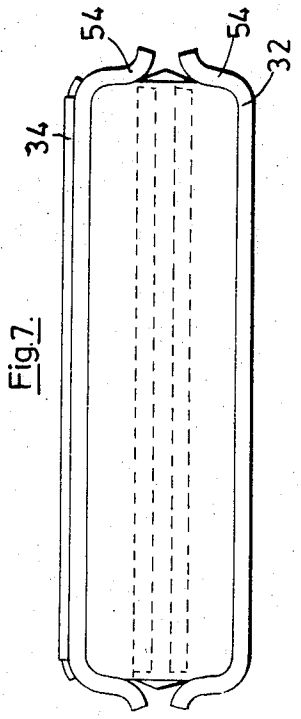


Fig.7.

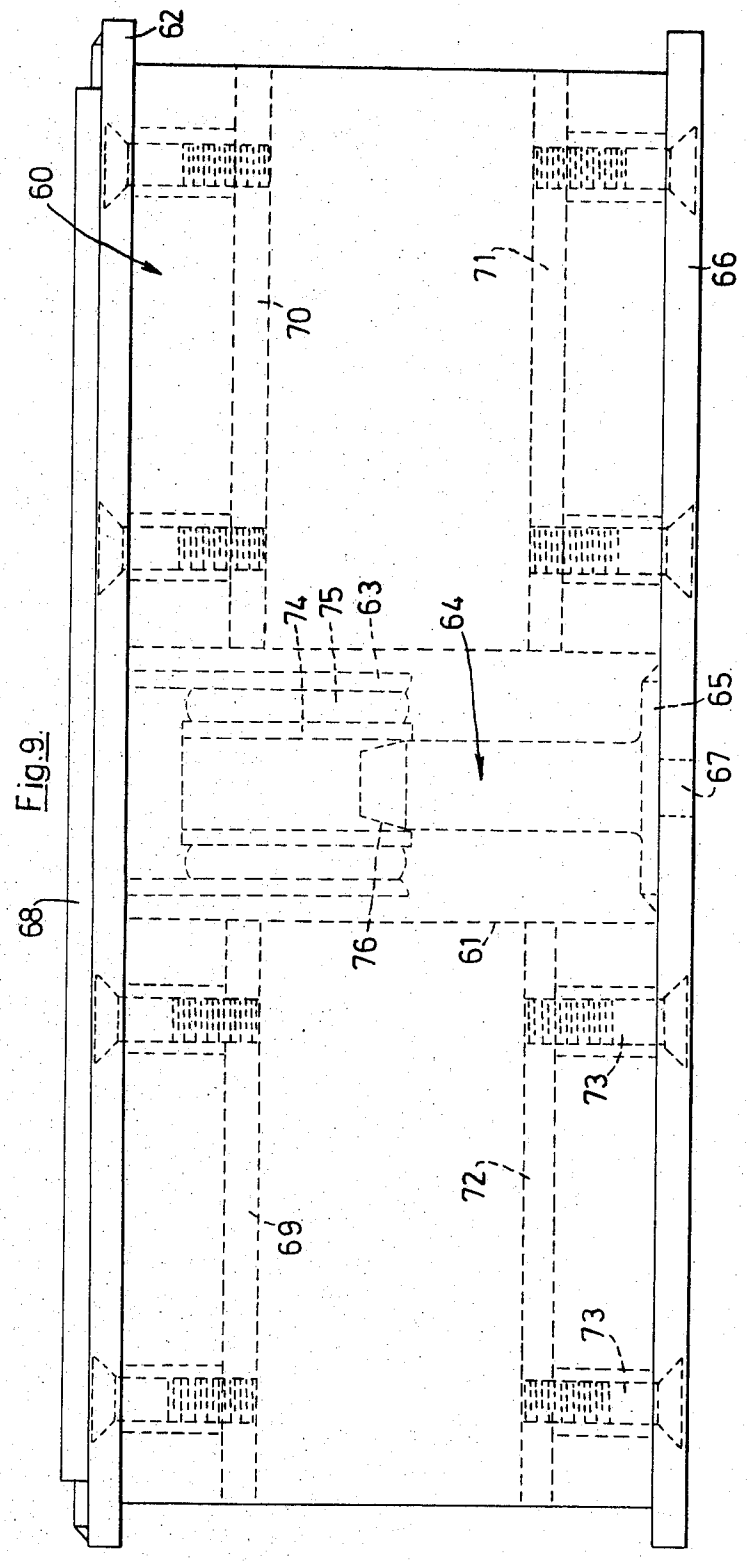


