May 3, 1938. L. M. CLARK 2,116,189

CUSHIONING MECHANISM

Filed March 9, 1937 2 Sheets-Sheet 1

Fig. 1,

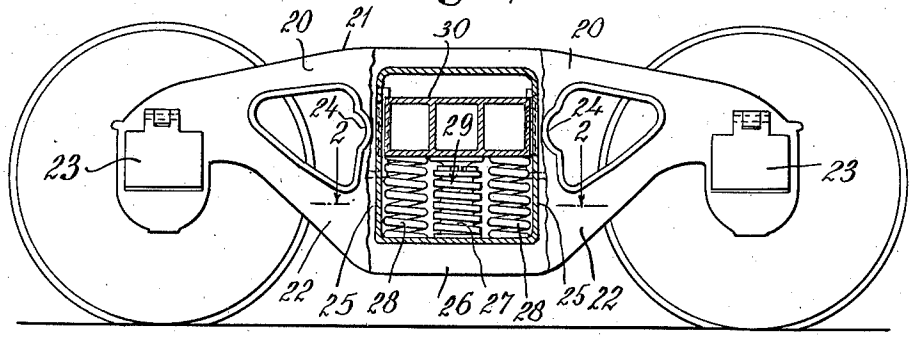


Fig. 3,

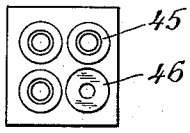


Fig. 2,

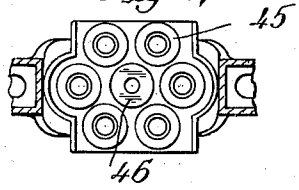


Fig. 4,

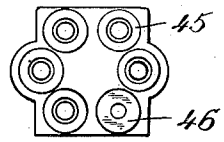


Fig. 5,

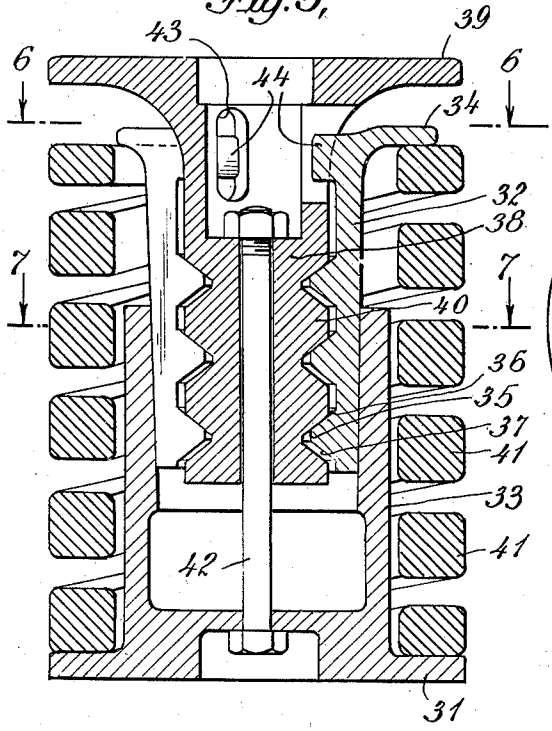
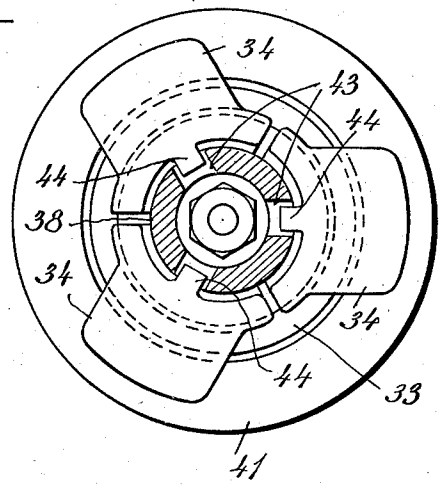


