Aug. 2, 1938. E. G. GOODWIN 2,125,275

TILTED SPRING SNUBBER

Filed July 22, 1935 2 Sheets-Sheet 1

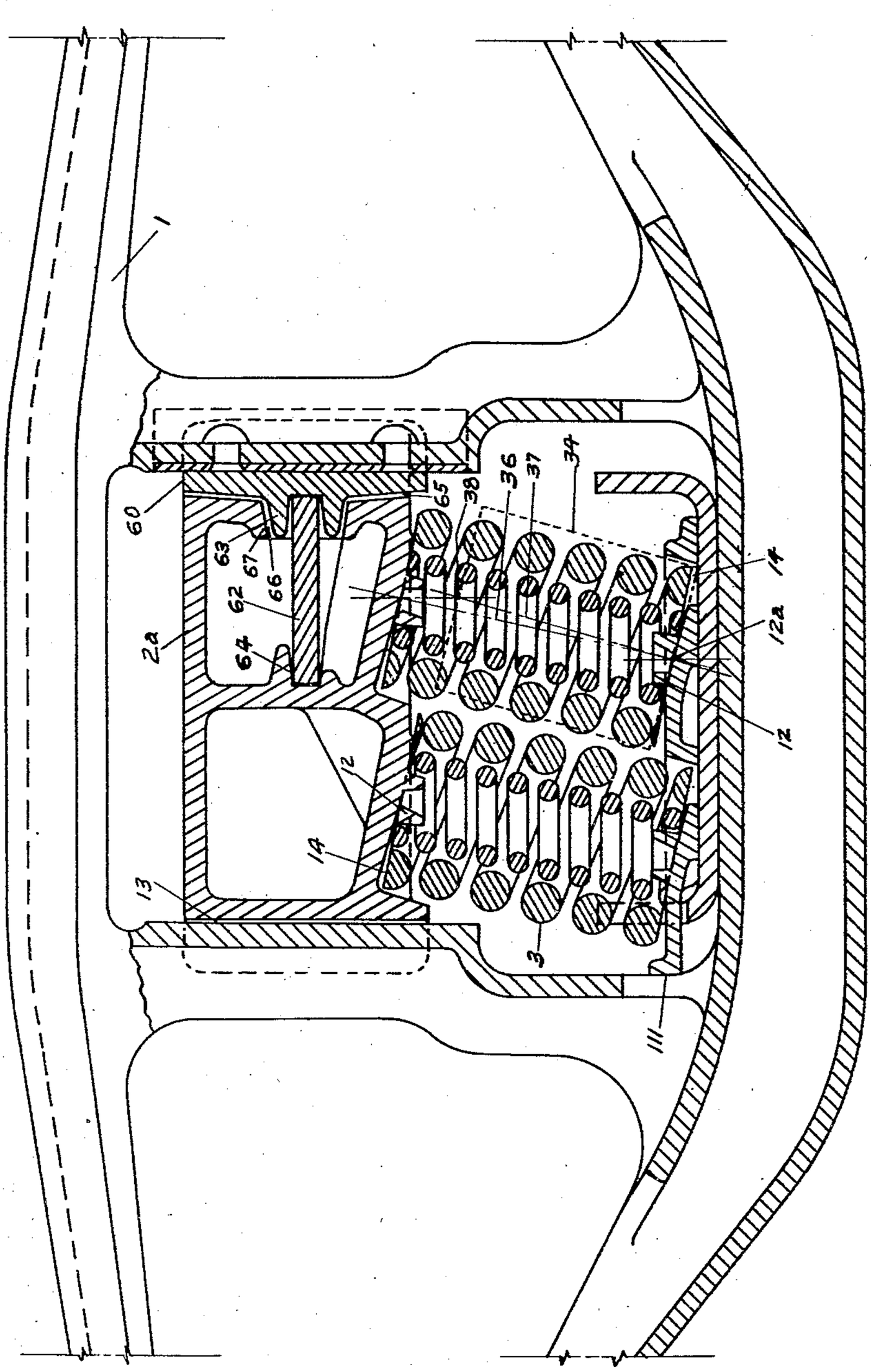

FIG. 1

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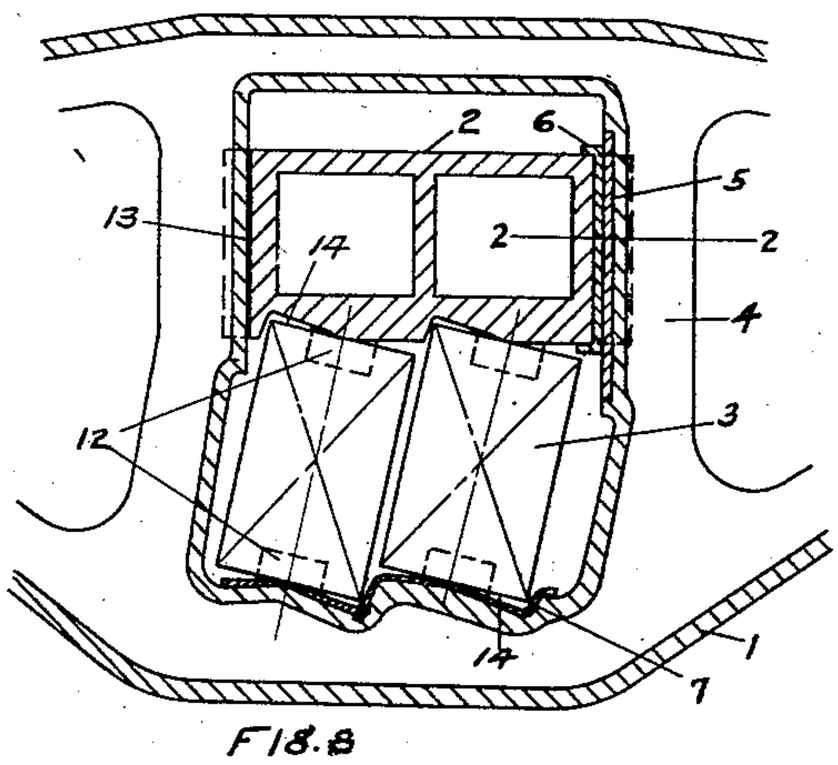