Fig.9.

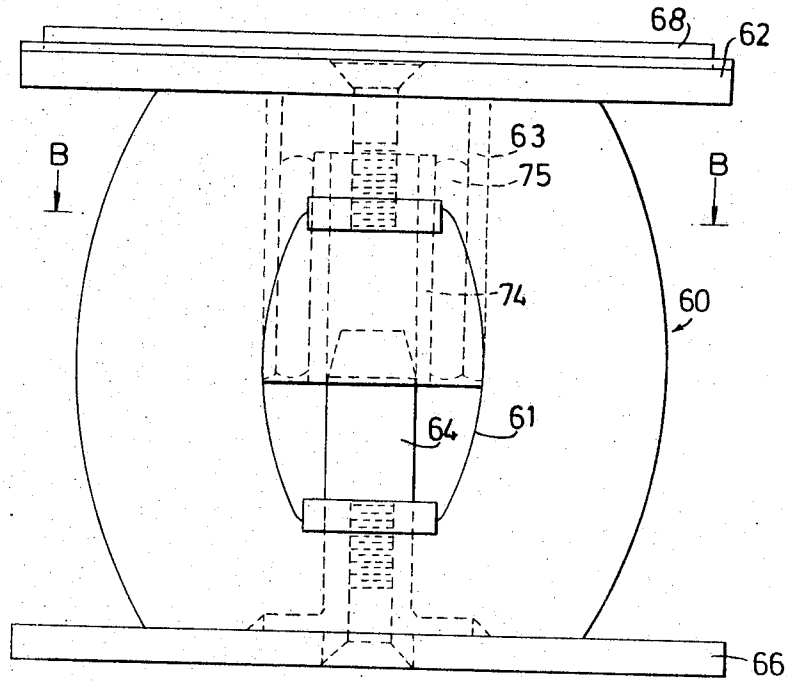
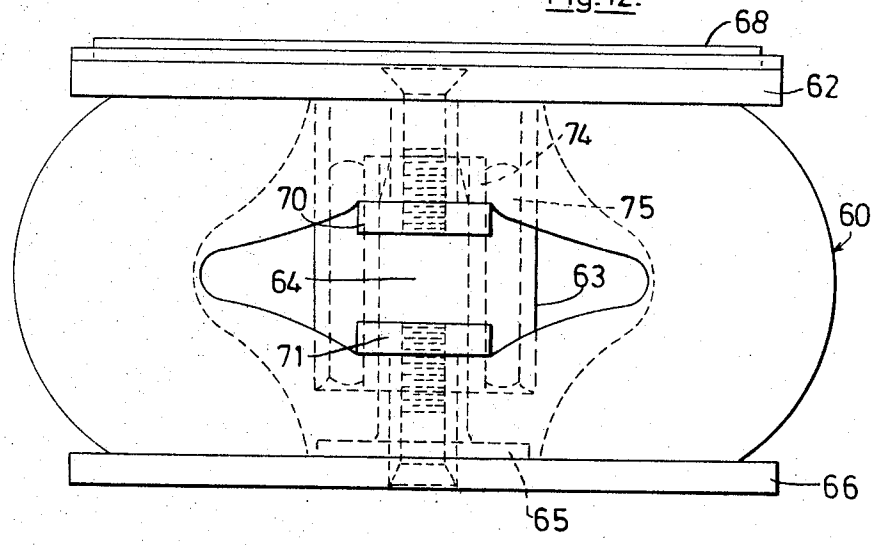


Fig. 10.

