Oct. 1, 1940. M. P. BLOMBERG 2,216,429

CUSHIONING MECHANISM

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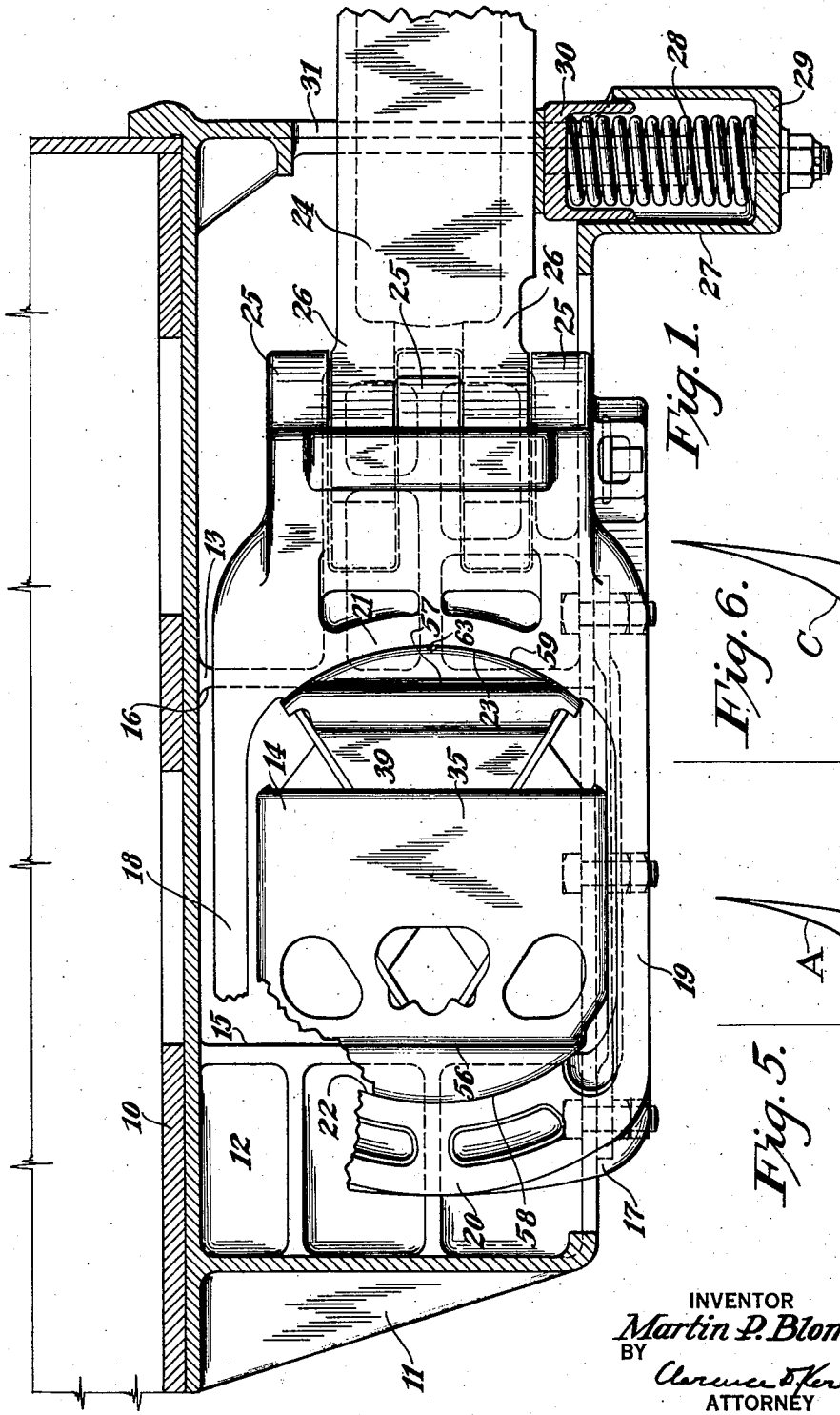


Fig. 1.

Fig. 6.

