Jan. 25, 1949. D. S. BARROWS ET AL 2,460,211

RAILWAY TRUCK JOURNAL BOX MOUNTING

Filed Sept. 20, 1944 2 Sheets-Sheet 1

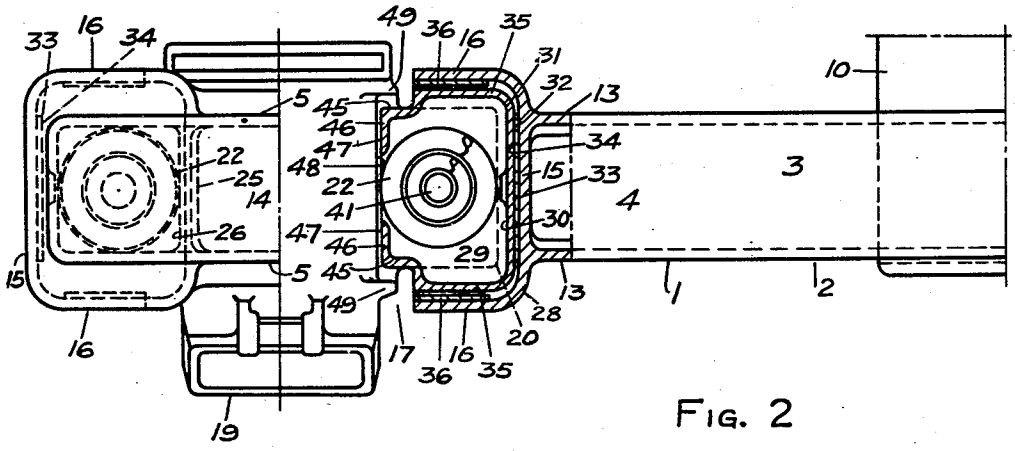


FIG. 2

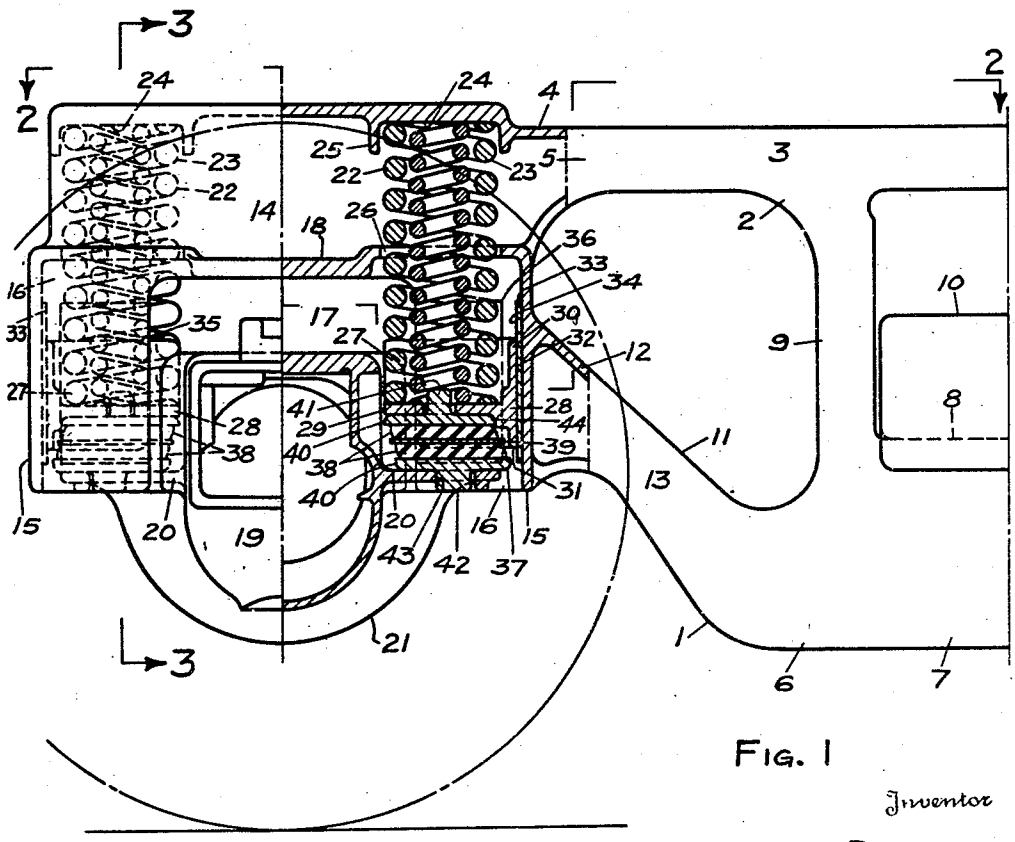


FIG. 1

Inventor

DONALD S. BARROWS
EMIL H. BLATTNER

By Ernest J. Mechlin
Their Attorney

Jan. 25, 1949. D. S. BARROWS ET AL 2,460,211

RAILWAY TRUCK JOURNAL BOX MOUNTING

Filed Sept. 20, 1944 2 Sheets-Sheet 2

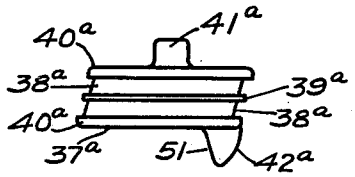


FIG. 7

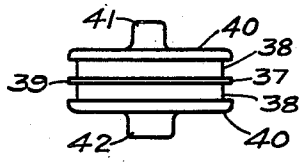


FIG. 4

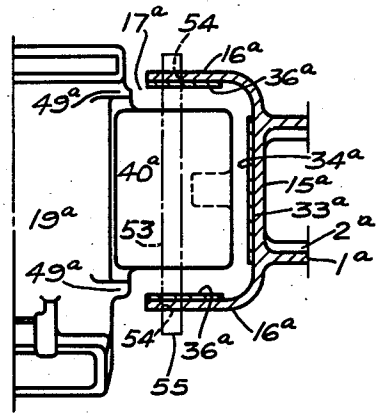


FIG. 6

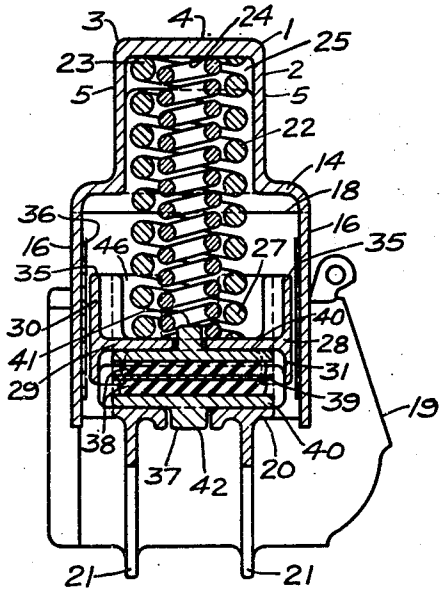