Fig. 12.



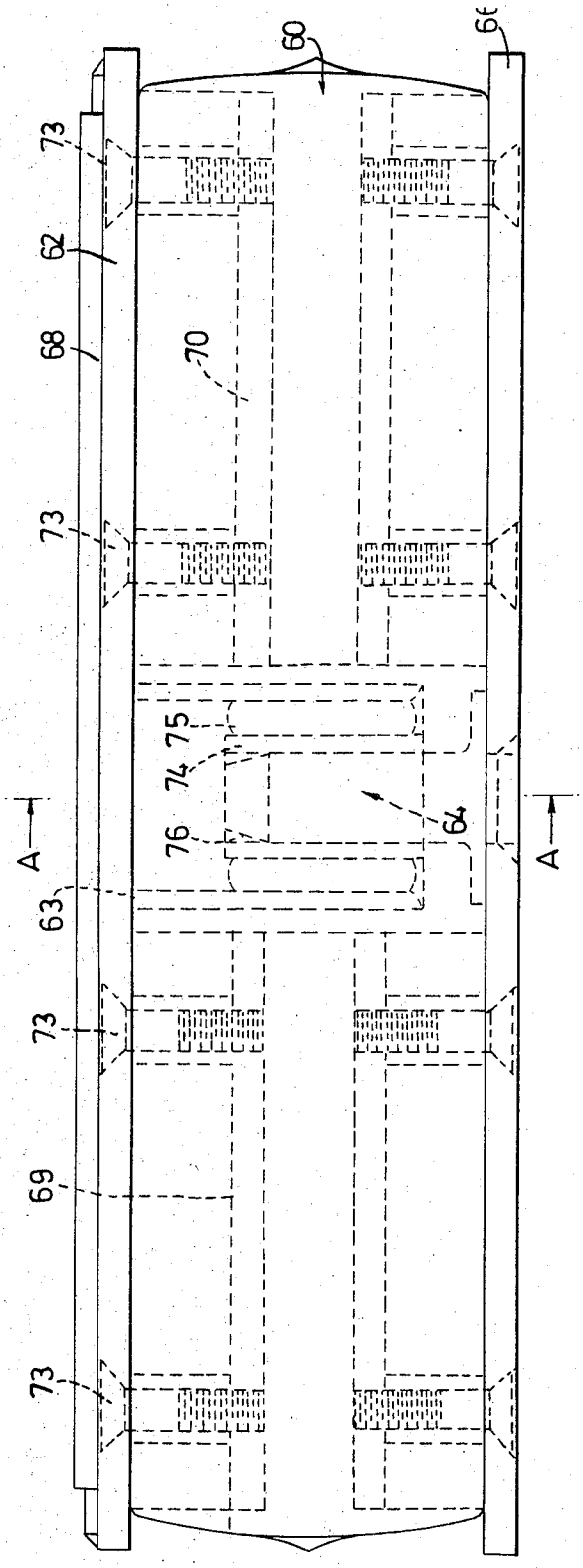


Fig. 11.

Fig. 13.

