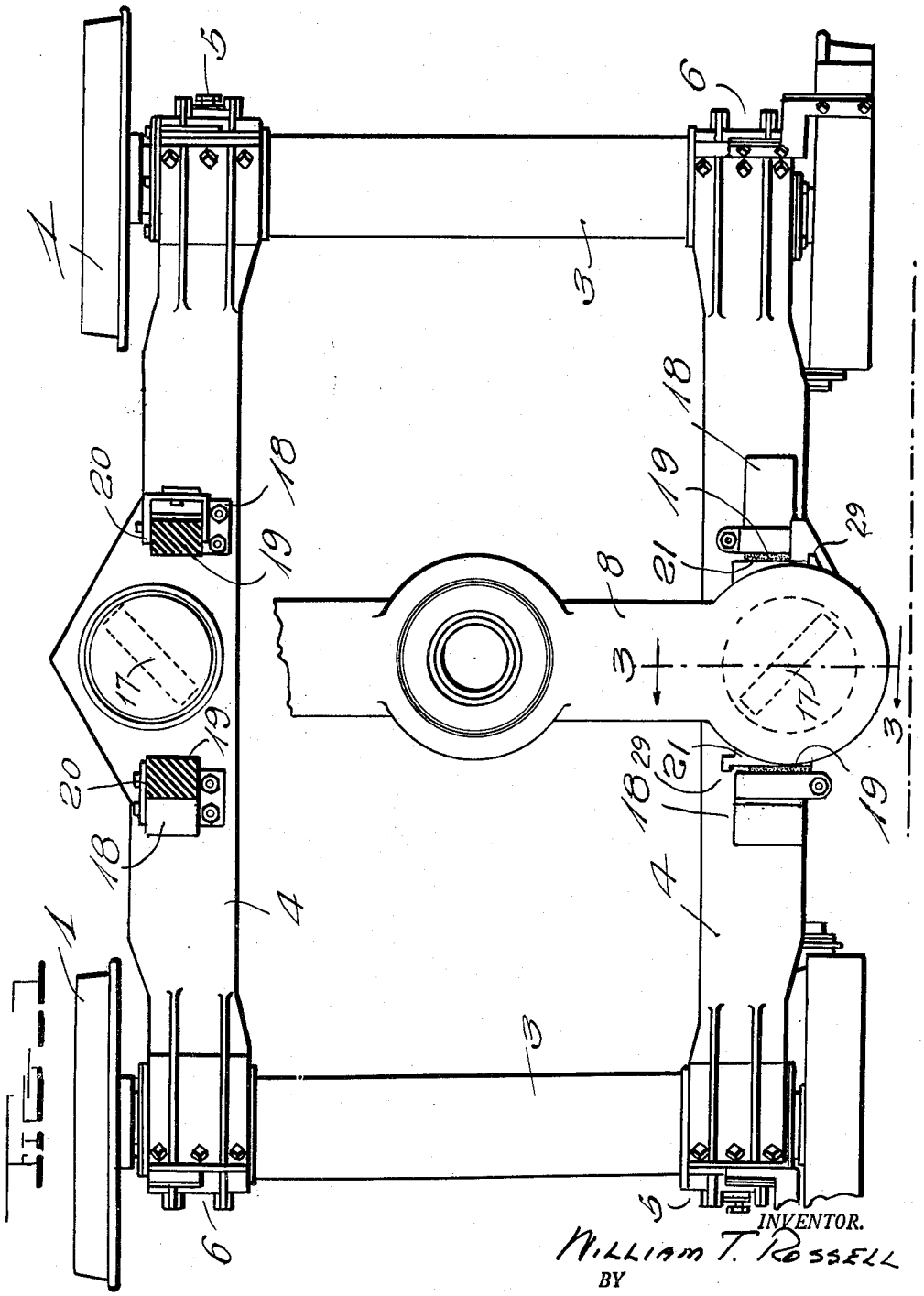
Jan. 25, 1955 W. T. ROSSELL 2,700,346

BOLSTER CONTROL MEANS

Filed June 28, 1950 3 Sheets-Sheet 1



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BOLSTER CONTROL MEANS

