Nov. 30, 1965 L. PÉRAS 3,220,358

RAILWAY CAR TRUCK WITH ELASTIC TORSION BLOCKS

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Fig. 1

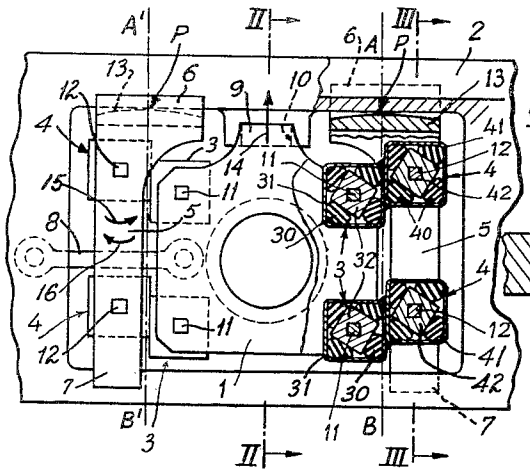


Fig. 2

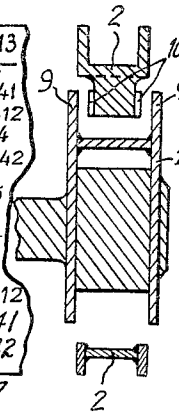


Fig. 3

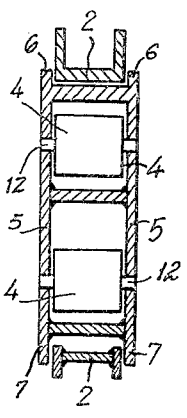


Fig. 4

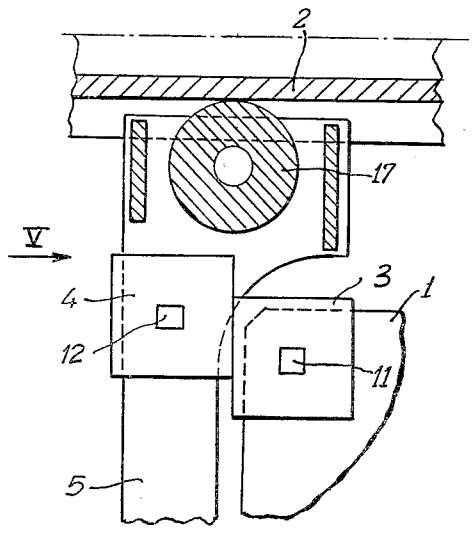


Fig. 5

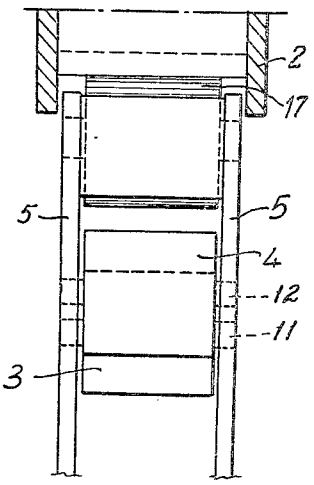


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Fig. 6

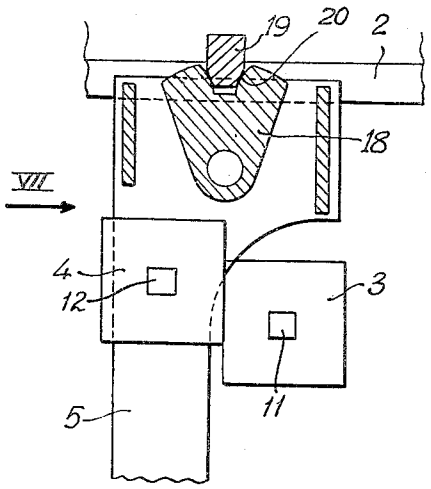


Fig. 7

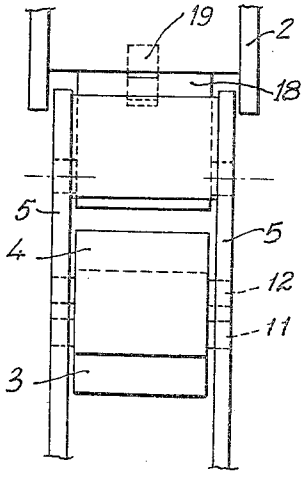


Fig. 8

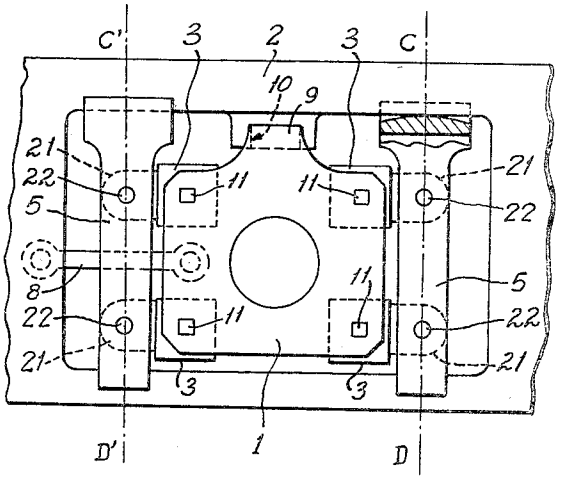


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Fig. 9

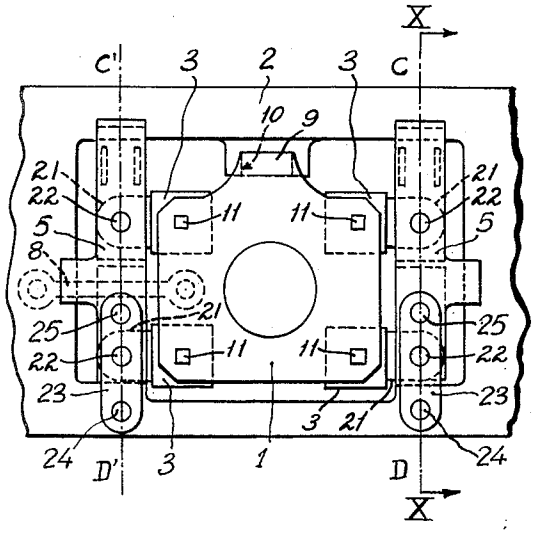
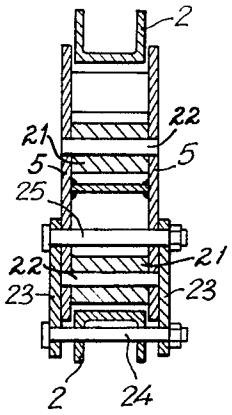



Fig. 10

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United States Patent Office 3,220,358 Patented Nov. 30, 1965



3,220,358

# RAILWAY CAR TRUCK WITH ELASTIC TORSION BLOCKS

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Filed May 8, 1961, Ser. No. 108,326
Claims priority, application France, May 7, 1958, 765,109, Patent 1,195,740
6 Claims. (Cl. 105—224.1)

This is a continuation-in-part of my co-pending application Ser. Nr. 810,497 filed on May 1, 1959, now abandoned.

This invention relates to suspension systems of vehicles which comprise torsion-stressed elastic blocks, and is applicable notably to suspension systems of railway rolling stock.

More particularly, this invention aims at providing, in a suspension incorporating torsion-stressed elastic blocks, irrespective of the structure of these blocks, a kinematic connection between the sprung and unsprung elements of the vehicle which is adapted to avoid the application of important radial compressive stresses on these blocks during the vertical movements of the suspension. Actually, the application of considerable radial stress on said torsion-blocks may be considered as inconsistent with the proper holding of the rubber or like elastic material constituting the deformable element of these blocks.

The manner in which the present invention complies with these requirements will become apparent as the following description proceeds with reference to the accompanying drawings forming part of this specification and illustrating diagrammatically by way of example a few typical forms of embodiment of the invention. In the drawings:

FIGURE 1 is an elevational end view of a railway-car suspension comprising co-operating elastic torsion-stressed blocks;

FIGURE 2 is a cross sectional view of railway-car suspension according to the invention taken upon line II—II of FIG. 1;

FIGURE 3 is a sectional view of the railway-car suspension according to the invention taken upon line III—III of FIG. 1;

FIGURE 4 is a detail view showing on a large scale a modified form of embodiment of the suspension illustrated in FIG. 1;