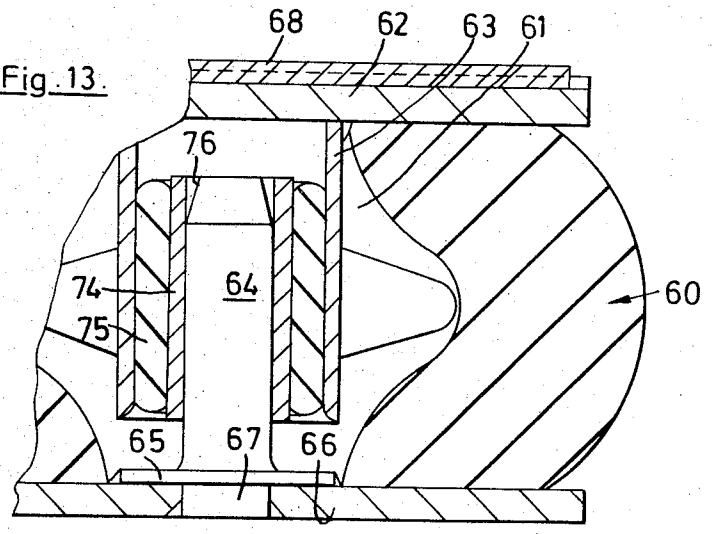
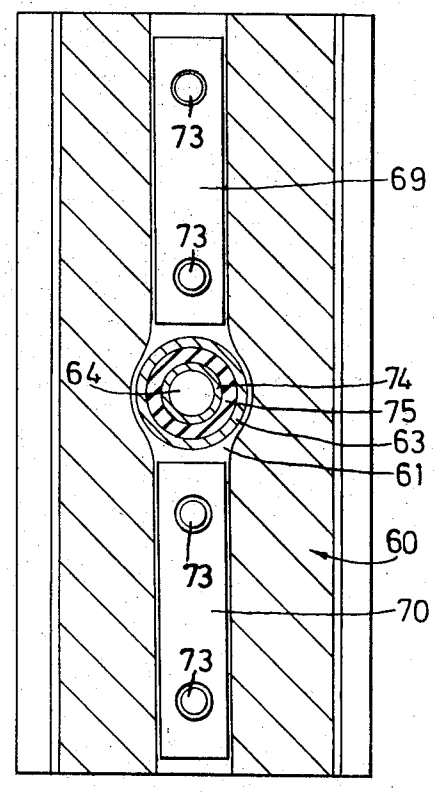


Fig. 14.



RESILIENT SIDE BEARINGS

This application is a continuation-in-part of my co-pending application Ser. No. 198,237, filed Nov. 12, 1971, now abandoned.

This invention relates to resilient bearers in railway vehicles especially bearers for use with a railway vehicle bogie.

Railway vehicle bogies are known in which the vehicle body is pivotally mounted on a bogie bolster (which is supported by side frames of the bogie) and is further supported to each side of the pivotal mounting by resilient bearers mounted between the vehicle body and the bogie bolster. In the past the resilient bearers have had a high vertical load/deflection rate which has meant that the deflections achieved have not been great and consequently accurate machining of metal parts has been necessary when the bogie was being assembled.

It has also been found that due to the wear which takes place on the rubbing face provided between the resilient means and the vehicle body, the load exerted by the resilient means can be reduced by an unacceptable amount.

It is an object of this invention to provide a resilient bearer which can have relatively low vertical load/deflection rate. It is a further object to provide a bearer which can if desired be used with known types of bogie in replacement for some presently used forms of resilient means.

The invention consists in providing a hollow tube of elastomeric material as a resilient component in a railway vehicle resilient bearer disposed in such a way that bearing pressure acts to compress the tube radially. Such a resilient bearer may have two opposed plates, a resiliently compressible hollow tube of elastomeric material (e.g., rubber) between the plates, one of the said plates being secured against each of opposite faces of the tube.

The tube is preferably elongate (e.g., with a length substantially greater than its width or height in the uncompressed state) and may be in the form of a thick walled tube of rubber. It preferably has flat upper and lower surfaces which are to be horizontal in the working position and to respective ones of which the two plates are secured e.g. by a bar within the tube and screws or bolts passing through the wall of the tube from the plate to the bar so that the wall is clamped between the plate and the bar.