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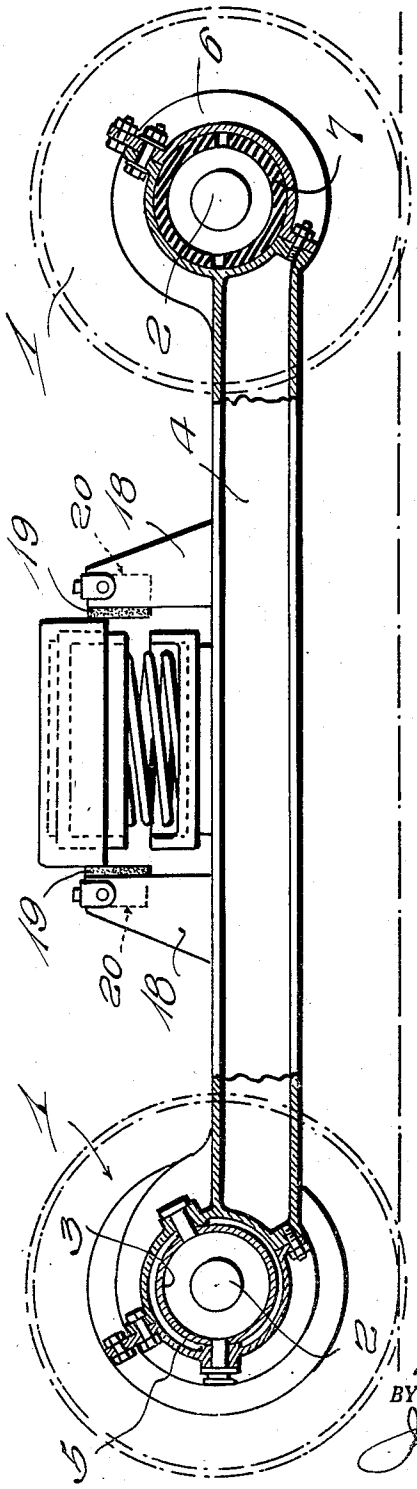

FIG. 2

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FIG. 3

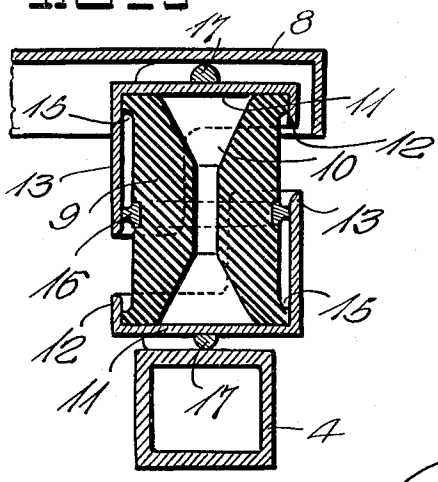
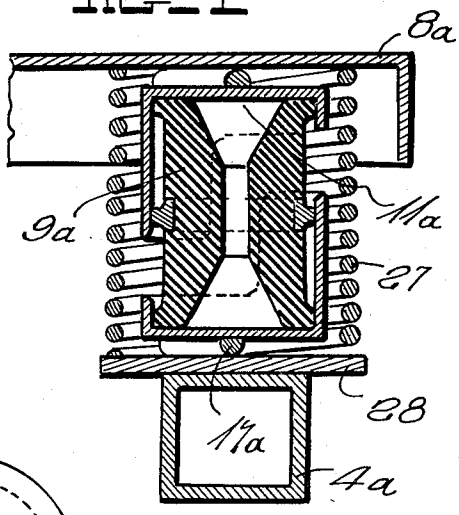