FIG. 8

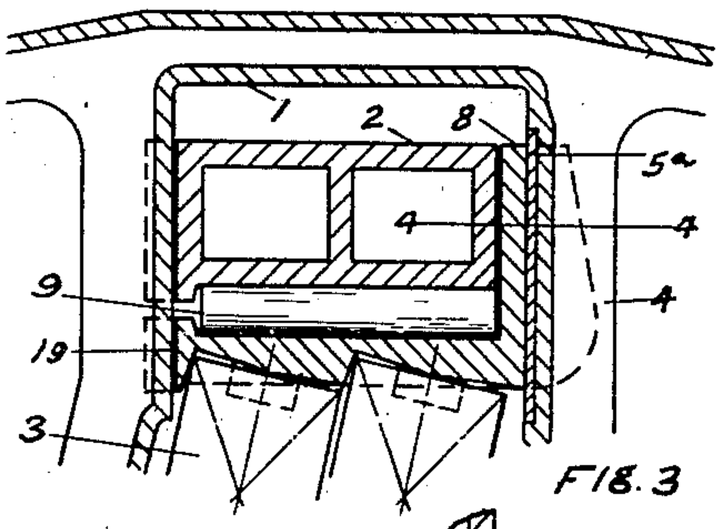

FIG. 3

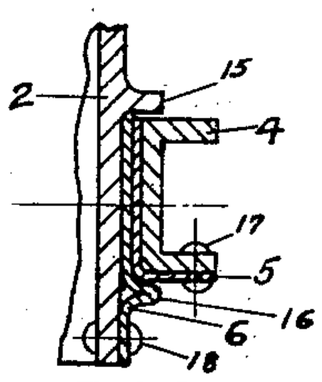

FIG. 2

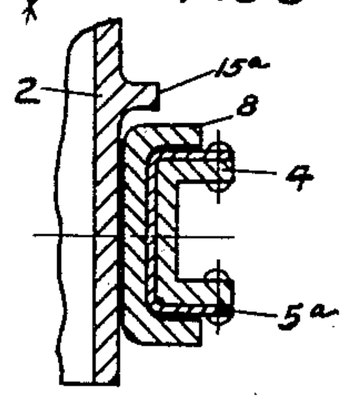

FIG. 4

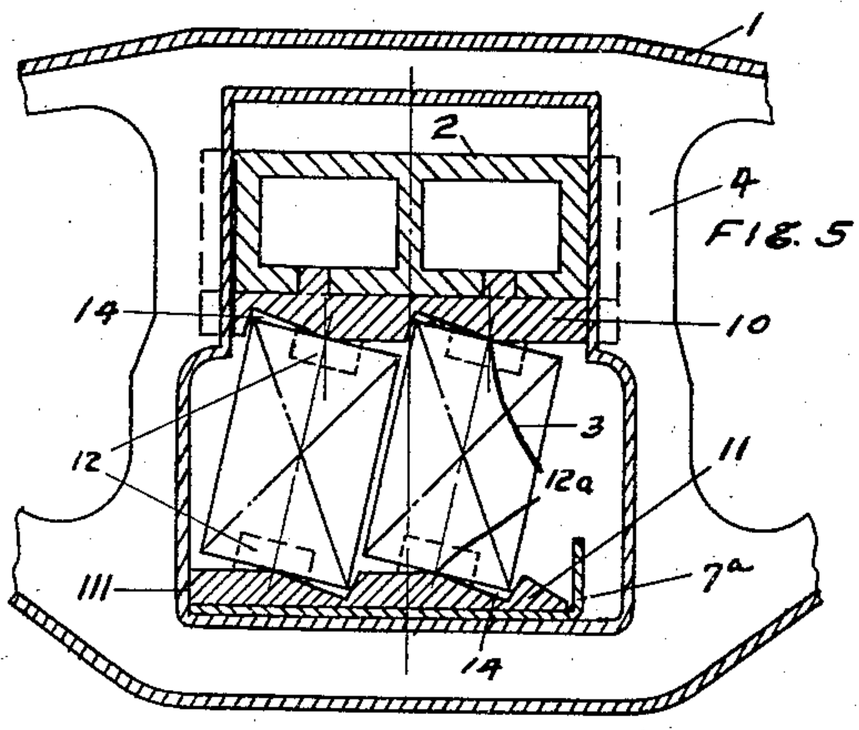

FIG. 5

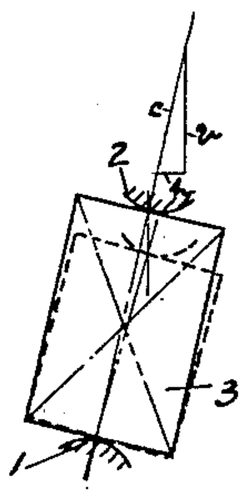

FIG. 6

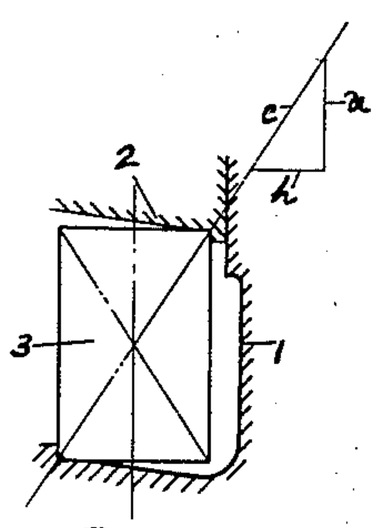

FIG. 7

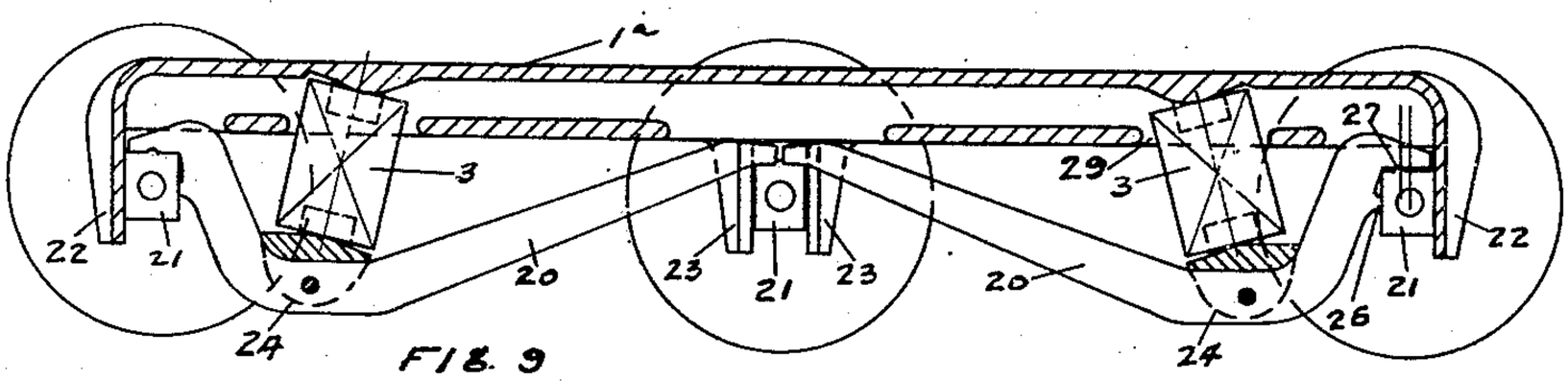

FIG. 9

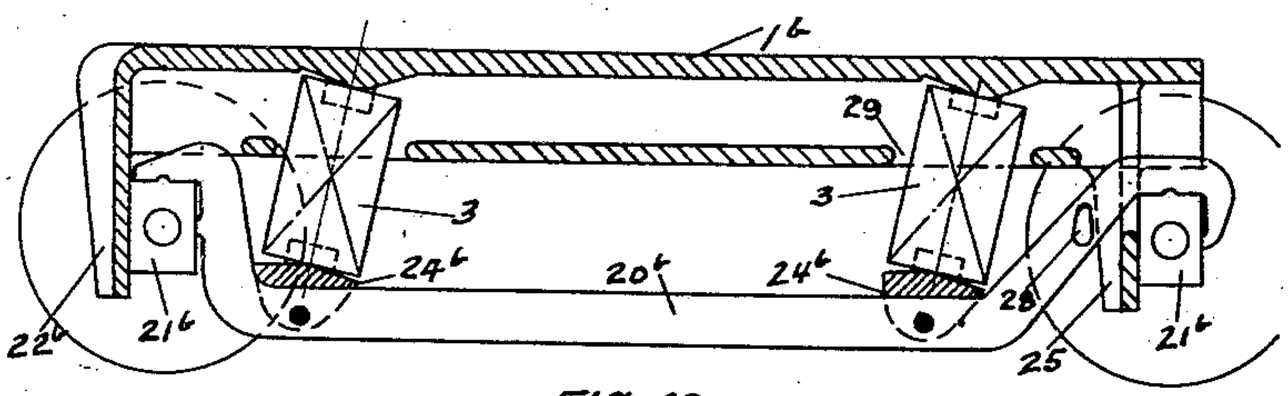

FIG. 10

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UNITED STATES PATENT OFFICE

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TILTED SPRING SNUBBER

Ernest G. Goodwin, Pelham, N. Y., assignor to Graham-White Sander Corporation, Roanoke, Va., a corporation of Virginia

Application July 22, 1935, Serial No. 32,642

28 Claims. (Cl. 105—197)

This invention relates to snubbers for vehicles, especially for railway car trucks and particularly for freight car trucks having helical springs. The primary object is to provide