Fig. 6,



INVENTOR
Everett M. Clark
BY
Pennie Davis Marvin & Edmonds
ATTORNEYS

May 3, 1938. L. M. CLARK 2,116,189

CUSHIONING MECHANISM

Filed March 9, 1937 2 Sheets-Sheet 2

Fig. 7,

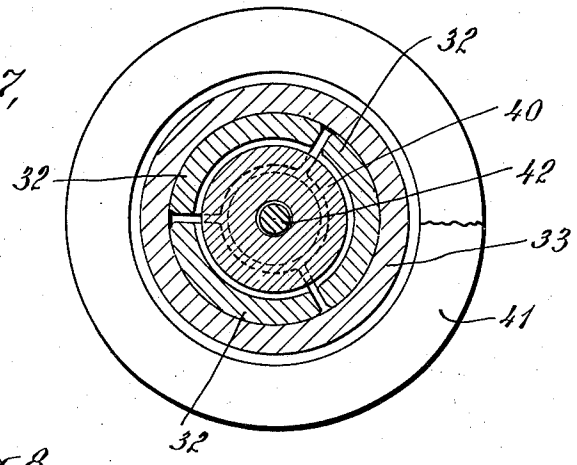


Fig. 8,

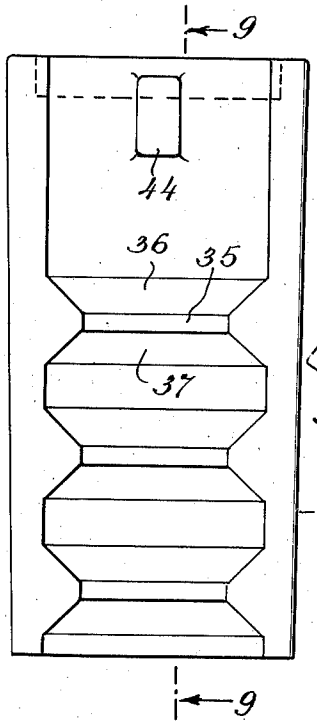


Fig. 10.

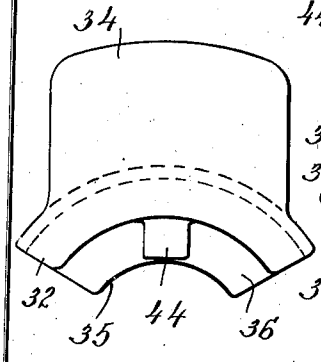
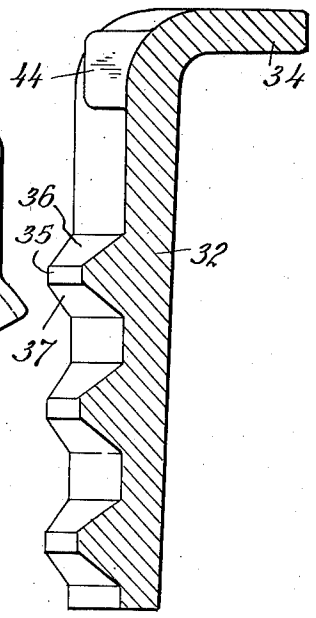


Fig. 9,



INVENTOR
Everett M. Clark
BY
Pennie Davis Marvin & Edmonds
ATTORNEYS

Patented May 3, 1938

2,116,189

UNITED STATES PATENT OFFICE

2,116,189

CUSHIONING MECHANISM

Leverett M. Clark, Snyder, N. Y., assignor to Waugh Equipment Company, New York, N. Y., a corporation of Maine

Application March 9, 1937, Serial No. 129,797

7 Claims. (Cl. 267—9)

This invention relates to trucks of the type used on railway vehicles, such as freight cars, and is concerned more particularly with a novel cushioning and shock absorbing device to be employed with springs for supporting the bolster of such a truck with relation to the side frames. The new device is a friction mechanism of the snubber type, which absorbs and dissipates portions of the energy of forces applied thereto, so that it limits the amplitude of the vertical movements of the car resulting from track irregularities, etc., and dampens harmonic oscillations that occur at certain critical speeds of locomotion. Its use thus improves the riding qualities of the car and substantially reduces damage to both ladings and the car structure.

The new device is of simple compact construction and it is of such size and shape that it may be employed to replace one of the helical springs ordinarily used for supporting the truck bolster above the side frames. It may, accordingly, be installed in standard rolling stock without change either in the bolster or side frames.