Fig. 5.

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CUSHIONING MECHANISM

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Fig. 2.

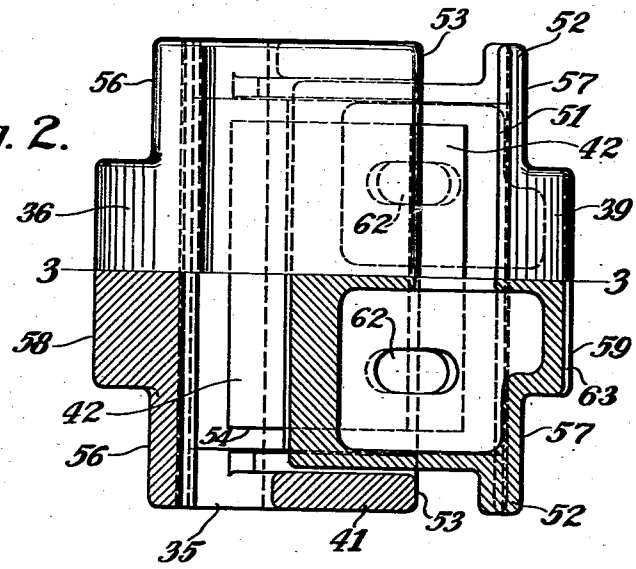
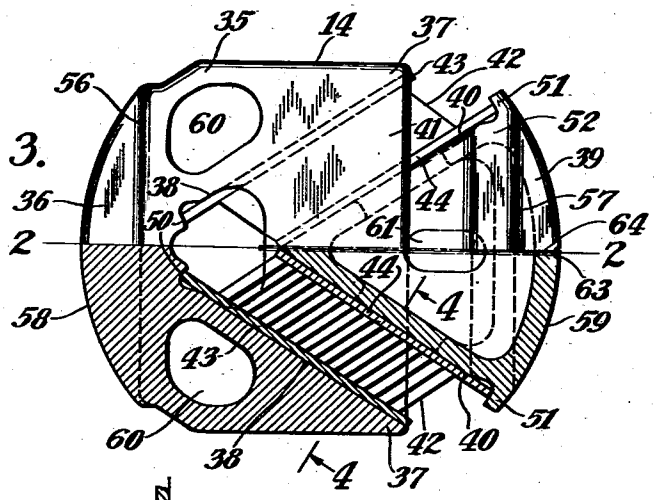


Fig. 3.



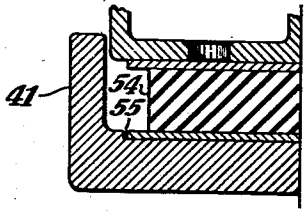


Fig. 4.