FIG. 4



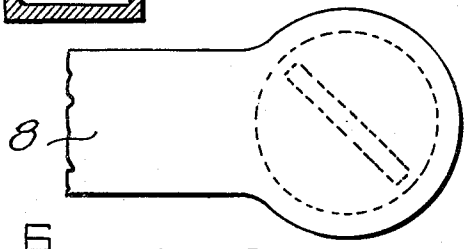


FIG. 5

FIG. 6

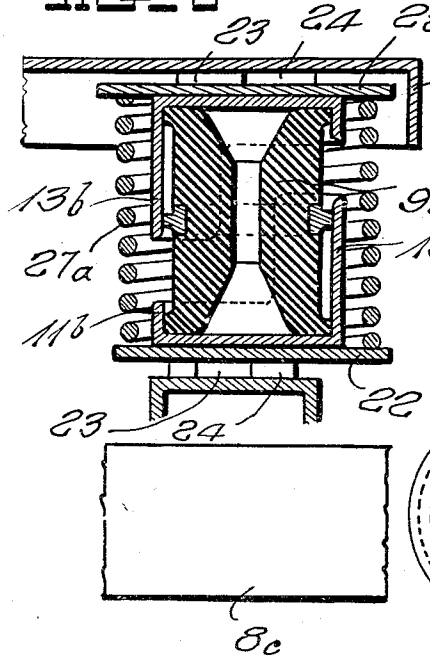
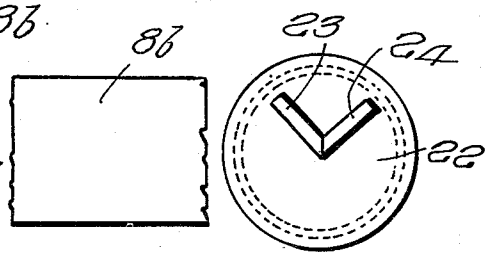


FIG. 7



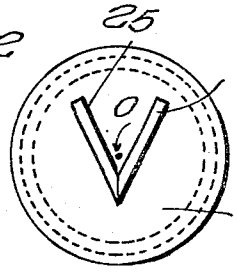


FIG. 8

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2,700,346

BOLSTER CONTROL MEANS

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Application June 28, 1950, Serial No. 170,755

5 Claims. (Cl. 105—197.2)

This invention relates to rail trucks and more particularly to means for supporting and for snubbing the bolster thereof in the interests of improving the quietness and riding quality of the car body supported thereby.

A bolster is provided on a truck in order to permit motions of the body relative to the frame and axles of the truck. It has lateral swinging movements which, in ideal form, should be free when the bolster is at or near its center or static position to avoid the transmission of many small vibrations to the body; it should offer resistance to swinging movements proportionate to the amount of such movement so that the movement in one direction terminates without shock; and there should be only enough energy left in the supporting means at the end of a swinging movement to return the bolster to center position so that the swinging movement dies out promptly.

With the above requirements in mind it will be apparent that neither a simple form of swing links nor bolster supporting springs will give adequate control to the movements of the bolster. In recognition of this fact, hydraulic shock absorbers and various types of snubbing arrangements have been employed but the results have always been imperfect either because of inability to maintain initial adjustments, or because the devices were inadequate to make the necessary corrections of bolster operation throughout the operating ranges encountered.

The first object of this invention is to provide spring means for supporting each end of the bolster and which will serve as the main springs for all vertical movements of the car body with respect to the truck wheels, and to so arrange and support these springing means that their reaction to bolster swinging movements will bear no relation to the vertical reactions but may be adjusted entirely independently thereof.

It is then the principal object to provide bolster springing and control means which will offer minimum resistance to swinging of the bolster at or near its central or static position, which will offer increasing frictional resistance to increasing swinging movement, and which will impart small energy to the bolster at the end of its swing in the return direction.

More specifically it is an object of this invention to provide spring assemblies for supporting each end of the bolster, these assemblies being capable of offering increasing resistance to increasing swinging movement of the bolster. As will be hereinafter explained this object entails the provision of means for stiffening the action of the springs under progressively increasing lateral deflection together with means for elevating the out-swinging end of the bolster against gravity in the manner of swing links.

Another specific object of the invention is to provide means for pivoting the spring assemblies so that they will tilt or rock, thus deflecting the bolster from its normal path of swinging against friction pads carried by the truck frame.

A further object is to provide spring assemblies as above described which may be supplied and mounted in place on the truck as a unit.

Other objects and advantages will become hereinafter more fully apparent as reference is had to the accompanying drawings wherein my invention is illustrated and in which

Figure 1 is a top elevation of a rail truck equipped with my invention and having one end of the bolster broken away for explanatory purposes,

Figure 2 is a side elevation of the truck of Figure 1,

Figure 3 is a vertical section taken along the line 3—3 of Figure 1, showing one form of bolster spring assembly,

Figure 4 is a view similar to Figure 3 showing a modified form of bolster spring assembly,

Figure 5 is a top elevation of Figure 3,

Figure 6 is a view similar to Figures 3 and 4 showing a further modified form of bolster spring assembly,

Figure 7 is a top elevation of the bolster and spring assembly of Figure 6, and

Figure 8 is a view similar to Figure 7 showing a modified form of spring rockers.