FIG. 3

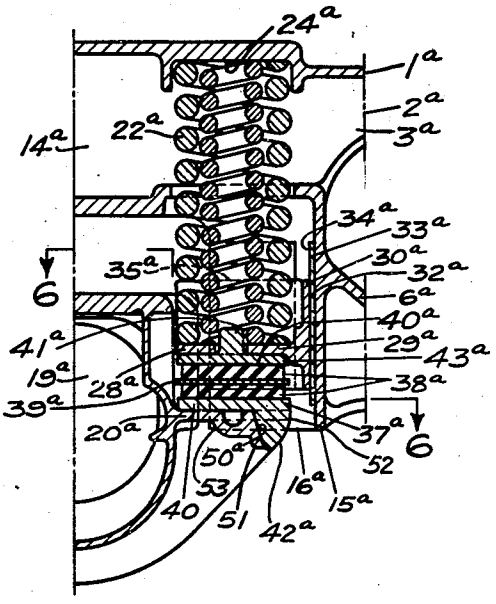


FIG. 5

Inventor

DONALD S. BARROWS
EMIL H. BLATTNER

By Ernest J. Mechlin
Their Attorney

Patented Jan. 25, 1949 2,460,211

UNITED STATES PATENT OFFICE

2,460,211

RAILWAY TRUCK JOURNAL BOX MOUNTING

Donald S. Barrows and Emil H. Blattner, Rochester, N. Y., assignors to The Symington-Gould Corporation, Rochester, N. Y., a corporation of Maryland

Application September 20, 1944, Serial No. 554,954

17 Claims. (Cl. 105—224)

1

The invention pertains to a railway truck journal box mounting and more particularly to a resilient support for a side frame at a journal box.

