July 25, 1944. K. R. HAMMERSTROM 2,354,458

RAILROAD CAR TRUCK SPRING CLUSTER

Filed Aug. 18, 1942

FIG. 1.

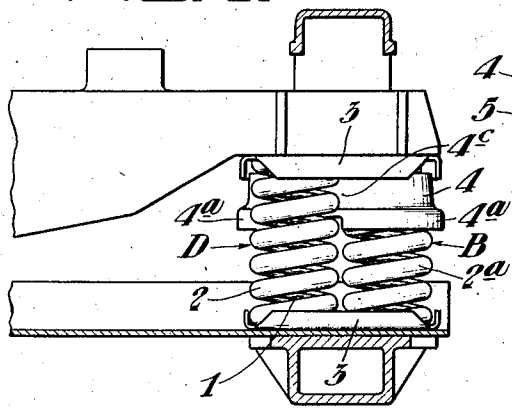


FIG. 2.

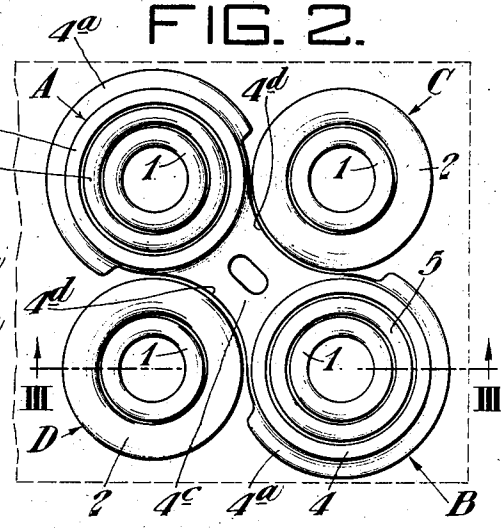


FIG. 3.

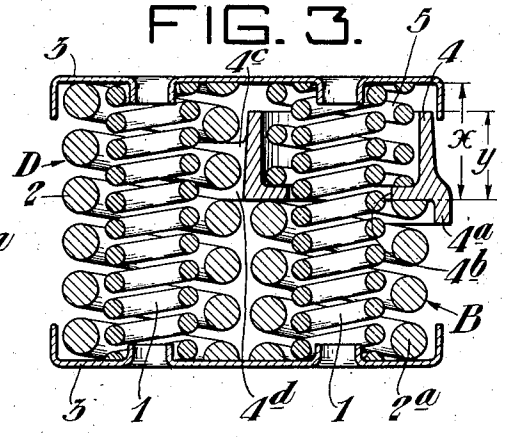


FIG. 4.

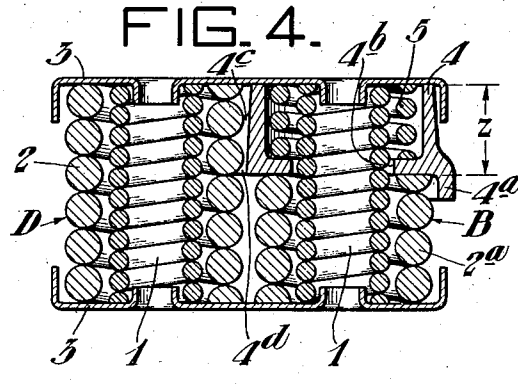
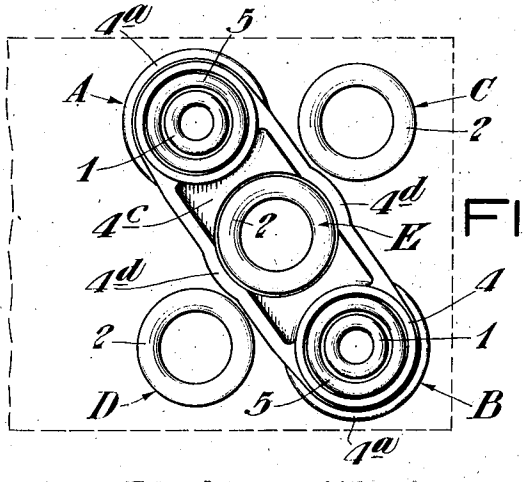


FIG. 5.