More particularly the numeral **1** designates the wheels of a rail vehicle which support the axles **2**. The axles **2** reside in axle housings **3** which form the main cross-members of the frame of the truck. The side rails **4** connect the axle housings **3**, each side rail **4** being rigidly connected at one end **5** to an axle housing **3** while its other end **6** is clamped about a rubber ring **7** encircling the other housing. The rigidly connected ends **5** are at diagonally opposite corners of the truck, the frame being thus made very resistant to distortion in a horizontal direction but flexible vertically in the sense that any one wheel may be depressed or elevated with respct to the other three wheels.

The truck thus far described forms no part of the invention and hence may be of any conventional or special type, the only requirement being that it have side rails or side frames of some type which may support bolster springs and friction snubbers.

The bolster **8** is supported on the side rails **4** by means of a spring assembly at each end thereof. As illustrated in Figure 3 the spring assemblies are each composed of a mass of rubber **9** of essentially cylindrical exterior shape which may be hollowed out at **10** to permit of greater deflection. A cap **11** fits over the top of the rubber **9** and a similarly shaped cap **11** fits over the lower end thereof. Each cap is in the shape of a cup with a low side wall **12** extending upwardly from a major portion of the base and a higher side wall **13** extending throughout the remaining portion of the periphery of the base. The side walls **13** each extend for a height such that they cover at least half the height of the rubber spring **9**, and, preferably, slightly more than one half. A rocker **17** is fixed on the base of each cup **11**, outwardly thereof, for contact with the bolster **8** and a side rail **4**, respectively.

The rubber spring **9** is enlarged at each end **15** so that as the spring is loaded vertically it expands and fills the cup, generally to the lower side walls **12**. The spring **9** may also be enlarged at its midsection for contact by the side walls **13** of the cups **11** but since there will be some friction I prefer to use a replaceable belt **16** at the mid-portion of the spring **9**.

In order to limit the movement of the bolster longitudinally of the side rails **4** I provide heavy brackets **18** which rise from the side rails **4** and which have pockets **20** to receive friction elements **19**. The side walls of the ends of the bolster **8** are flattened at **21**, as best seen at the lower side of Figure 1, for contact with the elements **19**, the brackets and elements being so spaced that there is but slight clearance between the side walls **21** and the elements **19**. Thus, if the truck frame is under acceleration or deceleration with respect to the bolster, while the bolster is swinging, there will be friction damping or snubbing by the rubbing of the surfaces **21** against the elements **19**. If the surfaces **21** are set with very slight clearance, or with no clearance, with respect to the elements **19**, then slight relative acceleration or deceleration will result in snubbing but as the elements **19** wear in operation the clearance gradually increases and the resultant snubbing action would decrease if the springing means were merely coiled springs.

The operation is as follows: as the bolster **8** swings it will cause the spring assemblies to rock on the rockers **17** thus causing the springs to tilt. The ends of the bolster will thus be deflected from their normal swinging path and will contact the friction elements **19**. The force of the swinging bolster may thus be said to be broken into two components, one of which is in a direction longitudinally of the side rails. The greater the swing of the bolster,

the greater will be the tilting of the spring assemblies and, hence, the greater the longitudinal component of the force which causes frictional contact of the bolster and snubbers. Furthermore, it may be noted that it is conventional to provide stops **29** which limit the swinging movement of a bolster but it seems self-evident that improvement in riding quality will result if the springs themselves gradually but rapidly increase their resistance to swinging of the bolster. Increased resistance in this invention is provided by the side walls **13** of the cups **11**. Assume that the bolster **8** of Figure 3 swings to the right. The side walls **13** then resist deflecting movement of the spring **9** because the rubber **9** is placed under compression. And as a further feature, the rubber **9**, being squeezed between the side walls **13** will tend to elevate the body against gravity thus adding resistance to swinging of the bolster in the same manner as does a swing link.

Now, if the end of the bolster illustrated in Figure 3 is swung to the left from the position shown in Figure 3, the side walls **13** swing away from the rubber thus allowing greater softness of action of the spring **9** on the side of the bolster away from the direction of swing.

It will thus be seen that swinging of the bolster results in a displacement of the ends of the bolster so that they will contact the friction elements **19**, the pressure of the contact increasing with increasing swinging of the bolster. And it is also seen that the supporting spring **9** stiffens at the side of the truck towards which swinging occurs, in such manner that the stiffening effect increases with increasing swinging of the bolster. And, furthermore, that the stiffening of the spring at one end of the bolster without a corresponding stiffening of the spring at the other end causes a slight tilting of the bolster which may be called "banking" the bolster so that an occupant of the car body supported by the bolster will be less aware of the swinging movement.