An object of the invention is the provision, in a railway truck, of a resilient support for a side frame having incorporated therein a friction means to snub or control the action of the resilient support.

Another object of the invention is the provision, in a railway truck, of resilient supporting means of different character and acting in series for the support of a side frame from a journal box.

A further object of the invention is the provision, in a railway truck, of a journal box adapted to move transversely of the truck relative to a side frame and arranged to have the side frame move vertically relative thereto with both the transverse and vertical movements controlled.

A feature of the invention is to provide a movable member sandwiched between resilient elements of different character and adapted to frictionally engage a side frame.

An added feature of the invention is to provide a journal box having associated therewith a rubber element subjected to compressive forces and in shear with a shoe means overlying and interlocked with the rubber element so as to be urged into frictional engagement with a member of a side frame.

The above objects and features of the invention as well as numerous others will become apparent from the succeeding description considered together with the accompanying drawings, the latter of which disclose in several views exemplifications of the present invention and wherein:

Figure 1 is a partial side elevational view and partial vertical sectional view of a railway truck embodying the present invention.

Figure 2 is a partial plan view and partial horizontal cross sectional view taken along the diagrammatic lines 2—2 of Figure 1, looking in the direction of the arrows.

Figure 3 is a vertical cross sectional view taken along the lines 3—3 of Figure 1, looking in the direction of the arrows.

Figure 4 is a side elevational view of a resilient element forming a part of the present invention

2

and is shown removed from its associated structure to more clearly disclose the details thereof.

Figure 5 is a vertical sectional view of a portion of a railway truck embodying a second species of the invention.

Figure 6 is a horizontal cross sectional view taken along the lines 6—6 of Figure 5, looking in the direction of the arrows.

Figure 7 is a side elevational view of a resilient element and, like Figure 4, is also shown removed from the truck to thereby illustrate more clearly its configuration before assembly.

Referring now in detail to Figures 1 to 4 of the drawings, wherein like reference characters indicate like parts, the numeral 1 is employed to designate, in a somewhat general manner, a railway truck illustrating one form of the present invention. Only substantially a quarter portion of the truck is shown in the drawings and it will be clearly understood that the undisclosed parts of the truck structure are identical with that illustrated. Making up transversely spaced, longitudinally extending load carrying members of the truck is a pair of counterpart side frames 2 only a portion of one of which is illustrated in the drawings since it is well known in the art that two such side frame members form the transverse limits of the truck.

Each side frame comprises a compression member 3 desirably channel or inverted U-shape in vertical cross section and having a web 4 with transversely spaced flanges 5 depending from adjacent the lateral limits thereof. A tension member 6 has a central horizontal portion 7 spaced a predetermined distance below the compression member and forms a seat 8. Joining the compression and tension members intermediate the ends of the side frame is a pair of longitudinally spaced, vertically extending columns 9 only one of which is illustrated. Disposed between the columns and mounted upon the seat is a bolster 10 forming a rigid connection between the spaced side frames and arranged to carry a car body (not shown). The tension member beyond the central horizontal portion extends towards the respective ends of the side frame away from an associated column in an upwardly inclined direction as at 11 and comprises a transverse web 12 having its side edges terminating in transversely spaced, downwardly extending flanges 13 to present a configuration of