In one form of embodiment of the invention, the device includes a casing having an internal friction surface of generally conical form, a plurality of shoes having friction surfaces engaging that of the casing, and an actuating plunger having an enlarged flanged head. The shoes are connected operatively to the plunger by two different means, one means acting to cause the shoes to move into and out of the casing with the plunger and the other insuring that the shoes will maintain the proper spacing circumferentially of the plunger.

For a better understanding of the invention, reference may be had to the accompanying drawings, in which:

Figure 1 represents a side elevational view, partly in section, of a truck embodying the invention;

Figure 2 is a sectional view on the line 2—2 of Figure 1;

Figure 3 is a view similar to Figure 2, showing a modified construction;

Figure 4 is a view similar to Figure 2, showing another modified construction;

Figure 5 is a vertical section of the new unit;

Figures 6 and 7 are sectional views on the lines 6—6 and 7—7, respectively, of Figure 5;

Figure 8 is a face view of one of the shoes of the device;

Figure 9 is a sectional view on the line 9—9 of Figure 8; and

Figure 10 is a plan view of the shoe shown in Figure 8.

In that form of the new apparatus illustrated in Figure 1, the mechanism is shown installed in a standard truck 20 of a railway car, and the truck has the usual side frames 21 which include tension members 22 and journal boxes 23. Each side frame is provided with guide columns 24, which define a window 25 at the middle of the side frame, and at the bottom of the window is a seat 26, upon which is mounted the cushioning mechanism 27. This mechanism includes a plurality of helical springs 28 and a friction unit generally designated at 29, and a bolster 30 extending between the side frames 20 is supported at its ends upon the springs 28 and the friction units 29.

The friction unit includes a casing 33 having an open top and a closed bottom provided with a projecting circumferential flange 31, and the inner surface of the casing is formed with a friction-generating surface which tapers inwardly towards the closed end of the casing. Mounted within the casing and projecting beyond the open end of the latter are friction shoes 32 which are arcuate in section and are provided at their outer ends with flanges 34 which project outwardly beyond the casing. These shoes have curved outer surfaces which contact with the friction surface of the casing and have a similar curvature. On its inner face, each shoe is provided with a plurality of ribs 35 extending transversely of the shoe, and the opposite surfaces 36, 37 of each rib converge toward the outer end of the rib.

Within the group of shoes is a plunger 38 which extends outwardly beyond the shoes and is provided at its outer end with an enlarged head 39. This plunger is provided with ribs 40 having opposite surfaces converging toward the ends of the ribs, and the ribs 35 on the shoes are received in the troughs between the ribs on the plunger. A spring 41 encircling the casing and shoes bears at its opposite ends against the flange 31 of the casing and the flanges 34 of the shoes, and this spring tends to maintain the shoes and plunger in their outermost position. A bolt 42 passing through the closed end of the casing and through a central bore in the plunger, and provided with a head and nut at its opposite ends, limits the movement of the plunger and shoes out of the casing.

Near its upper end, the plunger is provided with a plurality of vertical slots 43, one for each shoe, these slots being equidistantly spaced circumferentially of the plunger. In the construc-

tion illustrated, there are three shoes and the slots are, accordingly, spaced 120 degrees apart. Each shoe is provided at its upper end with an inwardly directed lug 44 which extends into one of the slots, and the slots and lugs serve to maintain the shoes at a proper spacing relative to one another, while allowing the shoes to have a relative movement lengthwise of the plunger.

The device may be installed in a truck in various ways, as, for example, if the truck bolster is normally supported on four helical springs 45, as illustrated in Figure 3, one of these springs may be removed and replaced by the device 46. In such installation, the bolster rests preferably on the enlarged head of the plunger, and the casing rests on the seat in the truck frame. The construction shown in Figure 2 is one in which the bolster would ordinarily be supported upon seven helical springs 45. The central spring of the group, however, has been replaced as shown by the friction device 46. In the arrangement illustrated in Figure 4, the bolster is ordinarily supported on six helical springs 45, but one of these springs has been replaced by the friction device 46. In any of these constructions, the location of the friction device is relatively unimportant, although it may be preferable to mount it in a central position as in the arrangement shown in Figure 2, where possible.

