

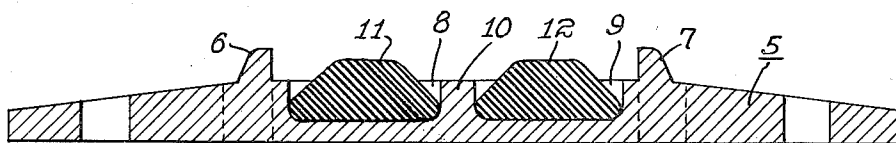
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K. L. JOHNSON

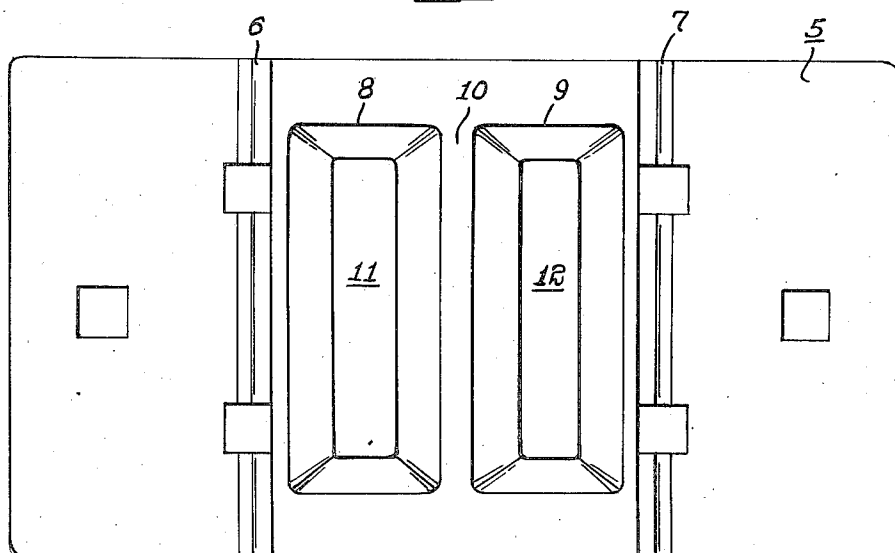
2,377,942

CUSHIONED TIE PLATE

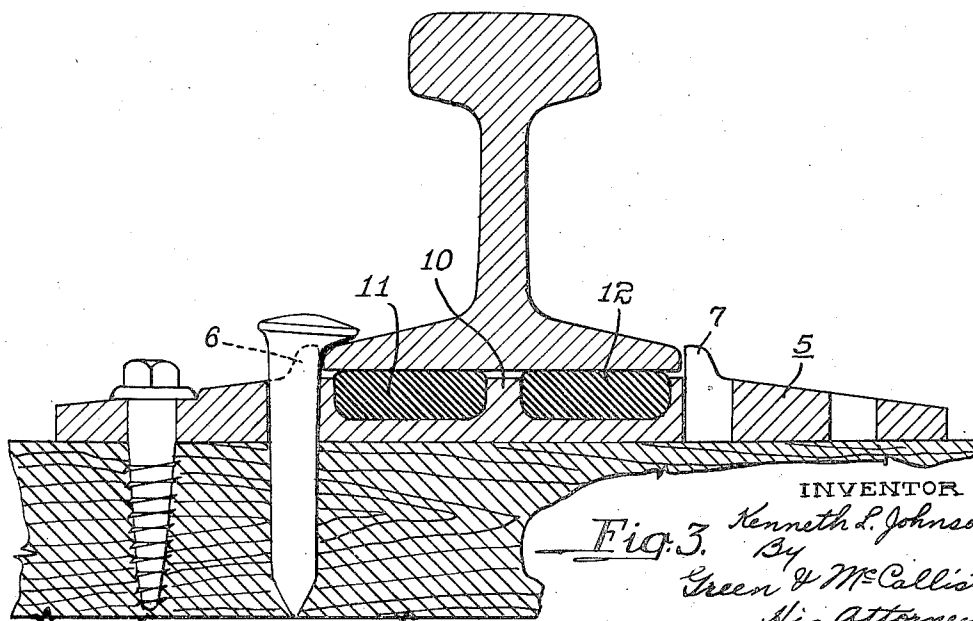
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—Fig. 1.



—Fig. 2.



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—Fig. 3.

UNITED STATES PATENT OFFICE

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CUSHIONED TIE PLATE

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9 Claims. (Cl. 238—283)

This invention relates to tie plates used in railroad construction and more particularly to tie plates of the type designed to provide cushioning of the rails in order to reduce vibration and noise.

Various cushion tie plate structures have been suggested and some are disclosed in patents. Stedman Patent 2,110,894 of March 15, 1938 discloses two types believed to be typical, at least in principle, of the majority of cushion tie plates of the prior art.