inverted U section. The compression member web extends to the end of the side frame while the compression and tension member flanges merge intermediate the columns and the end of the side frame to thus continue to the end of the side frame and form a housing 14. The housing is somewhat bulged or extended inwardly and outwardly of the truck beyond the transverse limits of the remaining portion of the compression and tension members to accommodate related structure hereinafter described in detail. The housing, at each end of the side frame, desirably comprises longitudinally spaced jaws or columns formed by end walls 15 which extend vertically and transversely of the truck to have their transverse edges merge with inboard or inner and outboard or outer flanges or side walls 16 which, from each end wall, extend toward one another to define an opening or space 17 therebetween. Extending horizontally through the housing intermediate its height is a top wall 18 which is formed integrally with the side walls and terminates in the end walls to define the upper limits of the space 17. Accordingly, the related jaws or columns at each end of the side frame are thus formed so as to open toward one another and downwardly of the truck. Disposed within the space 17 between the horizontal limits of the jaws or columns is a journal box 19 forming a container or casing for an extremity of a wheel and axle assembly and a suitable bearing, neither of which are illustrated because they are of standard design and their construction will be understood by those skilled in the art. It may be well to state that the journal box illustrated is designed primarily for a friction bearing but, if desired, a roller or anti-friction bearing may be associated with the wheel and axle assembly and, accordingly, the design of the journal box in the latter case will be such as to accommodate the roller or anti-friction bearings. The journal box is desirably provided with wings, ledges or shelves 20 which extend horizontally from the sides of the journal box preferably in the horizontal plane bisecting the axle of the wheel and axle assembly. The shelves or ledges which are reinforced by ribs 21 underlying and formed integral with the journal box and wings extend into related jaws or columns but among other reasons that will become hereinafter apparent, are spaced inwardly away from the jaw forming components to permit predetermined service movements of the journal box.

Resilient means is interposed between the journal box and side frame to thereby form a yieldable support for the side frame and which permits the side frame to move vertically relative to the journal box. If one type of spring such as a coil or helical spring is employed to support the side frame from the journal box to present a flexible connection therebetween, this type of spring, notably if of the same size, will have a substantial uniform period of vibration. Accordingly, at certain speeds of a railway truck and upon passage over rail joints and any other irregularities such as might appear in the tracks or road bed, external impulses will be transmitted through the wheel and axle assembly which will synchronize with the vibrations of the resilient side frame support. This synchronization of external impulses and spring vibrations will cause an amplification of the spring vibrations tending to force the springs solid during a compressive movement thereof and upon recoil expand them beyond their normal height. This excess spring travel will eventually result in a possible derailment of the truck and certainly in damage to the springs themselves as well as to the truck, car structure and car lading.

An arrangement has been incorporated in the embodiment of the present invention to check, retard or disturb the side frame supporting spring vibrations, and this arrangement considered generally is formed by resilient means of different or non-harmonic character acting in series and friction means associated with and actuated by the resilient means. One exemplification of the arrangement incorporated in the present structure comprises an inner and outer coil or helical spring 22 disposed vertically and positioned adjacent each side of the journal box in substantially vertical alignment with a subjacent shelf or ledge. Each coil spring has an upper extremity 23 thereof bearing against a spring seat 24 formed on the compression member web and has longitudinally spaced ribs or lugs 25 in overlying telescoping relation thereto so as to maintain the upper extremity of the spring in a predetermined or fixed position. Each coil spring extends from the compression member web downwardly through a suitable or accommodating opening 26 in the side frame top wall to have its other or lower extremity 27 terminate within the extended horizontal plane of the journal box proper short of an underlying ledge or shelf. By forming the coil springs so that they extend from the compression member web through the plane of the top wall to a location short of the wings of the journal box a long travel spring is incorporated in the truck to present an easy, smooth riding truck capable of performing in high speed service.

As will be understood, the coil springs may, if short travel springs are desired, be shortened so that their upper extremities bear against a suitable seat formed on the top wall which, in such instance, would eliminate at least the opening 26. Disposed below each coil spring in supporting relation thereto is a friction means, shoe or block 28 having its greater portion within the confines of a related column or jaw. Each friction shoe desirably comprises a base plate or web 29 disposed intermediate the height of the shoe and forming a lower seat for the related spring. Extending vertically above and below the base plate is a substantially U or channel shaped flange 30 which is formed by an upstanding wall or bearing plate 31 presenting a wear or friction surface 32 adapted to react constantly against a related jaw end wall 15. Each jaw end wall is provided with a wear plate 33 facing inwardly of the jaw and having an exposed surface 34 in constant intimate contact with the complementary surface 32 of the bearing plate. Accordingly, as the coil springs are flexed in service frictional forces are created on the contiguous surfaces 32 and 34 to check, control, snub or dampen the vibrations or actions of the coil springs. The transverse limits of the bearing plate merge with vertically coextensive, laterally spaced side walls 35 which lie adjacent to and are spaced a slight distance from the jaw side flanges to limit or restrict within a certain predetermined degree, the transverse movements of the shoes. Side wear plates 36 are secured by any desired means to the side flanges of the columns so as to be engaged by the shoes during their vertical travel and thereby relieve the side flanges of wear which might occur in service.