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Fig. 7

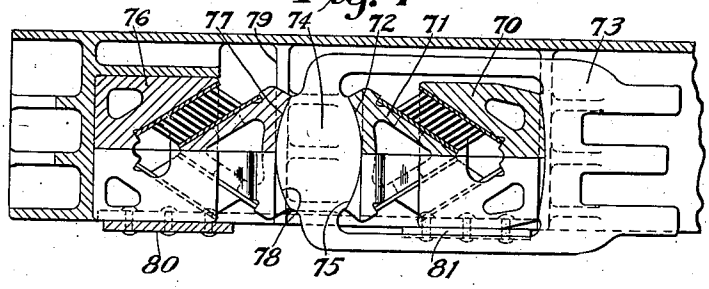


Fig. 8

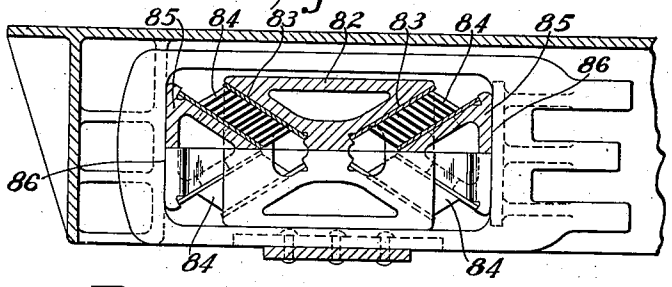


Fig. 9

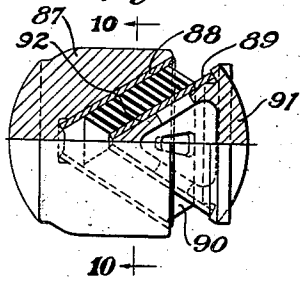


Fig. 10

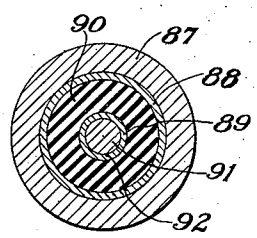
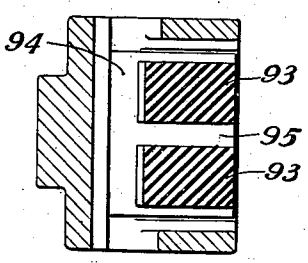


Fig. 11



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UNITED STATES PATENT OFFICE

2,216,429

CUSHIONING MECHANISM

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Application May 20, 1937, Serial No. 143,695

15 Claims. (Cl. 213—40)

This invention relates to cushioning mechanism for railway vehicles and more particularly to such a mechanism wherein the shocks to which the latter is subjected are absorbed by rubber cushions positioned between elements thereof. The invention is shown as embodied in a railway draft gear wherein various advantages thereof are especially well illustrated.

On certain types of cars and locomotives the space available for the draft gear pocket is very limited. A draft gear made in accordance with my invention is particularly adaptable for use in such a limited space and when so used may be constructed so as to give sufficient capacity and travel required for the operation of the vehicle. An object of my invention is to provide a draft gear which while shorter than the usual friction type of gear has an action over the first portion of its travel similar to that of a free spring, but which at the end of its travel builds up resistance rapidly, somewhat analagous to the latter part of the travel of the usual friction type gear. Experience has shown that this action is very desirable, especially on passenger cars and locomotives, in absorbing the small shocks and pulsations incident to normal operation of the train and the operation of coupling up the cars, and at the same time a large reserve of capacity is available for heavy shocks.

My invention, in brief, has been illustrated in connection with a railway draft gear and comprises as one of its features a plurality of rubber elements mounted between the two wedge followers of the draft gear in such a manner as to be placed under combined compression and shear during movement of either of said members towards the other. The invention also comprises a connection between the draft gear and yoke whereby the latter may tilt in a vertical plane to compensate for differences in the heights of adjacent cars.

It may be noted that while the invention provides particular advantages in conjunction with a railway draft gear, the use of various features thereof is not restricted to that field, and that it is also of advantage wherever load or shocks are to be cushioned, as will be apparent.

Other objects and advantages of my invention will be better understood from the following detailed description of several embodiments thereof in connection with the drawings, in which:

Figure 1 is a section through a portion of a car body to which the draft gear has been applied, showing a typical application of the gear to the yoke and associated attachments.

Figure 2 is a view of my draft gear partly in plan and partly in horizontal section, taken on line 2—2 of Fig. 3.

Figure 3 is a view partly in elevation and partly in vertical section, taken on line 3—3 of Fig. 2.

Figure 4 is a partial sectional view taken on line 4—4 of Fig. 3.

Figure 5 is a diagram showing typical curves representing pressure travel characteristics of rubber under compression alone and shear alone.

Figure 6 is a diagram showing a typical pressure travel curve of a draft gear embodying my invention.

Figure 7 is a view partly in elevation and partly in vertical section, showing my invention applied in two units to the draft attachments.

Figure 8 is a view partly in elevation and partly in vertical section, showing a modified form of the invention in which a rubber unit is placed at each end of the draft gear.

Figure 9 is a view partly in elevation and partly in vertical section, showing a further modification of the invention.

Figure 10 is a transverse sectional view taken on line 10—10 of Fig. 9; and

Figure 11 is a view showing a modified arrangement of the rubber elements.