an extremley light snubber having very few parts and at a very low cost as compared to the most economical railway snubbers now on the market or proposed by prior workers in the railway snubber art.

Another object is to provide a snubber which can be inserted in existing car trucks without the necessity of any but minor alterations, for example, involving only the cutting away of part of the flange at the ends of the spring plank where this is necessary and the substitution of tilted spring seats for those in the existing equipment. Broadly speaking, the object of my invention is so to arrange existing equipment as to make its self-snubbing.

I carry out these and other objects which will be later made apparent, primarily by giving the bolster springs a tilted position whereby the bolster is given a horizontal lateral thrust against one of the columns of the side frame which thrust increases with the compression of the springs due to increase in load bouncing or rocking of the car. This horizontal thrust creates a frictional resistance to dampen the vertical movement. It will be apparent that at light loads or under light shocks the snubbing effect is practically nil but that as the shocks grow in intensity or as the load is increased the snubbing effect takes place in greater amounts so that the increase in cumulative rocking or bouncing above a safe degree is prevented. Altho designed primarily for railway car trucks it will be readily understood that my invention is adaptable for use in snubbing or damping the vibration of any spring cushioned force since it consists in so positioning the spring as to split up the force into components one of which is normal to the direction of the force being snubbed and which component is utilized in part as a frictional resistance to the force, that is, the normal component is used to damp the vibrations.