FIGURE 5 is a side elevational view of the same suspension, as seen in the direction of the arrow V of FIG. 4;

FIGURE 6 is a detail view showing another modification of the suspension of FIG. 1;

FIGURE 7 is a side elevational view of the same arrangement, as seen in the direction of the arrow VII of FIG. 6;

FIGURE 8 is an elevational end view showing an alternate form of embodiment of a suspension in which only elastic blocks carried by the unsprung element are used;

FIGURE 9 is a similar view showing a modified form of embodiment of a suspension system wherein the elastic blocks are also carried by the unsprung element; and

FIGURE 10 is a section taken upon the line X—X of FIG. 9.

Referring first to the arrangement illustrated in FIGS. 1 to 3, the reference numeral **1** designates the axle box or case, and **2** is the frame of the vehicle, the suspension system of this invention, comprising co-operating torsion-stressed elastic blocks **3** and **4**, being interposed between the axle box **1** and the frame **2**.

These torsion-stressed blocks are an integral part of a double parallel link suspension system disposed longitudinally between the box or case **1** and a pair of vertical links **5** on which the frame of the vehicle is caused to bear. These links are formed in relation to the frame **1** with upper and lower lateral guide plates **6** and **7**, respectively; moreover, they are adapted to "float" longitudinally relative to the chassis **2**. The proper positioning of the axle box in relation to the frame is obtained in this case by means of a connecting-rod **8** which absorbs the reaction between the chassis and the axle box, that is between the chassis and the axle, caused by the brake applications and by the driving torque in the case of a power axle. This axle box is also provided with a pair of safety flanges **9** adapted to limit its transverse displacements in relation to the frame provided to this end with registering check members **10**.

The elastic blocks **3** and **4** adapted to act as suspension springs may be selected from any of the existent types of such blocks known to persons skilled in the art, which blocks consist essentially of a pin end and a rigid casing or shell surrounding the pin, there being arranged between the casing and the pin one or more elastic members made of rubber or other similar material, which counteract by torsional elasticity any relative angular movement between the casing and the pin of the block.

The torsion blocks **3** and **4**, diagrammatically shown in the drawings, may be of the known type illustrated in FIGURE 1, in which said blocks **3** and **4** are respectively composed of resilient elements **30** and **40** disposed at the interior of a rigid casing **31** and **41** around a hub **32** and **42** rigidly associated for rotation about a pin **11** and **12**. The above-mentioned connection in parallelogram is established by a rigid assembly of casings **31** and **41**, as by welding, whereas the pins **11** and **12** are mounted and held against rotation respectively on axle box **1** and vertical links **5**.

During the vertical movements of the suspension, the elastic blocks **3**, **4** are subjected to torsional stresses and the links **5** move longitudinally in relation to the frame. The mounting of the links **5** in floating relation thus permits eliminating the compressive stresses exerted on the blocks which would be caused, in the absence of such a floating arrangement, by the variation of the spacing between the pins **11** and **12** during the vertical movements of the suspension. Furthermore, provided that the centres by which this frame bears on said links are equally spaced on the axes AB and A'B' from the axes of pins **11** and **12** carrying the elastic blocks, the radial compressive stresses exerted on these blocks will be reduced to a minimum. Hence the specific shape given to the links **5** at their upper portions formed, as shown, with a convex upper sliding surface **13** such that the load-receiving points will meet the requirement set forth hereabove.

As a matter of fact, it will be seen in FIG. 1 that a relative upward displacement of the axle case (in the direction of the arrow **14**) applies to the links **5** (as a consequence of the torsion-block connection between these links and the case) a sense torque reaction **15**. This torque reaction would be increased if the load-receiving points were located on the vertical passing through the axes of pins **12**.

This torque reaction is actually compensated, in the suspension system illustrated by the sense torque reaction **16** resulting from the selection of the load application points P on the links **5**, so that the radial stresses exerted on the elastic blocks are effectively reduced to a minimum.

In regard to "sense torque" it is pointed out that the arrows **15** and **16** indicate the tilting couples to which each link **5** is subjected, these couples compensating each other as aforedescribed.