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RAILROAD CAR TRUCK SPRING CLUSTER

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5 Claims. (Cl. 267—4)

This invention relates to railroad car truck spring clusters of the type which increases its normal resistance to deflection after deflecting a predetermined distance, for the purpose of improving the riding qualities of an unloaded or partially loaded car, without interfering with the cluster's ability to carry a full load. The object is to provide such a cluster so that the various spring columns are all of the same lengths regardless of whether they are free because of no loading, or are completely solid because of overloading, whereby the coumns may be arranged parallel with all their ends naturally flush in any conventional clustering.

Specific examples of the invention are illustrated by the accompanying drawing in which the figures are as follows:

Figure 1 is a side view of a four-column cluster;

Figure 2 is a top view;

Figure 3 is a section from the line III—III in Figure 2;

Figure 4 is the same as Figure 3 but showing the springs fully closed; and

Figure 5 is the same as Figure 2 but showing a five-column cluster.

More specifically, the drawing shows a railroad car truck spring cluster including at least four parallel flush-ended columns A, B, C and D of inner and outer nested compression coil springs 1 and 2 respectively made of relatively lighter and heavier spring bar each of the same weight in each instance for all the springs made thereof. In other words, the inner springs 1 are made of lighter spring bar while the outer springs 2 are made of heavier spring bar, and the springs 1 are all made of the same weight spring bar, while the springs 2 are all made of the same weight spring bar. Conventional practice may be followed in the case of all the springs 1 and in the case of the springs 2 of columns C and D, this likewise applying to the use of standard spring retainer plates 3 for the purpose of laterally positioning the inner springs 1 as in the conventional cluster, the outer springs being positioned by reason of their co-relation with the inner springs. Still following conventional practice, all of the springs 1 and the springs 2 of C and D are made with the same free and closed lengths, plates 3 positioning them in the conventional parallel flush-ended four-column cluster.

The remaining two outer springs of the columns A and B, indicated as 2*a* in the drawing, may also follow conventional practice excepting for having relatively shorter free and closed lengths so there are spaces of lengths x between their ends and those of the others, these spaces containing rigid compression transmitting members 4 extending axially of the springs for lengths y which are less than the lengths of the spaces x and which equal the distances z between the closed lengths of the two shorter springs 2*a* and the closed lengths of the other springs, these other springs including all the inner springs 1 and the outer springs 2 of the columns C and D.

The members 4 are in the form of cylinders having segmental circular depending flanges 4*a* partially encircling the top convolutions of the springs 2*a* so as to form retainers engaging and laterally positioning the adjacent ends of the two shorter springs 2*a*, and constituting retainers rigidly associated with the members 4, the latter having inward flanges 4*b* against which the springs 2*a* bear, the other ends of these springs being flush with the adjacent ends of the other springs. The upstanding cylindrical walls of the members 4 provide the compression carrying portions, and these walls also function as spring retainers that are opposite the retainers 4*a*, and which engage and laterally position compression coil springs 5 nested about the inner springs 1 of the columns A and B having the shorter outer springs 2*a*. These retainer springs 5 have free lengths equaling the space length x less the thickness of the inward flanges of the members 4, or, in other words, these springs 5 have free lengths bringing their other ends flush with the adjacent ends of the columns when all the springs are free. In this manner all the columns are naturally flush-ended. At the same time, the columns all have the same solid capacities, the deflection resistances of the springs 5 being slight since these springs function mainly to retain the members 4 and to prevent them from rattling. In this connection, the openings 4*b* in the inward flanges of the members 4 are sized to embrace the inner springs 1 of the columns A and B, this largely relieving the springs 5 from performing any function other than holding the members 4 in position in the case of an unloaded or lightly loaded car.

To increase the lateral stabilities of the columns A and B, the members 4 are interconnected by a strut 4*c*, the two members 4 and their interconnecting strut 4*c*, preferably comprising an integral casting. This facilitates assembly of the cluster and assures rigidity between the members 4, with consequently greater stability of the cluster. In this same interest, the strut 4*c* is provided with deep segmental cylindrical walls 4*d* in which the columns C and D nest.