As previously indicated, the shoes are urged constantly longitudinally of the side frame in a direction away from the journal box to be in fric-

tional contact with the jaw or column end walls. As exemplary of a means for performing this function there is provided between each shoe web and journal box ledge a resilient element 37 also acting as a load carrying flexible member in series with the overlying coil springs and, therefore, under compression or subjected to compressive forces. Each resilient element preferably comprises a series or plurality of sandwiched pads 38 which may be formed of rubber, a rubber compound or any deformable or resilient material and being bonded or otherwise secured to an intermediate or interposed spacer plate 39. Forming the vertical extremities of the resilient element is a pair of vertically spaced end blocks or upper and lower discs 40 which also have the adjacent pads bonded or otherwise secured thereto so that the pads, spacer plate and end blocks of each resilient element form an integral, unitary component. The upper end block is provided with an upstanding somewhat centralized dowel or spud 41 which fits into and through an accommodating aperture in the associated shoe web to thereby assist in forming a suitable interlock between the resilient element and shoe. The spud 41 extending above the plane of the shoe web also acts, because it projects into the vertical limits of the coil spring, as a means for retaining the lower extremity of the coil spring in a predetermined position. Downstanding from a somewhat central position of the lower disc is a cylindrical dowel or pin 42 formed integral with the lower disc and extending into an accommodating aperture in the supporting ledge of the journal box to thereby interlock the lower disc with the journal box.

By referring to Figure 4 of the drawings which discloses a resilient element disassociated from a truck assembly, it will be noted that the dowels 41 and 42 are disposed in vertical alignment and that the sandwiched pads are superimposed one directly above another. However, as noted particularly in Figure 1 of the drawings, when assembled with other related components of the truck, the dowels are off-set horizontally relative to one another or are displaced horizontally out of vertical alignment and the pads have assumed a horizontally distorted configuration. By reason of this arrangement the pads are placed in horizontal shear longitudinally of the truck or side frame. Since there is an engagement or intimate contact between the dowels 42 and the ledges as at 43 and between the leading edge of the upper discs and transversely disposed shoulders on the shoes as at 44, the horizontal forces built up in the resilient elements cause the shoes to be urged constantly and horizontally against the column or jaw wear plates 33.

As previously indicated, the journal box is arranged to shift or move transversely of the truck so that as the journal box is urged transversely due to irregularities in the rails, road bed and the like, these external lateral impulses will not be transmitted entirely to the truck structure. While the journal box is permitted a lateral movement, this action is maintained constantly under control and the range of such movement is fixed within certain predetermined limits. As exemplary of such a means for accomplishing the above, the end walls of each shoe are off-set inwardly of the shoe toward one another to extend into the space 17 as at 45 and present barriers or abutments on the shoes. Reentrant flanges 46 are formed as continuations of the abutments to present vertical and transverse surfaces 47 adapted to be engaged by an associated surface 48 on the journal box side to thereby limit the longitudinal movement of the journal box and guide the latter during its transverse movement. The journal box has at each side thereof outstanding lugs 49 spaced a predetermined distance laterally of the truck from the shoe barriers and in overlapping relation thereto with the distance between each barrier and associated lug being determinative of the permissible transverse movement of the journal box relative to the side frame. As will be noted, the shoe is retained in substantially fixed position within the jaw longitudinally and transversely of the side frame and the resilient element is interlocked with the shoe and journal box ledge so that any transverse movement of the journal box will place the already stressed pads in horizontal shear transversely of the truck to positively control the lateral movement of the journal box.