An alternate form of embodiment is illustrated in FIGS. 4 and 5 and consists in utilizing a roller **17** as a bearing element for each link **5** as a substitute for the convex

sliding surface **13** for reducing the frictional contact between the link **5** and the frame **2**.

For the same purpose and as illustrated in FIGS. 6 and 7, it is also possible to provide as a bearing member a sector **18** pivotally mounted on each link **5** and centered by a fixed tooth **19** carried by the frame, a corresponding notched contour **20** (involute of curve) being formed in the sector **18**.

This invention is also concerned with a suspension system of this general type but utilizing only simple elastic blocks.

Thus, by way of example, FIG. 8 illustrates a form of embodiment wherein the double parallel-link connection between the axle case **1** and the vertical links **5** comprises only torsion blocks **3** carried by the axle box. The outer cases (similar to outer cases **31** of FIG. 1) of these blocks are connected to the links **5**, in this case, by means of lugs **21** pivoted freely on pins **22** solid with said links (that is, without any torsional effect in relation to the preceding case).

In this form of embodiment the centres by which the frame **2** bears on the links **5** must lie on the axes CD, C'D' intersecting the axes of the pivot pins **22** of lugs **21**, as shown in the drawing, in order to reduce to a minimum the radial compressive stresses exerted on the torsion blocks **3**.

Under these conditions, the bearing points may be arranged as in the preceding case with the same alternate modifications as those already set forth.

It is also possible without departing from the principles of this invention to position the elastic blocks only on the links **5**, not on the axle box. In this case the links must be adapted to receive the load on a vertical plane passing through the axes **11** of the pivotal mounting on the axle boxes. This arrangement, constituting a modification of the embodiment shown in FIG. 8, is not illustrated but can be easily inferred from the foregoing.

An alternate form of embodiment is illustrated in FIGS. 9 and 10 wherein the loads may also be applied to the links **5** in the form of a downward traction obtained in this case with the assistance of small links **23** pivoted freely by one end on the frame, by means of pins **24**, and by the other end on the main links **5**, by means of pins **25**. It is evident that these links **23** permit in all cases the longitudinal floating movements of the links **5**, and as in this example simple elastic torsion blocks **3** are used, the pivot pins of the small links **23** are positioned on the axes CD, C'D'.

On the other hand, in the practical application of this alternate form of embodiment to the suspension of co-operating torsion blocks of the type shown in FIG. 1, the pivot pins on which the small links **23** are mounted would be positioned on the verticals AB, A'B' for the reasons already explained hereabove.

I claim:

**1.** A truck having a frame and at least one axle supporting said frame, axle boxes at each end of each said axle, a guide means provided between the axle boxes and the frame, each axle box having parallel vertical links disposed adjacent the front and rear of the axle boxes, means on said vertical link supporting said frame and spacing said axle box therefrom, parallel longitudinal connection means coupling the vertical links with the front and rear of the axle boxes, said vertical links and the longitudinal connection means forming an articulated parallelogram with the axle boxes, said longitudinal connection means in at least two of the four points of the articulated parallelogram including resilient torsion blocks, whereby said vertical links are mounted in floating fashion in a longitudinal direction with respect to said frame.

**2.** A truck according to claim **1** wherein the point at which the load is applied between the vertical links and the frame coincides substantially with the vertical median of each longitudinal connection parallelogram at the front and rear of the axle boxes.

**3.** A truck according to claim **1** wherein said longitudinal connection means at the front and rear of the axle boxes include resilient torsion blocks so that said torsion blocks are disposed at two of the four of the articulation points that form vertical sides of the longitudinal connection parallelogram, whereby the point at which the load is caused to bear between the vertical links and the frame is provided at the vertical of the opposite side of the parallelogram that is not provided with said blocks.

**4.** A truck according to claim **1** wherein the means on said vertical link for supporting said frame comprises a convex bearing and sliding surface carried by an end portion of said link.

**5.** A truck according to claim **1** wherein the means on said vertical link for supporting said frame comprises a roller mounted on said link, said roller acting as a bearing member.

**6.** A truck according to claim **1** wherein the means on said vertical link for supporting said frame comprises a pivoted sector carried by said links and acting as a bearing member, a tooth rigidly mounted on said frame and depending therefrom, said sector being formed with a notch having the form of an involute of curve which is engaged by said tooth.


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