The spring assembly illustrated in Figure 3 permits of a wide range of engineering choice in its design. The rockers **17** are illustrated as being set at an angle of about 45° with respect to the direction of swing. That may be altered as experience and desired results show that other angularities are preferred. The rockers may be set parallel, top and bottom, or out of parallel, and the extent to which the long side walls **13** envelop the springs **9** may be varied to vary the amount of stiffening accomplished.

In addition to the above variations, the rockers **17** at opposite sides of the truck are shown in Figure 1 as forming an acute angle with each other. When this is done the bolster rotates about its center. If the rockers are all parallel then swinging of the bolster will cause bodily fore and aft displacement of the bolster with respect to the side rails. In the first instance, the bolster will contact diagonally opposite friction elements, whereas, in the second case, it will contact friction elements on the same side of the bolster.

Figure 4 illustrates a modified form of the spring assembly of Figure 3 in that a coil spring **20** is added. The spring **27** contacts the bolster **8***a* directly thus enveloping the upper spring cap **11***a*. The lower end of this spring is supported by a plate **28** atop the side rail **4***a*, the lower rocker **17***a* rocking on the plate **28** so that the spring **27** also envelops the lower spring cap **11***a*. By addition of this coil spring **27** the rubber spring **9***a* may be partially or entirely unloaded when the vehicle is unloaded and standing idle. This spring offers some resistance to swinging of the bolster otherwise the operation is essentially the same as described in connection with Figure 3.

Figures 6 and 7 illustrate a modification of the spring assembly of Figures 3 and 4 in which the rubber spring **9***b* and the spring caps **11***b* are essentially the same as the spring **9** and the spring caps **11** of Figure 3. The caps **11***b* are fixedly secured to the plates **22** which extend outwardly beyond the base of the caps **11***b* to form upper and lower seats for the coil spring **20***a*. The plates **22** are each provided with two half rockers **23** and **24** which radiate from the center of the plate **22**.

In operation, when the bolster **8***b* swings to the right, Figures 6 and 7, the springs **9***b* and the springs **27***a* deflect until the cap side walls **13***b* contact the rubber springs **9***b* whereupon the springs **9***b* at the right end of the bolster stiffen. The spring assemblies will rock on the left rockers **23** at the right end of the bolster and on the same rockers **23** at the left end of the bolster thus deflecting the bolster toward friction pads on the same side of the bolster (away from the bottom of the page as viewed in Figure 7). When the bolster **8***b* then swings to the left, as it crosses its center position, the right end of the bolster will rock on the rockers **24** and the left end will do likewise thus keeping the pressure against the same friction elements. Again, it is to be noted that I contemplate that the rockers **23** and **24** of the top plate **22** are parallel, respectively, with rockers **23** and **24** of the lower plate **22** but this need not be so, in fact, only one set of rockers **23** and **24** may be used as preferences in operating characteristics and evaluation of riding quality of a vehicle become matters of opinion in actual practice. Also, it will be noted in Figures 6 and 7 that the coil spring **27***a* rocks with the rubber spring **9***b* whereas in Figure 4 the coil spring **20** does not rock. This, again, is a matter of choice, the resistance of the springs laterally being designed and computed to provide a combined resistance as may be desired.

In Figure 8 the spring assembly is exactly the same as in Figures 6 and 7 with the exception that the rockers **25** and **26**, corresponding to the rockers **23** and **24**, do not meet at the center O of their respective spring caps **22***a* but at some point off-center, as illustrated. The effect of this is that when the bolster **8***c* swings to the right the rubber springs and the coil springs will deflect, as previously described, and the plates **22***a* at the right end of the bolster will rock on the rockers **25** while the plates **22***a* at the left end of the bolster will also rock on the rockers **25**. Since the rockers **25** do not pass through the center of the plate **22***a* there will be a slight lifting of the right end of the bolster with a corresponding slight depression of the left end of the bolster, by reason of the greater softness of the rubber spring at the left end, thus simulating the effect of elevating the out-swinging side of the vehicle body carried by the bolster as is done by swing links. As the bolster reverses its direction of swinging and as it passes through its center position the right end of the bolster will cause the plates **22***a* to rock on the rockers **26** and the left end to rock on their rockers **26** also.

Various changes may be made and various combinations of the features illustrated may be arranged to accommodate the invention to various types of service and I therefore desire to be extended protection as defined by the scope of the appended claims.