In Fig. 1 of the drawings, 10 is a part of the car structure to which is secured a cast or fabricated member 11 which forms the draft gear pocket. Stop lugs 12 are provided on each side of the pocket at the rear end thereof and similar lugs 13 are formed at the forward end of the pocket. The draft gear 14 engages a surface 15 on each of the rear stop lugs and a surface 16 on the forward lugs. A yoke 17 is preferably formed with an upper horizontal arm 18 and a lower arm 19 that are positioned above and below the draft gear. A rear wall 20 joins the arms rearwardly of the draft gear and wall 21 connects the arms at the forward end thereof. Rear wall 20 has an inner draft gear engaging surface 22 and wall 21 has a similar surface 23, both of said surfaces being curved about a center point substantially midway between the two surfaces. By forming these surfaces in this manner the yoke may tilt upwardly or downwardly without disturbing the relation between the engaging surfaces of the draft gear and stop lugs.

The yoke forwardly of wall 21 may be shaped in any desired manner for connection to the

shank of the associated car coupler. I have shown the usual swivel type of connection between the yoke and shank 24 in which the yoke is formed with spaced arms 25 and the shank with rearwardly extending arms 26 projecting into the spaces between arms 25. A vertical pin passing through suitable openings in arms 25 and 26 pivotally connects the coupler shank with the yoke.

The forward end of the draft gear pocket may be constructed to receive a resiliently mounted carrier iron which supports the shank of the coupler and at the same time permits vertical angling of the coupler shank and yoke with respect to the car. The pocket 27 receives spring 28 that extends between bottom wall 29 of the pocket and the carrier iron 30. The spring 28 maintains the shank in horizontal position when the car is not coupled with another car. However, when the two cars are joined, shank 24 can move downwardly against the resistance of spring 28. Furthermore, clearance is provided, as at 31, to permit shank to tilt upwardly.

Referring particularly to Figs. 2, 3 and 4, the draft gear 14 comprises a wedge member 35 formed with a base portion 36 and arms 37, the latter having inner surfaces 38 diverging in a direction away from said base portion. A V-shaped block 39 is provided with wedge surfaces 40 converging toward the member 35, the angle between the surfaces 40 being substantially the same as the angle between surfaces 38. As shown in the drawings, a portion of block 39 extends into the opening between arms 37 of the wedge member. Arms 37 are joined by tie members 41 which serve to reinforce the wedge and limit lateral movement of block 39 relative to the wedge.

Between surfaces 38 and 40 are positioned cushioning units 42, each comprising a plate 43 and 44 with a block of resilient material such as rubber bonded or vulcanized to the plates of each unit. It will be appreciated that upon inward movement of wedge block 39 forces will be applied to member 35, through rubber units 42, tending to spread arms 37 apart. However, tie members 41, which join the arms together in the zone of maximum bursting stress, adequately overcome this spreading tendency.

Wedge member 35 is formed with stops 50 adapted to be engaged by the inner end of each plate 43 to limit inward movement thereof. Likewise, block 39 is formed at its outer end with extensions 51 that overlie the outer ends of plates 44 so that as block 39 moves toward the wedge, plates 44 will be carried along with it. It will be understood that relative movement of wedge 35 and block 39 towards each other will reduce the distance between plates 43 and 44, resulting in compression of rubber blocks 42. Furthermore, since during such relative movement plates 43 move with wedge 35 and plates 44 move with block 39, the portions of the rubber blocks adjacent plates 43 and 44 will be moving in relatively opposite directions, causing the rubber to be subjected to shearing stresses. It is thus apparent that during compression of my draft gear the rubber is under a combined compression and shearing stress.

In order to limit the travel of the draft gear and prevent the rubber from being over stressed, extensions 52 are formed on block 39 which engage outer surfaces 53 of tie members 41 to take the over-solid blows. It will be observed that there is clearance between the lateral edges 54 of the rubber units and the inner surfaces of the tie members 41 so as to permit the rubber to flow as it is being compressed. In other words, as plates 43 and 44 move closer together the outer surfaces 54 of the rubber blocks bulge outwardly. It is undesirable to permit the rubber units to shift laterally with respect to wedge member 35 as surfaces 54 of the rubber blocks might at times rub against the tie members. I therefore recess arms 37 of the wedge member, as shown more clearly in Fig. 4, so that stops 55 are provided adjacent plates 43 to limit lateral movement thereof and prevent contact between the rubber and tie members.