At each end of the tube the two ends of the plates may be turned towards each other to provide end abutments for parts of the end of the tube to restrict longitudinal movement of the elastomeric material when the unit is under vertical or under both vertical and longitudinal (shear) load and to increase the longitudinal load/deflection rate.

The plate which is to be uppermost will be provided with a friction pad to support the vehicle body with which the resilient bearer is used.

This arrangement when placed in position in a railway vehicle as a bearer between the bogie and the body absorbs shock and vibration in the vertical direction between the bogie and the body and absorbs also low amplitude or high frequency shocks in its own longitudinal direction. But when the bogie is pivoted as when the vehicle negotiates a curve in the railway track the frictional engagement between the bearer and the body permit a sliding motion without distortion of the tube. We find it desirable to control the extent to which the tube can be distorted both when being rolled about its own central axis and in longitudinal shear by restraining the possibility of the plates moving excessively relative to each other in directions parallel to each other, providing means other than the tube itself for this purpose. More specifically, we provide attached to one of the two plates a hollow sleeve and attached to the other plates a spigot that can enter within the sleeve, and a resilient bush acting between the spigot and the sleeve to be placed under compression in at least one direction upon movement of the plates relative to each other and parallel to each other, the said spigot and sleeve being freely moveable relative to each other in the direction of their own axis i.e., in the direction perpendicular to the direction of the relative parallel movement of the plates. Thus this arrangement does not affect the behaviour of the bearer in radial compression of its tube but does control rolling or longitudinal or shear of the tube by the interposition of a resilient bush between vertically slidable sleeve and spigot, respectably fast with the plates.

The invention extends to bogie bolsters, bogies and railway vehicles having a resilient bearer as described above.

Two embodiments of this invention will now be described by way of example only with reference to the accompanying drawings wherein:

FIG. **1** is a partial side view of a bogie including a bogie side frame, a resilient bearer or spring unit and part of a vehicle frame;

FIG. **2** is a part plan view of part of the bogie shown in FIG. **1**;

FIG. **3** is a section on the line A—A shown in FIG. **1**;

FIG. **4** is an end view of the rubber tube used in the bearer shown in FIG. **1** prior to assembly of the unit;

FIG. **5** is a side view of the bearer shown in FIG. **1**;

FIG. **6** is an end view of the bearer shown in FIG. **5** with part of one plate omitted for clarity;

FIG. **7** is a view similar to FIG. **5** with the bearer under compression; and

FIG. **8** is an end view of the bearer in the state shown in FIG. **7**.

FIG. **9** is a side view of a second embodiment of a bearer in relaxed condition and FIG. **10** is an end view, FIG. **11** is a side view of the bearer in compressed condition and FIG. **12** is the end view;

FIG. **13** is a sectional view on the line A—A of FIG. **11**, and

FIG. **14** is a sectional view on the line B—B of FIG. **10**.

Referring to FIGS. **1** to **3** of the drawings, there is shown a bogie comprising side frames **10** provided with bearings (not shown in detail) for axles **12** carrying the bogie wheels **14**.

Forming a bridge between and supported by the side frames **10** misway along their lengths, is a bogie bolster **15** having a platform **16**. The bogie bolster **15** is supported by the side frames **10** through spring means shown diagrammatically at **17**. At the centre of the bolster platform is a pivot **18** comprising a central boss **20** and concentric therewith an annular bearing surface **22**. As seen in FIG. **3**, vehicle frame **24** is supported by the bolster platform **16** through the pivot **18** for pivotal movement with respect thereto, which mates with an annular bearing surface **26** provided on the underside of the vehicle frame **24**.