I claim:

1. A bolster spring assembly for supporting each end of a truck bolster comprising a mass of rubber and a spring cap overlying at least one end thereof, said rubber being adapted to resist vertical loading by the bolster largely by compression and to resist lateral deflections largely by shear and bending, said spring cap being composed of a base and side walls extending from the periphery of said base along the length of said spring, said side walls having greater height over a portion of the base than over the remainder thereof, said rubber when in static position having clearance with said side walls, said side walls of greater height contacting said rubber when said rubber is deflected laterally in one direction but not when the rubber is deflected in the opposite direction thereby changing the characteristics of said rubber spring under lateral swinging movements of the bolster dependent upon its direction of swinging, said spring cap having a rocker secured thereto separating said cap from its supporting surface, said rocker being angularly disposed with respect to the direction of the forces which impose lateral loading on said rubber whereby said rubber and said cap are caused to rock at an angle with respect to the direction of swing of the bolster.

2. A bolster spring assembly for supporting each end of a rail truck bolster comprising a mass of rubber and a spring cap overlying each end of said rubber, said rubber being of generally cylindrical form adapted to resist vertical loading largely by compression, said spring caps each having high side walls extending alongside less than 180° of the periphery of said rubber, the high side walls of one of said caps being diametrically opposite the high side walls of the other of said caps, said rubber when deflected in one direction resisting largely by a combination of shear and bending and when deflected in the opposite direction contacting said high side walls thereby resisting lateral deflection by a combination of compression, shear and bending, both of said caps having rockers outwardly thereon separating said caps from their supporting and supported surfaces, said rockers being deposed

at an angle with respect to the direction of the lateral forces on said spring assembly whereby the bolster is deflected from its normal path of swinging movements.

3. A bolster spring assembly for supporting each end of a rail truck bolster comprising a mass of rubber and a spring cap overlying each end of said rubber, said rubber being of generally cylindrical form adapted to resist vertical loading largely by compression, said spring caps each having high side walls extending alongside less than 180° of the periphery of said rubber, the high side walls of one of said caps being diametrically opposite the high side walls of the other of said caps, said rubber when deflected in one direction resisting largely by a combination of shear and bending and when deflected in the opposite direction contacting said high side walls thereby resisting lateral deflection by a combination of compression, shear and bending, both of said caps having pairs of rockers outwardly thereon, said pairs of rockers each being composed of two non-parallel rockers extending partially across the base of each of said caps, said rockers being so arranged with respect to the direction of the lateral deflecting forces imposed on said spring assembly that said caps rock on one rocker of each pair when the force is in one direction and on the other rockers of said pairs when the force is in the opposite direction.

4. A bolster spring assembly for supporting each end of a rail truck bolster comprising a mass of rubber and a spring cap overlying each end of said rubber, said rubber being of generally cylindrical form adapted to resist vertical loading largely by compression, said spring caps each having high side walls extending alongside less than 180° of the periphery of said rubber, the high side walls of one of said caps being diametrically opposite the high side walls of the other of said caps, said rubber when deflected in one direction resisting largely by a combination of shear and bending and when deflected in the opposite direction contacting said high side walls thereby resisting lateral deflection by a combination of compression, shear and bending, both of said caps having pairs of rockers outwardly thereon, said pairs of rockers each being two non-parallel rockers which meet at a point off the center of the base of their cap, said rockers being so positioned with respect to the direction of the lateral deflecting forces imposed on said spring assembly that said caps rock on one rocker of each pair when the force is in one direction and on the other rocker of each of said pairs when the force is in the opposite direction.

5. In a rail truck, a truck frame comprising side rails and cross members, spring assemblies supporting each end of said bolster from said side rails, each of said assemblies comprising a rubber spring of generally cylindrical shape having a spring cap on each end thereof, said spring caps each having high side walls arising from a portion of their periphery not to exceed 180°, the side walls of said caps being oppositely arranged with respect to said spring and so arranged with respect to said bolster that when said bolster swings laterally of the truck the spring at the end of the bolster leading the swing contacts said side walls thereby stiffening that spring against increased swinging of said bolster, said spring caps having rockers outwardly thereof for contact with said bolster and said side rails respectively, said rockers being angularly disposed with respect to the center line of said bolster whereby said spring assemblies tilt during swinging of said bolster to deflect said bolster out of its normal path of swing, and friction pads carried by each of said cross members for frictional contact with said bolster when said spring assemblies tilt.

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