Referring now in detail to Figures 5, 6 and 7 of the drawings wherein a second species of the invention is disclosed, the reference character 1a designates a railway truck, only a portion of which is illustrated since it is believed necessary to show only wherein this design differs from the previously considered species. The railway truck comprises a side frame 2a having the usual compression member 3a and tension member 6a merging adjacent one end of the side frame to form a housing 14a. This housing likewise is formed by spaced jaws or columns (only one of which is shown) with each column being formed by an end wall 15a and inner and outer flanges 16a defining an opening or space 17a therebetween.

Positioned within the space between the columns or jaws is a journal box 19a forming a casing for an extremity of a wheel and axle assembly (not shown). The journal box has outstanding therefrom wings, ledges or shelves 20a which extend to within the jaws or columns and like the previously described structure, the wings are of such proportion so as to permit a free service movement of the journal box relative to the side frame without interference between the side frame jaws and ledges. The present side frame is also arranged to move vertically relative to the journal box and the latter moves transversely of the truck relative to the side frame. Toward the accomplishment of the above there is provided between the side frame and journal box a group of nonharmonic resilient means having associated therewith a friction means and as exemplary of such an arrangement a helical or coil spring 22a is positioned in the side frame housing. The coil spring disposed vertically has an upper extremity bearing against a suitable downwardly facing spring seat 24a on the compression member and a lower extremity terminating adjacent to but spaced a predetermined distance about a related shelf. In subjacent relation to the coil spring is a friction shoe or block 28a disposed substantially entirely within a related column and comprising a base plate 29a which forms a suitable seat for the lower extremity of the coil spring. Extending vertically on both sides of the base plate is a flange 30a which presents a vertical outer wear surface 32a adapted to bear against or frictionally engage a correspondingly disposed surface 34a of a wear plate 33a the latter of which is secured by any desired means to a related jaw or column end wall 15a. The transverse extremities of the shoe flange merge into side walls

35a which are disposed in the close proximity to the jaw side flanges to limit the transverse movement of the shoe. Wear plates 36a are provided on the jaw side flanges to be engaged by the shoe side walls in service.

A resilient element 37a acting in series with the overlying coil spring and therefore also functioning as a load carrying means is disposed between the shoe and underlying journal box ledge. Each resilient element comprises a plurality of sandwiched pads 38a formed preferably of rubber or any deformable resilient material and being bonded to or formed integral with an intermediate spaced plate 39a. Upper and lower discs or end blocks 40a also bonded to adjacent pads are formed as an integral part of the resilient element. The upper end block has upstanding therefrom a spud or dowel 41a extending through a suitable aperture in the shoe web to form a centralizing device for the coil spring. The lower disc has downstanding therefrom adjacent one edge thereof a dowel or key 42a disposed intermediate the sides of the lower block and extending into a suitable notch 50 along the free or outer edge of a supporting shelf.

By referring to Figure 7 of the drawings it will be noted that when the resilient element is removed from a truck structure the end blocks, pads and spacer plate are normally positioned out of vertical alignment to present a somewhat stepped arrangement with opposite sides of the pads inclined. By now referring particularly to Figure 5 of the drawings, it will be observed that when assembled with a shoe and shelf the end blocks, pads and spacer plate are disposed one directly over another and the previously inclined opposite sides of the pads are substantially vertical thereby distorting the pads horizontally and placing them in horizontal shear.

Because of the contact between the leading edge of the upper end block and a suitable shoulder on the shoe as at 43a and the interlock between the lower dowel and related shelf, the forces built up in the pads of the resilient element urge the shoe constantly in a direction longitudinally of the truck into engagement with the column wear plate 33a. Any compressive or recoil action of the coil spring or pads will cause the side frame to move vertically relative to the shoe and result in the creation of frictional forces to snub, retard or control the spring and pad action.

For the purpose of facilitating the assembly of the mounting at the journal box the key is provided with an inclined surface 51 facing downwardly from and inwardly toward the journal box and this surface is, in an assembled structure, in intimate contact with a correspondingly disposed surface 52 which defines the inner limits of the shelf notch. During assembly, therefore, the surface 51 slides along the surface 52 until the lower block comes to rest upon the shelf and during which time the lower block is being urged into vertical alignment with the upper block. This action, caused by the inclined surfaces, will not only cause the pads to be subjected to compressive forces but will also energize the pads horizontally and subject them to shear forces.