The base portion 36 of the wedge member has surfaces 56 for engagement with surfaces 15 on the rear stops 12 in the draft gear pocket. Likewise member 39 has surfaces 57 adapted to engage surfaces 16 of front stops 13. Outwardly of the planes of surfaces 56 and 57, members 35 and 39 are formed with surfaces 58 and 59, respectively, of substantially the same curvature as surfaces 22 and 23 of the yoke. As previously described, the curvature of the surfaces on the draft gear and yoke permits the latter to tilt vertically without disturbing the engagement of the draft gear with the stop lugs. While I have shown the gear applied with member 39 toward the coupler, it will be understood that my gear can be reversed if desired, as both ends are of the same curvature.

In addition, the use of resilient material between the two members of the draft gear permits a limited amount of twisting movement between wedge 35 and block 39. For example, if we assume a draft stress in the coupler shank the yoke will transmit the stress to the draft gear, causing the latter to be compressed and surfaces 56 to move away from the rear stop lugs. At the same time surface 23 of the yoke will move away from surface 59 on block 39. When in this position, any twisting of the coupler shank about its longitudinal axis will rotate the yoke and member 35 with respect to block 39. This twisting will, of course, be resisted by the rubber blocks. In this manner the coupler shank and yoke are relieved of dangerous twisting strains. My novel draft gear construction has a further advantage in that blows to the coupler when the latter is angled relative to the car may be readily transmitted to and absorbed by the draft gear without putting any severe strains on the gear since wedge block 39 is free to angle a limited extent in any direction relative to wedge 35. In this connection it may be noted, as shown in Figs. 2 and 4, the members 41 of the wedge 35 are spaced from the side walls of the block 39.

The wedge block and the V-block may be lightened by forming openings 60 in the former and 61 and 62 in the latter without materially reducing their strength. It will thus be apparent that my invention provides a draft gear simple and compact in construction which permits it to be placed in a draft gear pocket smaller than normal and which is formed so as to cooperate with a yoke in such a manner that the latter can readily tilt vertically with vertical movements of the coupler. I have found that by the use of rubber blocks arranged as shown the draft gear during the first part of its compression acts quite similar to a free spring, that is the load increases substantially in proportion to the deflection. However, near the end of its travel the resistance increases much more rapidly for a given deflection. The gear has a soft resistance for lighter shocks

and a reserve of resistance, near the end of its travel, for heavier shocks. Moreover, my improved draft gear is susceptible of modification to vary the characteristics of travel and capacity simply by changing the angle between the wedging surfaces on blocks 35 and 39. As the angle between these surfaces is increased, the rubber will be subjected to a greater compression stress and less of a shearing stress. Conversely, as the angle is decreased the shearing stress will be greater and the compression of the rubber less. Since the load required to deflect the rubber a given amount is greater in compression than in shear it follows that by varying the wedging angle the characteristics of my gear may be varied over a wide range.

In Figs. 5 and 6 there are illustrated typical curves showing the pressure travel characteristics of rubber. In these figures the horizontal axis represents the compression or travel, as the case may be, and the vertical axis represents the pressure. Curve A represents a typical curve of rubber placed only under compression. When the rubber is subjected only to shearing stresses the pressure travel characteristics are similar to curve B. Curve C is an actual curve resulting from a test on a draft gear embodying my invention. In curve C the rubber was subjected to both compression and shear. In each curve the upper line represents the compression stroke and the lower lines the release of the rubber. The area between the two lines, in each case, is a measure of the energy absorbed by the rubber. By so arranging the rubber units that they are subjected to the combined stresses, the greater resistance offered by the rubber under compression for a given amount of travel is utilized in connection with the increased travel of rubber subjected to shear. Thus when absorbing the severe shocks encountered in railway service the draft gear has a greater travel, and hence a greater time interval, in which to absorb the blow. A draft gear in which the rubber is placed only in shear would not offer sufficient resistance to protect the vehicle, whereas if only the compressive action of the rubber were utilized a much larger quantity would be required to provide the same amount of travel.