Two resilient side bearers **30** described subsequently in greater detail are secured to the bolster platform **16** symmetrically with regard to the pivot **18** by means of lower loading plates **32** of the units welded to the upper surface of the bolster platform **16.**

On the underside of the vehicle frame **24** there are provided blocks **40** having downwardly facing horizontal surfaces **42** which make sliding contact with friction pads **38** provided on upper loading plates **34** of the side bearers **30.**

Referring now to FIGS. **4** to **8,** the resilient side bearers **30** are formed by the lower plates **32,** the upper plates **34** and secured between them a hollow thick walled tube **36** of resilient rubber which in the unstressed state is approximately two-and-a-half times as long as it is high and wide. An end view of rubber tube **36** before it is secured to the plates **32, 34** is shown in FIG. **4** from which it can be seen that the tube has curved side walls **37** and straight upper and lower walls **48** surrounding a cavity of approximately oval cross-section. The cavity extends from end to end of the tube **36.** The upper and lower walls **48** have flat outer faces which are horizontal in use and against which the plates **32, 34** are secured by means of bars **44** held within the tube **36** which are secured to the plates **32,34** by screws **46** passing through holes **47** in the upper and lower walls **48** of the rubber and making screw-thread engagement with holes tapped in the lates **44.** Correct tightening of each screw **46** is achieved when its plate **44** is drawn against a shoulder **50** on the screw.

A friction pad **38** composed for example of Ferobestos is stuck on to the upper surface of each upper plate **34** and is prevented from lateral movement by a surround **52** (see also the plan view in FIG. **2**).

As seen in FIGS. **5** and **7,** at each end of the tube **36** the ends of the plates **32,34** are shaped as shown at **54** so that their ends approach one another, but without any sharp angle being presented to the rubber, in order to restrict longitudinal expansion of the rubber and to provide the required longitudinal load/deflection rate for the unit. The downturned end **54** of the upper plate **34** is shown in FIG. **6** but the upturned end of lower plate **32** has been omitted from this figure to enable the shape of the rubber section **36** and details of the lower securing device **44,46** to be seen.

The length of the tube **36** and the shaping of the ends of the plate **32,34** influence the longitudinal load/deflection rate. The thickness of the rubber and the outside cross section dimensions of the section are factors which influence the vertical rate. Merely as an example, the tube **36** and plates **32, 34** may be designed to give a vertical rate of 1¾ tons per inch and a longitudinal (shear) rate of 13 tons per inch.

The condition of the bearers **30** under vertical loading is shown in FIGS. **7** and **8** and the effect of the ends **54** of the plates in restricting longitudinal movement of the rubber is shown.

The bearers above described give a relatively low vertical load/deflection ratio compared with some known forms of bearers in bogies thus allowing greater tolerance on the mating parts. The units give a relatively large vertical deflection for a relatively low free height which helps overcome the difficulties of tolerance just mentioned and also difficulties in change of loading produced by wear on the friction pads which, if the vertical rate were higher might result in an unacceptable lowering of the frictional force applied by or to the frictional pad **38.** At the same time a compact and simply manufactured assembly is provided.

A variety of longitudinal rates can be obtained by varying the form of the ends of the top and bottom plates. However, to gain control over the behaviour of the bearer when under conditions which would place the tube under longitudinal or rolling shear we prefer to use the arrangement shown in the second embodiment. Here, a tube **60** has an overall conformation generally as in the first embodiment except that as best seen in FIGS. **13** and **14,** a circular aperture **61** is pierced radially through it, halfway along its axial length.

The upper plate here designated **62** has a sleeve **63** welded to it so as to project perpendicularly to it and across about half the radial height of the tube **60** when it is in the relaxed condition as shown in FIG. **10.** The sleeve **63** is cylindrical and of a radius greater than that of a solid spigot **64** of which an enlarged collar portion **65** bears flat against the inner surface of the lower plate **66** of the bearer assembly, the securing of the spigot further being helped by the provision of a stud portion **67** which is welded within an aperture in the plate **66.**

A friction plate **68** is bonded fast to the upper surface of the upper plate **62** and further restrained by a raised border around the plate, to provide a frictional interaction with the portion of the railway vehicle on which it is designed to bear.