None of these cushion tie plates heretofore suggested or patented has been successful due to the fact that when the cushion is made soft enough to provide sufficient cushioning for the rails to make its use worthwhile, it makes the rails unstable in that they are extremely susceptible to toppling over under the side thrusts encountered.

Railroad rails are subjected to severe side thrusts in guiding a train, particularly on curves. Severe side thrusts are also occasioned by "hunting of the wheels." These side thrusts have a tendency to topple the rails over in the direction of the thrust. That is, if a thrust is exerted against the right side of the rail head, the rail tends to topple toward the left.

In a standard set-up in which the rails rest on solid tie plates, any tendency of the rails to topple over due to side thrusts occasioned by the wheel flanges, is counteracted by the weight of the train acting downwardly through the vertical axis of the rails.

In order for a rail in a standard set-up to topple over under a side thrust exerted by a wheel flange, the rail must tilt or pivot outwardly about the outer longitudinal edge of its flange. As before said, this tendency to tilt or pivot is counteracted by the weight of the train acting downwardly through the vertical axis of the rail and for this reason a standard set-up is extremely stable.

When the rails are supported on material such as rubber, which is relatively soft and can flow under pressure, the situation is quite different. A side thrust acting against the inner side of a rail head tends to tilt or pivot the rail about the point at which the vertical axis of the rail intersects the bottom face of the rail flange.

Under such a set-up, which is exemplified in both types of cushion tie plate of said Stedman patent, the rubber cushion material will flow from the compression area of the cushion to the decompression area thereof. That is, from its position under the outer half of the rail flange to a position under the inner half of said flange, making such a set-up extremely unstable.

All resistance to toppling of the rails when such a structure is employed, is derived from the stiffness or resistance to internal flow of the cushion material. For this reason there is a definite limit to the amount of cushioning, or the degree of softness of the cushion, that can be safely used. It has been found that this limit is considerably under the desired degree of softness that is necessary to make the use of cushions of the types of the Stedman patent worthwhile.

One object of this invention is to produce a resilient support for the rail in which the desired degree of cushioning is provided without increasing the tendency of the rail to topple over under the influence of side thrusts caused by the flanges of the wheels on the rail.

Another object is to produce a rail support which is practical both from the standpoint of performance and serviceability and which provides sufficient cushioning of the rails to warrant its use.

A further object is to produce a rail support in which the rail is supported solely on rubber or other elastic material and in which such material is prevented from flowing from compression to decompression areas.

These and other objects which will be apparent to those skilled in this art, I attain by means of the tie plate structure described in the specification and illustrated in the drawing accompanying and forming part of this application.

In the drawing:

Figure 1 is a longitudinal section through the center of a cushion rail support embodying this invention.

Figure 2 is a top plan view of the tie plate of Figure 1.

Figure 3 is a sectional view of the same support, secured to a tie and supporting a standard type rail. The cushions are shown as they will appear under full loading of a heavy freight train.

In the rail support of this invention I provide sufficient cushioning to make its use worthwhile. In order to accomplish this without increasing, to the danger point, the susceptibility of the rails to topple over under the influence of side thrusts of the wheels of a train, I design the metallic portion of the plate so as to prevent a flow of cushion material from compression to decompression areas. That is, cushion material is prevented from flowing from the cushion located on one side of the vertical axis of the rail to the cushion located on the other side of such vertical axis and the material of each cushion is also prevented from flowing longitudinally of the rail.

Flow of cushion material is prevented because when my tie plate is under load, each cushion is in effect confined on all sides, since the clearance between the lower face of the rail flange and the upper faces of the walls surrounding such cushions is not sufficient to permit cushion material to be extruded therethrough under any loadings encountered in normal service.

Plate 5 in general is of usual construction with the customary flanges 6 and 7 for aligning the plate with the rail flange. The body portion between flanges 6 and 7 is provided with transversely extending recesses or pockets 8 and 9 which are preferably of the same size and shape. These pockets are separated by portion 10 of the plate body, which portion is so located that its longitudinal center line is located exactly midway between flanges 6 and 7 and, therefore, in line with the vertical axis of the rail supported by the plate.

A cushion, preferably formed of live rubber and roughly of trapezoidal form, is located within each pocket with its base portion snugly fitting the pocket so that it will not easily become dislodged and lost in handling, prior to and during installation of the tie plate.

The cushion adjacent flange 6 is numbered 11 while that adjacent flange 7 is numbered 12.

Because of the size and form of the cushions, they extend above the tops of the pockets or recesses and leave portions of the pockets along their sides and ends unfilled by cushion material when supporting no load, as shown in Fig. 1.