By placing the rubber units of my draft gear at an acute angle to each other, they are subjected to combined compression and shear stresses, the resulting capacity of which for a given amount of travel depends upon the angle between the rubber units. It will be apparent that the amount the rubber in each unit is compressed for a given travel of the draft gear will be equal to the travel times the sine of one-half the angle between the rubber units. For example, in the draft gear illustrated in the drawings the rubber units are placed at an angle of 65 degrees to each other. If we consider that the members 35 and 39 have moved towards each other one inch, then the rubber of each unit will be compressed an amount equal to the sine of 32½ degrees or .537". Likewise, the amount of movement in shear represented by relative movement between plates 43 and 44 will be equal to the travel of the draft gear times the cosine of 32½ degrees. Again, if we assume that the travel of the draft gear has been one inch the relative movement in a shear direction between the lates 43 and 44 will be .843". For railway draft gears I prefer that the amount of deflection of the rubber blocks in compression should be equal to at least 40% of the relative movement between the members of the draft gear. If this relation between the compressive deflection and travel of the gear is less than the above figures, sufficient resistance will not be developed within the limited amount of travel available for draft gears to absorb the blows encountered in railway service.

The characteristics of the draft gear can also be varied by changing the composition of the rubber used in the units, the softer the rubber the less capacity for a given wedge angle and vice versa. It is apparent therefore that my invention provides a very compact draft gear that can be adapted to widely varying service conditions by the proper selection of rubber composition and wedge angle.

To facilitate shipping and insertion of the draft gear in the yoke it is desirable that the parts of the gear be held together temporarily and in such a manner that they can be readily released for operation after being placed in the yoke. I have shown V-block 39 provided with a groove 63 receiving a wire 64 that passes through the openings between members 41 and base portion 36 to limit outward movement of said block relative to member 35. Members 35 and 41 are preferably held in a slightly compressed position so that the draft gear as a whole may be slid into the yoke after which wire 64 may be cut and drawn out of groove 63. The groove is preferably deeper than the diameter of the wire to facilitate withdrawal of the latter.

In Fig. 7 there is shown a draft rigging in which the cushioning unit embodying my invention is placed within the yoke and another such unit is positioned to the rear of the yoke. The cushioning unit 70 is substantially the same as the one shown in Figs. 1 and 3, except that block 71 has a surface 72 curved in the opposite direction from surface 59 of the previously described form of the invention. Yoke 73 has an enlarged portion 74 at its rear end provided with curved surface 75 which cooperates with surface 72 on block 71. Rubber unit 76 to the rear of the yoke is similar to unit 70 and is formed with a curved surface 77 at its forward end which cooperates with curved surface 78 at the rear of portion 74. By reason of the above described curved surfaces the yoke may tilt a limited amount in a vertical plane without disturbing the positions of the cushioning mechanisms. The units 70 and 76 are arranged so that only unit 70 operates in draft and only unit 76 operates in buff. With such a construction the two units may be made so as to have different characteristics so as to meet widely varying conditions of draft and buff. If desired, stops may be provided to prevent rearward movement of block 71, in which case both units would operate in buff. A stop 79 is fastened to the sills on each side of unit 76 so as to prevent forward movement thereof when the yoke moves forward under draft. Plates 80 and 81 secured to the sills support the cushioning mechanism in the draft gear pocket.

In the modification shown in Fig. 8, member 82 is provided at each end with wedging surfaces 83 which receive rubber units 84 similar to those shown in Figs. 1 and 3. V-blocks 85 engage the rubber units and cause them to be placed under combined compression and shear stresses and may be formed with flat surfaces 86 engaging the ends of the yoke. In such case any vertical tilting of the yoke relative to the draft gear would be resisted by the cushioning

action of the rubber units. If desired, surfaces 86 and the cooperating surfaces on the yoke could be curved similar to the corresponding surfaces of the embodiment shown in Fig. 1. In this modification both of the rubber units would be active in both buff and draft.