Consideration has also been given to maintaining the springs, shoes and elements assembled with a side frame during a wheel changing operation and for accomplishing this purpose each journal box shelf is provided with a transversely extending, upwardly opening relief, recess or

groove 53. The side frame jaw flanges 16a have formed therein openings 54 in substantial horizontal alignment with the groove so that prior to effecting a wheel change operation a removable bar or rod 55, indicated diagrammatically in Figure 6, is inserted through the groove and openings to thereby underlie in supporting relation the resilient element and the subsequent removal of the supporting journal box ledge will not affect the assembled relation of the side frame, coil spring, shoe and resilient element.

As will be understood, the resilient element of this design also controls the transverse movement of the journal box relative to the side frame while stop means or lugs 49a on the journal box are arranged, after a predetermined movement of the journal box, to engage the shoe to thereby limit such transverse movement.

As will be understood, various changes and alterations may be made to the structures illustrated and described without departing from within the spirit of the invention and scope of the appended claims.

We claim:

1. In a railway truck wherein a side frame is provided with downwardly opening jaws facing one another and a journal box disposed between said jaws and arranged to have the side frame move vertically relative thereto, the combination of, means outstanding from said journal box within the vertical plane of said jaws, spring means supported by and interlocked with said means, friction shoes within and being arranged to constantly frictionally contact said jaws and being mounted upon and interlocked with said spring means, and resilient means interposed between said side frame and said friction shoes.

2. In a railway truck wherein a side frame is provided with downwardly opening jaws facing one another and a journal box disposed between said jaws and arranged to have the side frame move vertically relative thereto, the combination of, resilient elements of different character acting in series for the support of said side frame from said journal box, and shoes between said resilient elements; at least one of said resilient elements being distorted to urge an associated shoe into frictional engagement with a related jaw.

3. In a railway truck wherein a side frame is provided with downwardly opening jaws facing one another and a journal box disposed between said jaws and arranged to have the side frame move vertically relative thereto, the combination of, resilient elements of different character acting in series for the support of said side frame from said journal box, and shoes between said resilient elements; at least one of said resilient elements being distorted horizontally to urge an associated shoe into frictional engagement with a related jaw.

4. In a railway truck wherein a side frame is provided with downwardly opening jaws facing one another and a journal box disposed between said jaws and arranged to have the side frame move vertically relative thereto, the combination of, resilient elements of different character acting in series for supporting said side frame from said journal box, one of said resilient elements being interlocked with said journal box, and means being interposed between said resilient elements and being urged horizontally against said jaws by said interlocked resilient element.

5. In a railway truck wherein a side frame is provided with downwardly opening jaws facing one another and a journal box disposed between

said jaws and arranged to have the side frame move vertically relative thereto, the combination of, resilient elements disposed one above another for supporting said side frame from said journal box, one of said resilient elements being distorted horizontally, and means between said resilient elements and being urged horizontally against said jaws by said distorted resilient element.

6. In a railway truck wherein a side frame is provided with downwardly opening jaws facing one another and a journal box disposed between said jaws and arranged to have the side frame move vertically relative thereto, the combination of, resilient elements disposed one above another and acting in series for supporting said side frame from said journal box, the lower of said resilient elements being interlocked with said journal box and distorted horizontally, and shoe means interposed between said resilient elements; said shoe means being urged horizontally against said jaws by said distorted resilient element.

7. In a railway truck wherein a side frame is provided with downwardly opening jaws facing one another and a journal box disposed between said jaws and arranged to have the side frame move vertically relative thereto, the combination of, metallic springs and rubber elements acting in series for the support of said side frame from said journal box, and shoe means associated with said metallic springs and rubber elements, said rubber elements being so arranged as to urge said shoe means into frictional engagement with said jaws.

8. In a railway truck wherein a side frame is provided with downwardly opening jaws facing one another and a journal box disposed between said jaws and arranged to have the side frame move vertically relative thereto, the combination of, metallic springs and rubber elements acting in series for the support of side frame from said journal box, and shoe means associated with said metallic springs and rubber elements; said rubber elements being interlocked with said journal box and shoe means so as to urge said shoe means into frictional engagement with said jaws.