In the case of the Figure 5 showing the application of the principles of the invention to a five-column cluster, the same numerals are used since the parts are all equivalents. The only thing that need be noted as a difference in the provision of the strut 4c with an opening through which passes the central column E of the cluster, the steadying walls 4d being provided on the inside of the hole so that the central column E nests therein. In the case of a six-column cluster, the two central transversely opposite columns will constitute the columns A and B, with the columns on the opposite sides of these then following conventional practice. This last is not illustrated since there is no chance for misunderstanding.

Assuming the illustrated cluster is in the window of a freight car truck side-frame, with the bottom plate 3 resting on the spring seat and the bolster supported by the cluster on top of the top one of the plates 3, it can be appreciated that the cluster works in the same level manner of a conventional cluster, but that it will have less resistance to deflection in the case of an unloaded or lightly loaded car, the spaces x then being greater than the lengths y of the members 4. Increased loading results in diminishing the space lengths x so that they ultimately equal the lengths y of the compression transmitting members 4, the springs 2a then adding their full deflection resistance to the cluster. The cluster will then have a greater resistance to deflection than a uniformly deflecting cluster; because although the springs 2 and 2a are made of the same diameter spring bar, the shorter length of the springs 2a, as compared with the springs 2, causes the same closing motion of the cluster as a unit, to cause the same deflection of the springs 2a as it does of the springs 2, the springs 2a, therefore, offering greater resistance to deflection than the springs 2. Since the springs 2a offer more resistance to deflection, their effect is of real practical value and effectively increases the loading necessary to completely close the springs, so the resistance to overloading is enhanced.

When two coil springs are made of the same strength material and of the same outside diameter and of the same diameter spring bar they will have the same deflection and unit carrying capacities per coil. However, if one spring is made longer, as for example, by doubling the number of coils, the load capacity would not change but the longer spring would have twice the deflection and one-half the resistance for the same deflection as the shorter spring. If one of these long springs and one short spring be arranged side by side to carry a given load, a spacer block or equivalent must be added to the short spring to compensate for the difference in solid heights of the two springs. The longer spring will then carry all the load for a distance of one-half its total deflection during which movement one-half its capacity will be utilized. For the remainder of the travel both springs will deflect in unison and the other half of the capacity of the long spring will be absorbed while all of the capacity of the short spring will be taken up in this distance, with the result that the resistance over the last half of the travel is greatly increased and at closure both springs carry equal load. Using the principal of this example, it will be seen that columns A, B, C and D all have the same inner coil 1 so, as far as they are concerned, their deflection and carrying capacities are equal throughout the travel. The two springs 2 in columns C and D are also in full action throughout the travel, but columns A and B, having the light retainer springs 5 which work in conjunction with springs 2a, are of relatively light capacity and, therefore, transmit only a fractional load and deflection to springs 2a up to the point where x equals y. Therefore, to this point in the travel of the group, springs 2a offer very little resistance to deflection and the other springs are actually carrying the major part of the load, producing a relatively low resistance and consequently an easy riding vehicle up to x equal y deflection of the group. For the balance of the travel the two springs 2a will deflect in harmony with springs 1 and 2 and, due to their shorter length and the fact that little of their travel and capacity have been utilized up to this point as compared with springs 2, they will offer more resistance comparatively, so that the capacity of the group will be increased to the point where at closure the full load capacity of all springs is realized. This simple method provides softer riding for empty or partially loaded cars and stiffer resistance to deflection with satisfactory riding for heavier loaded and fully loaded cars.

For the purpose of keeping the number of spring bar diameters to a minimum, this description covers springs made from bars of but two diameters. In some designs it may be desirable to vary the spring bar diameters.

I claim:

1. A railroad car truck spring cluster including at least four parallel flush-ended columns of inner and outer nested compression coil springs respectively made of relatively lighter and heavier spring bar of the same weight in each instance for all the springs made thereof, all of the inner springs and at least two of the outer springs having the same free and closed lengths with at least one of the remaining outer springs having relatively shorter free and closed lengths so there is a space between its end and those of the others, this space containing a rigid compression transmitting member extending axially of the spring for a length less than the differences between the free length of the shorter spring and the free lengths of the other springs and equaling the difference between the closed length of the shorter spring and the closed lengths of the other springs.