Referring to the drawings:

Figure 1 is a vertical section thru a truck side frame and bolster end showing the preferred embodiment of my invention.

Figure 2 is a fragmentary horizontal section on line 2—2 of Figure 8.

Figures 3 and 4 are sections respectively similar to Figures 8 and 2 but of a modification in which provision is made for lateral motion.

Figure 5 is a vertical section also similar to Figure 8 and showing a modification of a still further simplified form in that the spring seats are separable from the side frame and bolster.

Figure 6 is a force diagram combined with a diagram of the preferred method of loading the spring.

Figure 7 is similar to Figure 6 but showing the spring loaded substantially on diagonal corners.

Figure 8 is a vertical section similar to Figure 1 but of a simplified form.

Figure 9 is a vertical section thru the side frame of a pedestal type of six wheel truck in which my invention is incorporated; this modification provides for a snubbing resistance betwen two spring supported pedestals and two of the journal boxes.

Figure 10 is a view similar to Figure 9 but showing a four wheel truck, both figures being modifications fundamentally similar to Figure 8.

In order to better understand the invention it will be best to refer first to Figure 5 which shows standard construction in which the usual parts are rearranged to incorporate my invention in one of its most simplified forms. Within the window of the standard side frame 1 there is carried a bolster 2 on springs 3 in such a manner that the bolster is at all times under normal conditions urged against one of the columns 4 whereby to create a frictional pressure and snubbing action between the bolster and the column with each relative movement of the last named parts. At this point of frictional engagement there may be provided replaceable means such as a liner 5 and a shoe 6 (see Figures 1, 2 and 8) to take up the resulting wear. The tilting of the springs 3 is brought about by providing tilted and relatively displaced upper and lower spring seats 10 and 11 respectively which seats have the usual spring retaining means such as hubs or bosses 12 but which engage the springs preferably on knife or roll edges 12*a*. In order to provide sufficient room for offsetting the lower seat 11, I cut away or flatten out the flange of the spring plank 7*a* so that the edge 111 abuts the side frame as shown in Figures 1 and 5.

Now turning to my preferred form shown in Figure 1, I provide for delayed snubbing by connecting the bolster shoe 60 to the bolster 2*a* thru a thrust link member 62 which is rounded at each end for pivoting in the recessed boss 63 of the shoe at one end and in a somewhat similar recess 64 of the bolster at the other end. The link or bar 62 is made sufficiently long to provide a space 65 between the shoe and the bolster and I also provide clearance 66 between the boss 63 and the upper and lower edges of the bolster-wall

aperture 67 in which the boss 63 is located. Thus the bolster may move freely an appreciable distance up or down before the shoe 60 comes into snubbing action. It will be seen that in effect the shoe is pivoted on the bolster whereby it may lay flat against the column or liner regardless of irregularities of wear and non-parallelism of the columns. The bolster is usually spaced at 13 from the opposite column so that wear elements may be left out on that side if desired.

The space 14 between the top of the springs at the left of the bosses or hubs 12 is taken up when the springs go solid as indicated in the dotted rectangle 34 and the same is true of the space 14 at the diagonally opposite corner. This is due to the pivoting of the springs on the knife edges 12*a* which permits the springs to rock from the position indicated by the center line 36 to the solid position indicated by the center line 37 and which rocking takes place as the bolster moves up and down. The upper spring seats in Figure 1 are made integral with the bottom wall of the bolster and this is also true of the upper seats in the modification shown in Figure 8. However, as shown in Figure 8 the side frame also may be formed with tilted integral spring seats which may be provided with a spring plank 7 shaped at the ends to correspond with the contours of these seats. The liner 5 and shoe 6 of Figure 8 may be secured in place in any known manner, for example, by rivets 17 and 18 respectively as shown in Figure 2. Stops 15, 15*a* and 16 may be provided in the usual manner for preventing excessive lateral motion.