In its operation, the device is usually associated with certain helical springs which, in combination, support a given load, and this load may or may not be shared equally by the device and the springs. The effect of whatever load that may be initially applied to the device is to force the plunger and shoes inwardly of the casing against the combined resistances of the spring 41 and the friction developed between the shoes and the casing. The device is ordinarily assembled with its spring under a substantial initial compression and the pressure of the spring acting between the flanges of the casing and the shoes forces the latter against the plunger, through their coacting angular ribs, while the plunger is restrained by the bolt from being forced out of the casing. The result of this pressure between the coacting angular ribs forces the shoes radially outward against the casing and establishes a frictional component that adds to the resistance of the spring. As a load is initially impressed on the device, as when the weight of the truck bolster and the supported portion of the car body is first placed on the device and its associated group of springs, the plunger starts to enter the casing against the combined resistances of the spring 41 and the frictional component between the shoes and casing. As the plunger and shoes continue to be moved inwardly of the casing, the pressure between the coacting angular ribs, and between the shoes and casing, increases due to further compression of the spring and particularly to the inward taper of the casing bore. The pressure continues to increase until the reaction of the coacting angular ribs exceeds the resistance of spring 41, and the frictional resistances between the coacting angular surfaces of the ribs and between the shoes and casing, whereupon the shoes will move inwardly with respect to the plunger, thereby preventing a further increase in resistance disproportionate to the applied load. The inward movement of the shoes with respect to the plunger will continue to the point where either the maximum load has been applied or the plunger has moved into contact with the closed end of the casing.

Normally, the weight of the truck bolster end of the portion of the car body supported thereby, when the car is empty, produces an inward movement of the plunger equal to approximately one-half of its total possible travel. This gives the device the desired capacity to carry loads and, in addition, causes a substantial adhesional resistance to be built up between the shoes and casing, this resistance resulting in the generation of friction which functions to produce a dampening effect. The remaining portion of the travel of the plunger is then available for taking care of lading loads and further compressive movements produced by the application of dynamic forces set up during locomotion. Starting in a statically loaded condition, the device functions to dampen relative movements of the truck frame and bolster tending to compress the device, and during such compression, frictional resistance is developed to a substantial amount because of the inward taper of the casing bore. Relative movements of the truck frame and bolster in the opposite direction are dampened by the device to a less extent in that as the shoes and plunger are withdrawn from the casing, the frictional resistance opposing such movements results only from the effect of spring 41 acting through the cooperating angular surfaces of the ribs on the shoes and plunger to maintain the shoes in contact with the frictional surface of the casing.

The number of shoes employed in the device is to some extent optional, but I prefer to use three shoes and that construction is illustrated in the drawings. These shoes must be maintained in the proper circumferential spacing relative to the plunger and casing, and such spacing is not maintained by the interlocking ribs and recesses on the shoes and plunger, respectively. Accordingly, I have provided the plunger and shoes with interengaging parts, which permit a relative movement of the plunger and shoes in a direction longitudinal of the casing, but substantially prevent relative movement circumferentially of the casing. In the device as illustrated, these interengaging parts take the form of lugs on the shoes and vertically elongated slots on the plunger, but it will be understood that various other forms of such interlocking parts may be employed. In all forms of the device, however, I provide two different connections between the shoes and the plunger, one connection preventing substantial relative longitudinal movement of the parts, while permitting relative circumferential movement, and the other permitting relative longitudinal movement of the parts, while preventing substantial relative circumferential movement.

In order that the device may function smoothly without sticking, I prefer to form the contacting surfaces on the shoes and plunger, at self-releasing angles, so that after the application of a compressive force to the device, the shoes and plunger will move relatively to lighten the contact of the shoes against the friction surface of the casing, and then will move together outwardly of the casing to their normal positions of rest.

I claim:

1. A cushioning mechanism for use on a railway vehicle truck, which comprises the combination of a casing, a plurality of friction shoes in the casing having surfaces in engagement with a surface thereof, a central actuating plunger extending within the group of shoes, resilient means

engaging the shoes and tending to force them out of the casing, and a pair of separate means operatively connecting the plunger and each of the shoes, one means preventing substantial relative longitudinal movement of the shoes and plunger, while permitting their relative circumferential movement and the other preventing substantial relative movement of the shoes and plunger circumferentially of the latter.