The cushions being located on opposite sides of the center line of the bearing area of the rail support with the rigid portion 10 of the support separating them and preventing flow of cushion material from either side to the other of the vertical axis of the rail resting upon them, provide a set-up that is practically as stable as a standard set-up in which the rail rests on a solid plate since the end walls of the cushion pockets prevent cushion material from flowing longitudinally of the rail.

Although the cushions are depressed under load, tilting or pivoting of the rail, during toppling, must take place about the edge of the rail flange farthest removed from the point of application of side thrust because of the fact that flow of cushion material from one cushion to the other is prevented by portion 10 of the rail support. In other words, the rail cannot pivot, as in the prior art structures, about the point at which the vertical axis of the rail intersects the lower face of the rail flange. For this reason the cushions may be made as soft as is necessary to give sufficient cushioning to the rails, without incurring danger of toppling over.

The volume of each cushion extending above the tops of the cushion cavities or pockets exceeds the volume of the unfilled portions of the pockets or cavities in an amount sufficient to provide cushioning of the rails when fully loaded by a heavy freight train.

The shape and size of the cushions are such, that as different loads are applied they are depressed in different amounts. Under the load of a heavy freight train the cushions will be deformed until the cavities or pockets are completely filled, but sufficient cushion material still extends above the tops of the cavities or pockets as shown in Fig. 3 of the drawing, to provide cushioning for the rails under loads occasioned by the heaviest trains.

Although the cushions are soft during the early

stages of their deformation, they stiffen as the loads increase until a point is reached, under loading by heavy freight trains, where the cushion material completely fills the cavities or pockets. In this stage the cushions form more or less positive, although cushioned stops since cushion material still extends above the tops of the cavities or pockets. This unconfined material provides sufficient cushioning for the heaviest trains.

As above pointed out, Fig. 3 shows the cushions as they are when under full loading of a heavy freight train. With the cushions compressed as here shown, the clearance space between the lower face of the rail flange and the upper face of that portion of the tie plate within which the pockets are formed is so slight that cushion material, even when such material is live rubber, is not extruded through such clearance space.

With the tie plate of this invention it is possible to obtain sufficient cushioned vertical movement of the rails to "iron out" small inequalities of the road bed, and, since flow of material from one cushion to the other is prevented, there is no danger of overloading the cushions.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Means for supporting a railway rail on a tie, comprising a metal member adapted to be supported on a tie and having two spaced pockets formed in the portion of the upper face thereof located below the supported rail; such pockets being located on opposite sides of the central longitudinal axis of such rail and extending side by side lengthwise of the rail and each such pocket being of less length, longitudinally of the rail, than the width of such metal member and of less width, transversely of the rail, than half of the width of the base of the rail and completely surrounded by the metal of said metal member; and a separate resilient cushion member located in each such pocket; each such cushion member being so formed, with relation to its co-operating pocket, as to substantially completely cover the bottom of the pocket and, under dead load conditions, to project above the confines of the pocket and provide unfilled space within the pocket above the bottom thereof and, under appreciably increased load conditions, to completely fill such pocket and project above the confines thereof.

2. In a tie plate for supporting a railway rail on a tie, a metal member provided with pockets positioned below the base of the rail to be supported; one such pocket being located on one side of the central longitudinal axis of such rail and another such pocket being located on the other side of such axis and each such pocket being completely surrounded by the metal of such member; and a resilient cushion member located within each such pocket; each such cushion member being so proportioned, with relation to its co-operating pocket, that under dead load conditions it projects above the confines of the pocket and provides unfilled space within the pocket above the bottom thereof and under appreciably increased load conditions completely fills such pocket while transmitting load from such rail to such tie.

3. A tie plate as defined by claim 2 in which each of the cushion members offers substantially the same resistance to deformation under load.

4. A tie plate as defined by claim 2 in which each cushion member substantially completely covers the bottom portion of its co-operating pocket under all load conditions.

5. A tie plate as defined in claim 2 in which each pocket is rectangular in form and each cushion member substantially completely covers the bottom of its co-operating pocket and, under dead load conditions, tapers toward a rectangular top of appreciably less area than the bottom thereof.

6. A tie plate as defined by claim 2 in which each cushion member substantially completely covers the bottom of its co-operating pocket and, under dead load conditions, projects beyond the confines of the pocket and tapers toward a top of substantially less area than that of the bottom thereof.

7. A tie plate as defined in claim 2 in which each cushion member is formed of rubber.

8. A tie plate as defined in claim 2 in which the pockets are formed in the upper face of the metal member and the opposite face thereof engages the tie.

9. A tie plate as defined by claim 2 in which the base portion of each cushion member substantially completely fills the bottom of its co-operating pocket and, under dead load conditions, the unfilled space within the pocket increases in extent toward the top of the pocket.

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