Upper and lower portions of the tube **60** are clamped to the upper and lower plates respectively by being clamped between those plates and holding bars **69** and **70** on the upper side and **71,72** on the lower side, the bars all being engaged by respective screws **73** of which the heads engage the plates **62,66** respectively.

The spigot **64** is, like the sleeve **63,** cylindrical and so there is an annular gap between them and this is radially occupied by a bushing made up of a sleeve **74** surrounded by an elastomeric bush **75.**

The sleeve **74** is a close but freely sliding fit about the spigot **64.** The elastomeric bush **75** is forced fitted within the sleeve **63** so that it is retained against movement along the axis of the sleeve **63.** The alternative arrangement could equally well be used i.e., with the bushing axially fixed relative to the spigot and slidable relative to the sleeve **63.**

To assist entry of the spigot **64** into the inner sleeve **74** the spigot has a bevelled-off nose portion **76.**

Comparison of FIG. **10** with FIG. **12** or of FIG. **9** with FIG. **11** will show the extent to which the sleeve **63** and spigot **64** may be displaced relative to each other along their common axis upon radial compression of the tube **60.** The rate of compression with load achieved in that direction is solely dependent on the nature and construction of the rubber tube **60;** however longitudinal shear of the tube **60** i.e., shear with the plate **60,62** moving one to right and one to the left in FIG. **9** and parallel to each other is resisted not only by the material of the tube **60** itself but by radial compression of the elastomeric bush **75** between the spigot **64** and sleeve **63.** Control of that characteristic is obtained partially by the structure and characteristics of the tube **60** but principally by the dimensioning of the bushing made up of sleeve **74** and bush **75** and the characteristics of the elastomeric material used in the bush **75.** In one choice of the materials and dimensions, for example, there may be achieved a vertical rate of 1¾ tons to the inch.

The presence of the spigot and sleeve and their aasociated bushing also helps prevent the imposition of rolling shear on the tube but this in normal conditions of use is not of such great importance as longitudinal shear.

I claim:

1. A railway vehicle resilient bearer for positioning between a vehicle body and a bogie to frictionally engage one of them, the bearer having two opposed plates, and a resiliently compressible thick-walled, open-ended hollow tube of elastomeric material between the plates with its axis parallel to the plates, respective ones of the two said plates being secured against repsective ones of opposite faces of the tube to extend generally parallel to each other, whereby upon the plates moving towards each other the tube is compressed in its radial direction against the resilience of the elastomeric material of the tube, and restraint upon the plates moving parallel to each other is provided by the elastomeric material of the tube.

2. A resilient bearer according to claim **1** wherein at least one plate has its ends turned inwardly over the ends of the tube.

3. A resilient bearer according to claim **1** wherein each plate is clamped against the face of the tube by a member within the tube.

4. A resilient bearer according to claim **1** wherein one of the plates has a friction pad secured to its exposed outer face.

5. A resilient bearer according to claim **1** which has extending between the two plates and diametrically of the tube, means additional to the tube for restraining the plates against relative displacement parallel to each other.

6. A resilient bearer according to claim **5** wherein the said means includes a sleeve secured to one of the plates, a spigot secured to the other of the plates, the spigot fitting freely within the sleeve, a bushing between the spigot and the sleeve and compressed by relative displacement of the sleeve and the spigot in a direction axially of the tube, the spigot and sleeve being freely movable relative to each other in a direction radial of the tube.

7. A resilient bearer according to claim **6** wherein the bushing includes an annular elastomeric element and an annular rigid element fast with the elastomeric element, the elastomeric element being immovable relative to one of the spigot and the sleeve and the rigid element being slidable relative to the other of the spigot and the sleeve.

8. A resilient bearer according to claim **6** wherein said spigot and sleeve are half way along the length of the said plates taken in the axial direction of the tube and the said clamping members within the tube are situated on each longitudinal side of the spigot and sleeve arrangement.

* * * * *