One form of my invention is combined with lateral motion means as shown in Figure 3 in which the upper spring seats are separated from the bolster 2 as by antifriction members 9 and the seat is preferbly made integral with the shoe 8 which, as illustrated in Figure 4, may be channel-shaped in horizontal cross section for embracing the column. No liner is needed between the shoe and the opposite column at 19 as contact here is light and relatively infrequent, however if this column is faced it should extend down past the shoe bearing. It is to be understood that the shoe 60 of Figure 1 may also be of this channel shape construction.

The operation of the mechanisms described thus far is believed to be self evident but attention is called to the fact that in the constructions described there is an increase in the frictional engagement of the shoe and column as the springs are compressed and this is not due entirely to the increase in the compressing forces but, as will be seen in Figures 1 and 6, is due in part to the rocking of the springs on the knife edge supports. This rocking causes a change in the angle between center lines 36 and 37 which change causes a change of frictional engagement of the shoe and column. This may be roughly indicated by the distance between the center lines 36 and 37 on a horizontal line thru point 38. The force diagrams in Figures 6 and 7 show how the spring capacity *c* is split up into the horizontal component *h* and vertical load component *v*. It will also be noted in Figure 6 that the knife edges on the spring seats may be in the form of rollers. Under some conditions the spring seats may be plane though sloping as shown in Figure 7 if the spring 3 is engaged at diagonally opposite corners and as will be noted the spring in this arrangment is in a vertical position.

My invention may also be incorporated in a type of truck having six wheels as illustrated in Figure 9. In the truck shown in Figure 9 the frame 1*a* is supported on two oppositely tilted springs 3 which pivotally engage the frame in much the same manner as the springs engage the bolster in my above described simpler modifications, i. e., on knife edge seats. The springs are supported on equalizer bars 20 which rest at each end on the journal boxes 21 and the tilt of the springs is such that they at all times urge the equalizer bars and thereby the outside journal boxes against the outside pedestals 22 of the frame, the inside pedestals 23 preventing horizontal movement of the central journal box with respect to the frame. The lower spring seats 24 are preferably but not necessarily detachably carried by the equalizer bars 20, which engage the outside journal boxes 21 thru contact studs 26 and 27. It will be apparent that as the springs contract and expand, the outside pedestals will slide with respectively greater and less friction on the journal boxes whereby damping excessive bouncing and swaying of the car is accomplished.

The modification in Figure 10 differs from that in Figure 9 in that the springs are tilted in the same direction whereby it is necessary to provide a hook on the right end of the equalizer bar 20*b* for engaging the outside of the journal box 21*b* to draw the same against the pedestal 25 while at the same time forcing the opposite journal box 21*b* against the pedestal 22*b*. The stop or stops 28 on the bar 20*b* prevent excessive movement of the journal boxes with respect to the pedestals. By providing larger openings 29 any number or type of springs may be employed instead of the two shown.

It will be appreciated that my invention makes it possible to have all the advantages of the low cost light weight helical springs without their single disadvantage of accumulative bouncing such as encountered when the vehicle moves over a road or track having substantially uniform spaced irregularities at speeds which in the absence of snubbers amplifies vertical vehicle movements to the degree that is damaging to the vehicle, load and track and which is uncomfortable to passengers or to live stock.

What I claim is:

1. In a car truck, a bolster, springs for supporting the bolster and means for guiding the bolster as it moves in response to expansion and contraction of the springs, said springs being arranged to urge the bolster against said guide whereby snubbing occurs.

2. In combination a load carrying member, a supporting member, springs for supporting said load carrying member, and a guide on one of said members for constraining said load carrying member to move in a certain path as the springs contract and expand, said springs being arranged to convert a part of the contracting and expanding forces into forces normal to the guided path whereby said member is urged against the guide and thereby creates snubbing friction to dampen excessive bouncing of the spring supported load carrying member.

3. In a car truck, a side frame having an opening for receiving a bolster end, springs for supporting the bolster, and columns for guiding the bolster end as the springs contract and expand characterized by the springs being arranged with their axes substantially parallel to the plane of the side frame but tilted in the same direction from the vertical whereby to urge the bolster end against one of the columns.

4. The device of claim 3 in which the columns

are vertical and the springs are helical, said springs being tilted toward said one of the columns.

5. The device of claim 3 in which the car truck is of standard construction having a standard side frame and the usual spring plank, said springs being helical, spring seats on said plank and spring seats on the bolster, the seats on the plank being offset from those on the bolster whereby the springs are tilted toward one of the columns.