2. A cushioning mechanism for use on a railway vehicle truck, which comprises the combination of a casing, a plurality of friction shoes in the casing having surfaces in engagement with a casing surface, a central actuating plunger extending within the group of shoes, resilient means engaging the shoes and tending to force them out of the casing, interengaging parts on the plunger and each of the shoes preventing substantial relative longitudinal movement of the shoes and plunger, while permitting their relative circumferential movement and other interengaging parts on the plunger and each of the shoes preventing substantial relative movement thereof circumferentially of the plunger.

3. A cushioning mechanism for use on a railway vehicle truck, which comprises the combination of a casing, a plurality of friction shoes in the casing having surfaces in engagement with a casing surface, a central actuating plunger extending within the group of shoes, resilient means engaging the shoes and tending to force them out of the casing, interengaging parts on those portions of shoes and plunger normally lying within the casing, said parts preventing substantial relative longitudinal movement of the shoes and plunger, and interengaging parts on those portions of the shoes and plunger normally lying outside of the casing and preventing substantial relative movement of the shoes and plunger circumferentially.

4. A cushioning mechanism for use on a railway vehicle truck, which comprises the combination of a casing, a plurality of friction shoes in the casing having surfaces in engagement with a casing surface, a central actuating plunger lying within the group of shoes, a series of interengaging parts on the shoes and plunger preventing substantial relative longitudinal movement thereof while permitting their relative circumferential movement, said series extending longitudinally of the plunger, and other interengaging parts on the shoes and plunger preventing substantial relative movement thereof circumferentially of the casing.

5. A cushioning mechanism for use on a railway vehicle truck, which comprises a casing of generally tubular form having an internal friction surface, a plurality of friction shoes extending into the casing and having surfaces in engagement with said friction surface, an actuating plunger lying within the group of shoes and having a plurality of longitudinally elongated slots therein, one for each shoe, interengaging parts on the shoes and plunger preventing substantial relative longitudinal movement thereof, said parts lying in a row lengthwise of the plunger and permitting relative movement of the shoes and plunger circumferentially of the casing, and a lug on each shoe entering one of the slots on the plunger, the engagement of the lug with the walls of its slot preventing displacement of the shoe circumferentially of the plunger.

6. A cushioning mechanism for use on a railway vehicle, which comprises a hollow casing having a closed end and an open end, the casing being provided with an internal friction surface tapering toward the closed end of the casing, a plurality of shoes extending into the casing and having curved friction surfaces in contact with the casing friction surface, a plunger extending into the group of shoes, a series of interengaging parts on the shoes and plunger, said parts being disposed lengthwise of the plunger and preventing substantial relative longitudinal movement of the shoes and plunger, while permitting relative circumferential movement thereof, interengaging parts on the shoes and plunger permitting relative longitudinal movement thereof, but preventing substantial relative circumferential movement, a spring encircling the casing and shoes and acting on the shoes to force the shoes and plunger out of the casing, and means engaging the casing and plunger and limiting the movement of the plunger out of the casing.

7. A cushioning mechanism for use on a railway vehicle truck, which comprises the combination of a generally cylindrical hollow casing having a closed end provided with a circumferential flange, the casing having an internal friction surface tapering toward the closed end, a plurality of friction shoes extending into the casing and having curved surfaces contacting with the friction surface of the casing, the outer ends of the shoes having projections overlying the casing flange, a spring encircling the casing and bearing at one end against the flange and at the other end against the projections on the shoes, a plunger extending within the group of shoes, the outer end of the plunger having an enlarged head, a series of interengaging parts on the shoes and plunger disposed lengthwise of the plunger and preventing substantial relative longitudinal movement of the shoes and plunger, while permitting relative circumferential movement thereof, interengaging parts on the shoes and plunger permitting relative longitudinal movement thereof, while preventing relative substantial circumferential movement, and means engaging the casing and plunger and limiting the movement of the plunger out of the casing.

LEVERETT M. CLARK.