9. In a railway truck wherein a side frame is provided with horizontally spaced columns and a journal box disposed between said columns and arranged to move vertically and transversely relative to said columns, the combination of, rubber means carried by said journal box adjacent each column, shoe means interlocked with said rubber means and being urged thereby into frictional engagement with said columns, and coil springs interposed between said shoe means and side frame; said rubber means controlling the transverse movement of said journal box relative to said side frame.

10. In a railway truck wherein a side frame is provided with horizontally spaced columns and a journal box disposed between said columns and arranged to move vertically relative to said columns, the combination of, rubber means in horizontal shear carried by said journal box, shoe means associated with said rubber means and being urged into frictional contact with said columns, and spring means interposed between said rubber means and side frame and acting in series with said rubber means for the support of said side frame.

11. In a railway truck wherein a side frame is provided with horizontally spaced columns and a journal box disposed between said columns and arranged to move vertically relative to said columns, the combination of, compressed rubber

means in horizontal shear associated with said journal box, shoe means associated with said rubber means and being urged into frictional contact with said columns by said compressed rubber means, and spring means interposed between said rubber means and side frame and acting in series with said rubber means for the support of said side frame.

12. In a railway truck wherein a side frame is provided with horizontally spaced columns and a vertically movable member disposed between said columns, the combination of, supporting spring means positioned between said side frame and movable member, said spring means comprising metallic and rubber elements acting in series, and shoe means associated with said supporting spring means to be urged by shear forces in said rubber elements into frictional engagement with said columns for snubbing the action of said supporting spring means.

13. In a railway truck wherein a side frame is provided with horizontally spaced columns and a vertically movable member arranged between said columns, the combination of, load carrying spring means disposed between said side frame and movable member, said spring means comprising coil springs and rubber elements, said rubber elements being subjected to horizontal shear, and shoe means associated with said rubber elements to be urged by the horizontal shear forces into frictional engagement with said columns for snubbing the action of said load carrying spring means.

14. In a railway truck wherein a side frame is provided with horizontally spaced columns and a vertically movable member arranged between said columns, the combination of, load carrying coil spring means disposed between said side frame and movable members, vertical load carrying elements containing rubber in horizontal shear interlocked with said movable member, and shoe means interlocked with said elements and being urged by the horizontal shear forces into frictional engagement with said columns to snub the action of said coil springs.

15. In a railway truck wherein a side frame is provided with horizontally spaced columns and a vertically movable member arranged between said columns, the combination of, load carrying coil spring means disposed between said side frame and movable member, elements containing rubber under initial vertical compression and in horizontal shear, said elements being interlocked with said movable member, and shoe means interlocked with said elements and being urged by the horizontal shear forces into frictional engagement with said colmnns to snub the action of said coil springs.

16. In a railway truck wherein a side frame is provided with a compression member and horizontally spaced jaws with a journal box disposed below said compression member and between said jaws, the combination of, shelves outstanding from said journal box, rubber means interlocked with said shelves and being under compression and in horizontal shear, shoe means mounted upon said rubber means and urged horizontally thereby into frictional engagement with said jaws, and coil spring means extending between said compression member and shoe means.

17. In a railway truck wherein a side frame is provided with horizontally spaced columns and a vertically movable journal box between said columns, the combination of, load carrying coil

spring means disposed between said side frame and journal box, elements containing rubber in horizontal shear and interlocked with said journal box, shoe means interlocked with said elements and being urged thereby longitudinally of said truck into frictional engagement with said columns, and aligned openings in said columns for the reception of removable means for holding said elements and shoes assembled with said side frame upon removal of said journal box from said side frame.

DONALD S. BARROWS.
EMIL H. BLATTNER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
299,510	Bemis	June 3, 1884
550,220	Eickemeyer	Nov. 19, 1895
1,951,547	Goodwin	Mar. 20, 1934
2,053,990	Goodwin	Sept. 8, 1936
2,168,293	Kiesel, Jr.	Aug. 1, 1939
2,299,560	Travilla	Oct. 20, 1942
2,355,450	Leese	Aug. 8, 1944