6. In combination, a standard type side frame having the usual bolster opening, a standard type bolster having its end in said opening, a standard flanged spring plank, lower spring seats on said plank, upper spring seats on the bolster, a nest of helical springs between said upper and lower spring seats, characterized by the lower spring seats being offset laterally in the same direction from points directly below the upper spring seats whereby the springs are tilted toward one of the columns.

7. The combination of claim 6 in which the spring seats are provided with substantial knife edges for engaging the springs on lines parallel to the spring plank whereby upon contraction and expansion the springs may rock in the plane of the side frame.

8. The combination of claim 6 in which one of the flanges is flattened out at the end of the spring plank whereby the lower spring seats may be offset a maximum amount and in abutting engagement with one side of the bolster opening so that the springs lean toward the other side of the bolster opening.

9. In combination in a car truck, a side frame having a bolster opening, a bolster, springs in said opening for supporting one end of the bolster, lateral motion means between the springs and the bolster, and including a spring seat, and a friction shoe connected to said spring seat, said springs being positioned to lean toward the side of the opening engaged by said shoe whereby the shoe is urged into frictional engagement with the side frame as the springs contract and expand and acts to damp the springs.

10. In a car truck, a journal box, a frame, springs supporting the frame on said journal box, and a guide for maintaining the frame and journal box in their relative horizontal positions as the springs contract and expand, said springs being tilted whereby to urge the journal box into frictional engagement with said guide to cause snubbing.

11. In a car truck having a plurality of journal boxes, a bar spanning two of said journal boxes, said bar resting on one of the two boxes and having abutting engagement with the other of the two, a frame having vertical guides engaging said journal boxes, a spring on said bar for supporting said frame, the line of action of said spring being such as to cause the bar to urge said other of the two journal boxes into frictional engagement with its guide whereby to dampen the vibration of the spring.

12. In a car truck, a side frame column, a shoe for frictionally engaging said column, means for maintaining said frictional engagement including a spring supported bolster having its end adjacent the shoe, means for spacing the shoe from the side of the bolster, said spacing means having rolling engagement with the bolster and shoe so that the bolster may freely move up and down on its springs with respect to the shoe and spaced cooperating members located in part on the shoe and in part on the bolster for limiting said relative movement and for causing the shoe to move with the bolster after such limited movement of the bolster end, whereby snubbing occurs only after an amount of bolster movement determined by the chosen clearance between said spaced cooperating members.

13. In a car truck, a column member, a spring supported bolster member, a snubbing shoe having frictional engagement with one of said members for damping vertical movement of the bolster, a horizontal thrust bar having one end pivoted on the shoe and the opposite end pivoted on the other member and slightly spacing the shoe laterally from said other member and means loosely interlocking the shoe and said other member whereby the bolster member has limited unsnubbed vertical movement.

14. In combination, a side frame having spaced guide columns, a bolster end spring supported on said side frame between said columns, characterized in that the axes of the springs are oblique to one of said columns so that the bolster end is urged toward said one column of the side frame and away from the opposite column.

15. The device of claim 14 in which the springs are supported on knife edges so that the pressure against the said one column increases as the springs are compressed.

16. The device of claim 14 plus a shoe interposed between the bolster and said one column, and a rocking member between the bolster and shoe, said bolster and shoe having stops with clearance to allow appreciable spring motion without movement of the shoe and consequently without snubbing.

17. In a car truck, a vertical side frame column, a shoe frictionally engaging said column, means for maintaining said frictional engagement including a bolster end adjacent the shoe, bolster supporting springs arranged to exert a part of their forces to urge the bolster toward the column, a horizontal plate spacing the shoe from the side of the bolster and having rounded ends for rolling engagement with the bolster and shoe so that the bolster may move up and down on its springs with respect to the shoe and spaced cooperating members located in part on the shoe and in part on the bolster for limiting said relative movement and for causing the shoe to move with the bolster after such limited movement of the bolster end, whereby snubbing occurs only after an amount of bolster movement determined by the chosen clearance between said spaced cooperating members.

18. In a car truck, an unsprung part having a vertical snubbing surface thereon, a sprung part having a vertical snubbing surface cooperating with the first mentioned surface, springs supporting the sprung part on the unsprung part, said springs being tilted to exert horizontal force components directed to create a pressure between said surfaces, said components being proportional to the load on the springs whereby snubbing occurs in proportion to the load.