In Figs. 9 and 10 the base casting 87 is cylindrical and is formed with a conical recess for receiving the rubber unit. Plates 88 and 89 are also conical in shape, as is the rubber block 90. Member 91 is likewise formed with conical surface 92 which fits into plate 89. In this form of the invention the force applied to the draft gear would cause the rubber to be placed under combined compression and shear around the entire circumference of the gear. As a variation of this embodiment the recess in boss 87 could be made rectangular in cross-section and member 91 correspondingly shaped in the form of a pyramid.

Fig. 11 shows a little different form of rubber unit in which two blocks 93 are secured to plate 94 and are separated, as at 95, so as to allow for an additional flow of rubber. It is, of course, understood that, if desired, more than two blocks could be used to further change the characteristics of the gear. Moreover, it will be apparent that, in any of the other embodiments shown, the rubber means may be broken up into several blocks instead of using a single piece.

The terms and expressions which I have employed are used as terms of description and not of limitation, and I have no intention, in the use of such terms and expressions, of excluding any equivalents of the features shown and described or portions thereof, but recognize that various modifications are possible within the scope of the invention claimed.

What I claim is:

1. In a cushioning mechanism for railway vehicles, a base member having a pair of forwardly extending diverging arms each having substantially flat inner surfaces, a wedge member positioned between said arms, and having outer converging substantially flat surfaces spaced from and substantially parallel to said inner surfaces on said arms, and rectangular shaped rubber means extending between said surfaces on said members adapted to resist movement of said members towards each other, all the lateral edges of said rubber means being free to expand under compression of the rubber.

2. In a cushioning mechanism for railway vehicles, a base member having a pair of forwardly extending diverging arms, a wedge member positioned between said arms, and having outer converging surfaces spaced from and substantially parallel to inner surfaces on said arms, and rectangularly shaped rubber means extending between said surfaces on said members, said members and said rubber means being so constructed and arranged as to place said rubber under combined compression and shear during movements of said members towards each other, all the lateral edges of said rubber means being free to expand under compression of the rubber, the angle between said surfaces on said base and wedge members being such that the compressive deflection in said rubber means is equal to at least 40% of the movement of said members towards each other.

3. A cushioning mechanism for railway vehicles comprising a pair of spaced, relatively movable members each formed with a pair of angularly arranged plane surfaces, stop lugs on said members, and separable rectangular rubber units extending between said members and engaging said stop lugs for resisting relative movement of said members towards each other, all the lateral edges of said rubber units being free to expand under compression of the rubber.

4. A cushioning mechanism for railway vehicles comprising a pair of spaced, relatively movable members each formed with a plurality of angularly arranged surfaces, stop lugs on said members, cushioning units positioned between said members and engaging said surfaces, each of said units comprising a rectangular rubber block and a pair of elements bonded to opposite sides thereof, the remaining sides of each of said blocks being spaced from said members to provide for flow of said rubber upon relative movement of said members towards each other.

5. A cushioning mechanism for railway vehicles comprising an outer jaw-shaped member and an inner wedge-shaped member arranged to move toward one another, the opposing faces of said members being substantially parallel and arranged at an angle to the direction of relative motion, rubber blocks interposed between said angularly arranged faces whereby relative movement of said members causes a combination of compressive and shear stresses to be set up in said rubber blocks, the angularity of said faces being such that the compressive deflection in said blocks is equal to at least 40% of the relative movement between said members.