2. A railroad car truck spring cluster including at least four parallel flush-ended columns of inner and outer nested compression coil springs respectively made of relatively lighter and heavier spring bar of the same weight in each instance for all the springs made thereof, all of the inner springs and at least two of the outer springs having the same free and closed lengths with the remaining outer springs having relatively shorter free and closed lengths so there are spaces between their ends and those of the others, these spaces containing rigid compression transmitting members extending axially of the springs for lengths less than the differences between the free lengths of the shorter springs and the free lengths of the other springs and equaling the differences between the closed lengths of the shorter springs and the closed lengths of the other springs, the members being rigidly associated with retainers engaging and laterally positioning the adjacent ends of the shorter springs which have their other ends flush with the other adjacent spring ends, and the members also being rigidly associated with opposite retainers engaged and laterally positioned by retainer compression coil springs nested around the inner springs of the columns having the shorter outer springs, the retainer springs

having free lengths bringing their other ends flush with the adjacent ends of the columns when all the springs are free.

3. A railroad car truck spring cluster including at least four parallel flush-ended columns of inner and outer nested compression coil springs respectively made of relatively lighter and heavier spring bar of the same weight in each instance for all the springs made thereof, all of the inner springs and at least two of the outer springs having the same free and closed lengths with the remaining outer springs having relatively shorter free and closed lengths so there are spaces between their ends and those of the others, these spaces containing rigid compression transmitting members extending axially of the springs for lengths less than the differences between the free lengths of the shorter springs and the free lengths of the other springs and equaling the differences between the closed lengths of the shorter springs and the closed lengths of the other springs, the members being rigidly associated with retainers engaging and laterally positioning the adjacent ends of the shorter springs which have their other ends flush with the other adjacent spring ends, and the members also being rigidly associated with opposite retainers engaged and laterally positioned by retainer compression coil springs nested around the inner springs of the columns having the shorter outer springs, the retainer springs having free lengths bringing their other ends flush with the adjacent ends of the columns when all the springs are free, and the members encircling the inner springs of the last named columns so as to be further laterally positioned thereby.

4. A railroad car truck spring cluster including at least four parallel flush-ended columns of inner and outer nested compression coil springs respectively made of relatively lighter and heavier spring bar of the same weight in each instance for all the springs made thereof, all of the inner springs and at least two of the outer springs having the same free and closed lengths with the remaining outer springs having relatively shorter free and closed lengths so there are spaces between their ends and those of the others, these spaces containing rigid compression transmitting members extending axially of the springs for lengths less than the differences between the free lengths of the shorter springs and the free lengths of the other springs and equaling the differences between the closed lengths of the shorter springs and the closed lengths of the other springs, the members being rigidly associated with retainers engaging and laterally positioning the adjacent ends of the shorter springs which have their other ends flush with the other adjacent spring ends, and the members also being rigidly associated with opposite retainers engaged and laterally positioned by retainer compression coil springs nested around the inner springs of the columns having the shorter outer springs, the retainer springs having free lengths bringing their other ends flush with the adjacent ends of the columns when all the springs are free, and the respective members being rigidly interconnected as a unit so as to increase the lateral stability of the last named columns.

5. A railroad car truck spring cluster including at least four parallel flush-ended columns of inner and outer nested compression coil springs respectively made of relatively lighter and heavier spring bar of the same weight in each instance for all the springs made thereof, all of the inner springs and at least two of the outer springs having the same free and closed lengths with the remaining outer springs having relatively shorter free and closed lengths so there are spaces between their ends and those of the others, these spaces containing rigid compression transmitting members extending axially of the springs for lengths less than the differences between the free lengths of the shorter springs and the free lengths of the other springs and equaling the differences between the closed lengths of the shorter springs and the closed lengths of the other springs, the members being rigidly associated with retainers engaging and laterally positioning the adjacent ends of the shorter springs which have their other ends flush with the other adjacent spring ends, and the members also being rigidly associated with opposite retainers engaged and laterally positioned by retainer compression coil springs nested around the inner springs of the columns having the shorter outer springs, the retainer springs having free lengths bringing their other ends flush with the adjacent ends of the columns when all the springs are free, and the members encircling the inner springs of the last named columns so as to be further laterally positioned thereby and the respective members being rigidly interconnected as a unit so as to increase the lateral stability of the last named columns.

KARL R. HAMMERSTROM.