19. In a car truck having a sprung part and an unsprung part, said parts having cooperating frictional surfaces for guiding the sprung part on the unsprung part as the springs expand and contract during operation of the truck, said springs being tilted toward said surfaces whereby to vary the frictional contact of said surfaces in accordance with the load on the springs and whether the sprung part is moving up or down with reference to the unsprung part.

20. In a vehicle, a load carrying member, a

supporting member, springs supporting said load carrying member on the supporting member, means including a guide on one of said members and engaging the other member for constraining said load carrying member to move in a path, said guide being disposed at an angle to the direction of forces exerted by the springs as they contract and expand whereby the load carrying member is urged against the guide to produce a damping effect on said springs.

21. In a vehicle, a load carrying member and a supporting member, a spring on the latter supporting said carrying member, a guide frictionally engaging and directing said carrying member to move in a linear path fixed with respect to the other member and at an angle to the direction of the forces of contraction and expansion of the spring, and pivoting means for the spring to permit it to rock in a plane thru its own axis as it expands and contracts, said path lying in said plane whereby said angle varies with the expansion and contraction of the spring thereby to vary said frictional engagement and produce a damping effect on said spring.

22. In a car truck an axle supporting member, a bolster member, means for resiliently supporting the bolster member on the axle supported member, said means including parallel supports pivoted on the axle supported member and pivotally engaging the bolster member, said supports being oblique whereby tending to displace horizontally said supported and supporting members relatively to each other and cooperating vertical guiding surfaces on both members limiting the horizontal displacement and at the same time permitting relative vertical movement of said members, said movement being constantly snubbed by the frictional engagement of the cooperating guiding surfaces caused by the horizontal thrust of said oblique supports.

23. In a car truck, an unsprung part, a sprung part, said parts having constantly cooperating vertical guiding surfaces, pivoted resilient supports for supporting the sprung part on the unsprung part, said supports being arranged obliquely to the guiding surfaces whereby creating a snubbing action between said surfaces, and means on said parts for limiting lateral movement of the sprung part on the unsprung part.

24. In a car truck, an axle supported member, a bolster member, means including oblique tiltable supports for resiliently supporting said bolster member on the axle supported member, cooperating vertical guiding surfaces on said members, said surfaces being substantially normal to the direction of travel of the truck, and the axes of said tiltable supports lying in substantially vertical planes parallel to the direction of travel, all of said supports being tilted in a direction to create frictional resistance between said guiding surfaces, and cooperating means on said members for limiting lateral movement of the bolster member.

25. In a car truck, an unsprung part, a sprung part, means for limiting lateral movement of the sprung part on the unsprung part, means resiliently supporting the sprung part on the unsprung part including non-perpendicular supports between and pivotally engaging the parts and tending to displace horizontally one part with respect to the other part, and vertical cooperating guiding surfaces on both parts to limit such horizontal displacement and at the same time permit relative vertical movement of the sprung part on the unsprung part, such movement being constantly restricted by the frictional drag between the above mentioned guiding surfaces.

26. In a car truck in combination, a plurality of journal boxes, a frame vertically movable with respect to said journal boxes and having snubbing surfaces engaging said journal boxes, said surfaces being normal to the longitudinal axis of the truck, and means supporting the frame on the journal boxes, said frame supporting means being oblique to a plane normal to said axis thereby acting at all times to force said journal boxes into snubbing engagement with said surfaces whereby to damp oscillations of the frame with respect to the journal boxes.

27. In a car truck in combination, a plurality of axles, a plurality of journal boxes, a frame vertically movable with respect to said journal boxes and having snubbing surfaces arranged parallel to said axles and engaging said journal boxes, and frame supporting means resting in part on said journal boxes and including members tilted to change a part of the vertical load forces into horizontal force components passing through said snubbing surfaces thereby acting at all times to force said journal boxes into snubbing engagement with said surfaces whereby to snub relative vertical movement of the frame and journal boxes.

28. In a car truck in combination, a side frame having an opening for receiving a bolster end, a snubbing surface bordering said opening, a bolster end movable up and down in said opening and bolster supporting means acting at all times to urge said bolster end against said snubbing surface thereby to snub both the horizontal and up and down movement of the bolster in the frame.

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