6. A draft gear comprising an outer jaw-shaped member and an inner wedge-shaped member arranged to move toward one another, the opposing faces of said members being positioned at an angle to the direction of relative motion, rubber means engaged on opposite sides by said angularly arranged faces to resist relative movement of said members, all the lateral edges of said rubber means being free to expand under compression of the rubber, said means being adapted to transmit stresses from said wedge member to said jaw member capable of bursting the latter, reinforcing means spaced from said rubber means and joining the jaws of said outer member and capable of successfully resisting said bursting stresses, and means on said wedge shape member adapted to engage said reinforcing means to limit relative movement of said members in one direction.

7. A draft gear comprising an outer jaw-shaped member and an inner wedge-shaped member arranged to move toward one another, the opposing faces of said members being positioned at an angle to the direction of relative motion, said inner member having substantially parallel side walls joining said angled surfaces on said member, rubber means engaged on opposite sides by said angularly arranged surfaces to resist relative movement of said members, all the lateral edges of said rubber means being free to expand under compression of the rubber, and a pair of members joining the jaws of said outer member and spaced from said side walls to enable relative rotational movement between said inner and outer members about the longitudinal axis thereof.

8. A cushioning mechanism for railway vehicles comprising a pair of relatively movable members arranged to alternately move toward one another, the opposing faces of said members being positioned at an angle to the direction of relative motion, rubber means interposed between said angularly arranged surfaces to resist relative movement of said members, the sides of said rubber

means being spaced from adjacent portions of said members to permit flow of the rubber, and means on one of said members limiting lateral movement of said rubber means so as to prevent contact thereof with adjacent portions of said members during flow of said rubber.

9. In a railway draft rigging, a draft gear and a yoke, said draft gear comprising a pair of relatively movable members each having a surface adapted to engage said yoke, resilient means between said members opposing movement thereof towards one another, a groove in one of said members extending across the surface of said member and adjacent the engaging surface on said yoke, and means in said groove and passing through the other of said members for holding the draft gear in assembled relation.

10. In a railway draft rigging, a draft gear and a yoke, said draft gear comprising a pair of relatively movable members each having a surface adapted to engage said yoke, resilient means between said members opposing movement thereof towards one another, a groove in one of said members extending across the surface of said member and adjacent the engaging surface on said yoke, and a wire in said groove and passing through the other of said members for holding the draft gear in assembled relation.

11. In a railway draft rigging, a draft gear and a yoke, said draft gear comprising a pair of relatively movable members each having a surface adapted to engage said yoke, resilient means between said members opposing movement thereof towards one another, a groove in one of said members extending across the surface of said member and adjacent the engaging surface on said yoke, and a wire in said groove and passing through the other of said members for holding the draft gear in assembled relation, the diameter of said wire being less than the depth of said groove so as to facilitate removal of the wire after the draft gear has been inserted in the yoke.

12. A cushioning mechanism comprising a pair of spaced, relatively movable wedge members each formed with a pair of angularly arranged surfaces, a member intermediate said wedge members formed at opposite ends thereof with angularly arranged surfaces complementary to said wedge surfaces, and rubber means between said surfaces adapted to be placed in combined compression and shear to resist alternate movement of said wedge members toward said intermediate member.

13. A draft gear for railway vehicles comprising spaced interfitting members, draft means for producing relative movement between said members, and means for absorbing light draft loads with a low resistance and heavy shocks with substantially greater resistance, said means comprising rubber blocks engaged on opposite sides by said members and arranged to be placed under combined compression and shear during movement of either of said members with respect to the other, all the lateral edges of said blocks being free to expand under compression of the rubber.

14. Cushioning mechanism as defined by claim 13, wherein the angularity of the faces of said members is such that the compressive deflection in the rubber is at least 40% of the relative movement between said members.

15. A cushioning mechanism comprising a pair of relatively movable members, one of said members having a recess formed with diverging surfaces and the other of said members projecting into said recess and having outer converging surfaces, rubber means extending between said surfaces adapted to be placed under combined compression and shearing stresses to resist movement of said members towards each other, all the lateral edges of said rubber means being free to expand under compression of the rubber, the angularity of said surfaces being such that the compressive deflection in said blocks is equal to at least 40% of the relative movement between said members and stop lugs on said members for limiting movement of said rubber means in a plurality of directions.

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