Oct. 27, 1936. H. W. PROTZELLER ET AL 2,058,623

RUBBER CUSHION

Filed Jan. 11, 1935 3 Sheets-Sheet 1

Fig. 1.

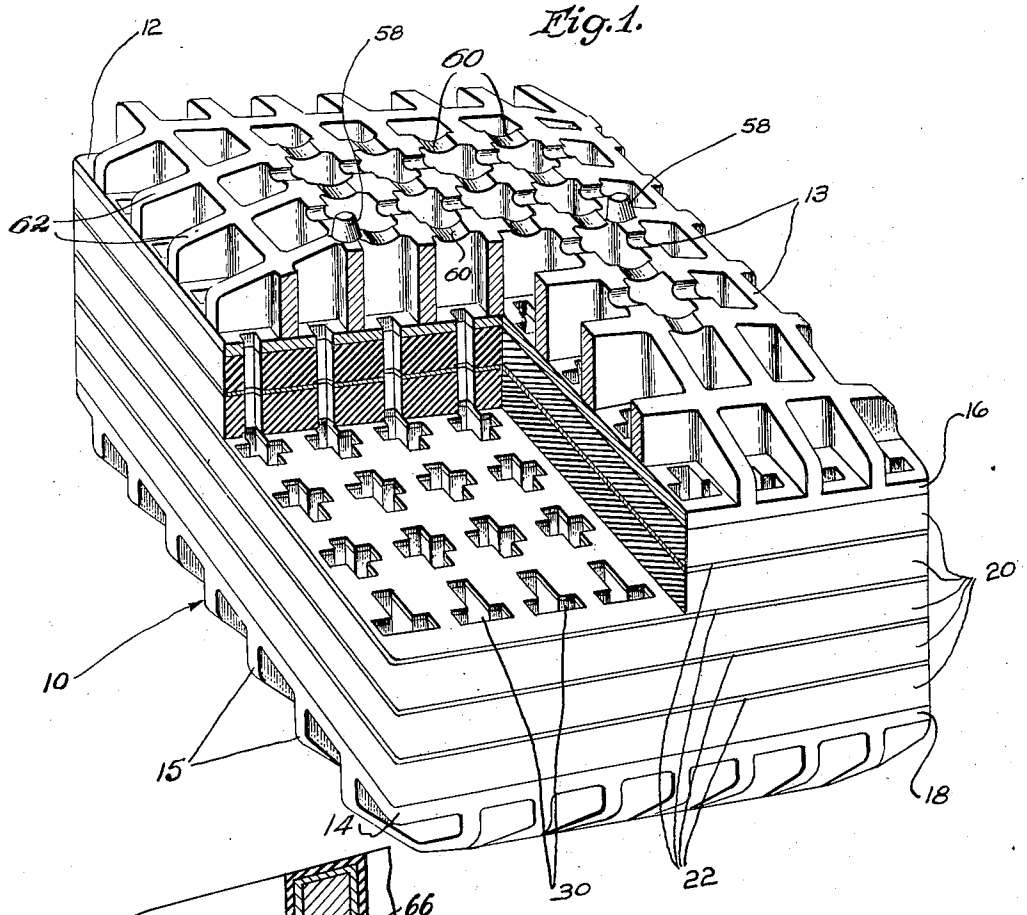
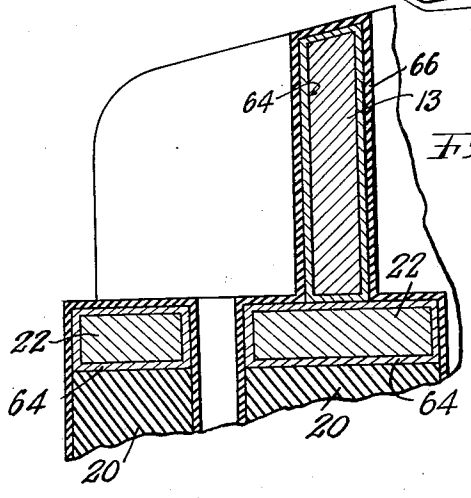


Fig. 6



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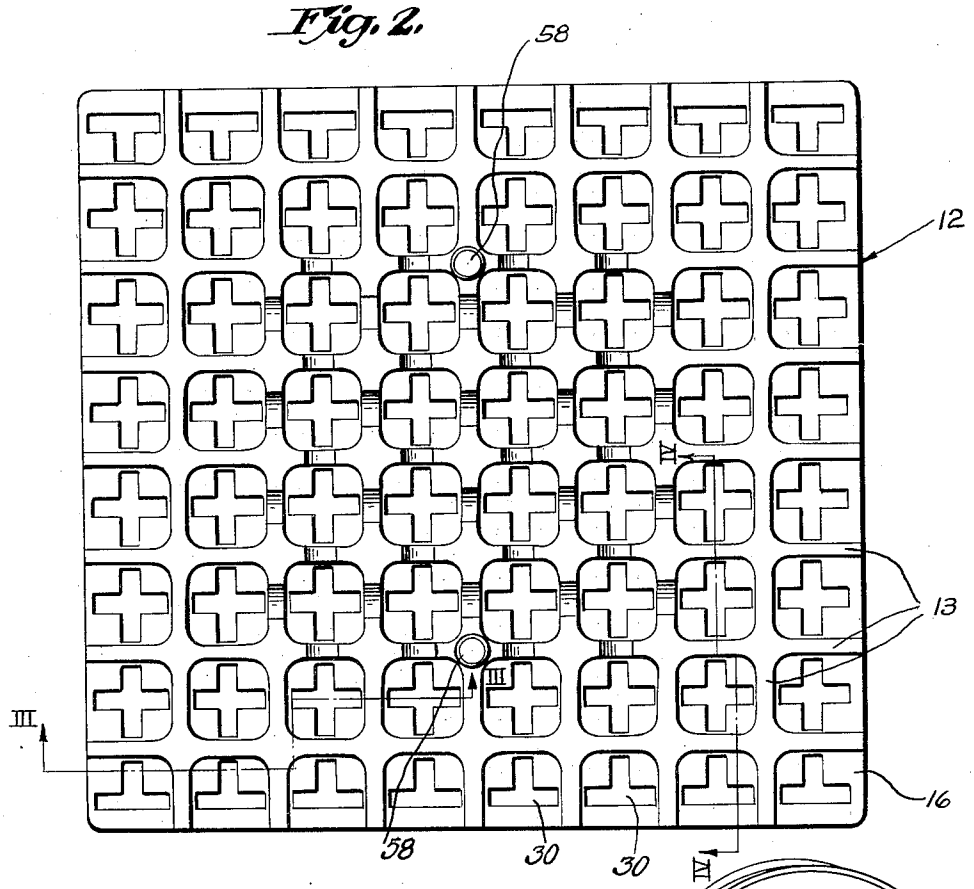
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Filed Jan. 11, 1935 3 Sheets-Sheet 2

Fig. 2.



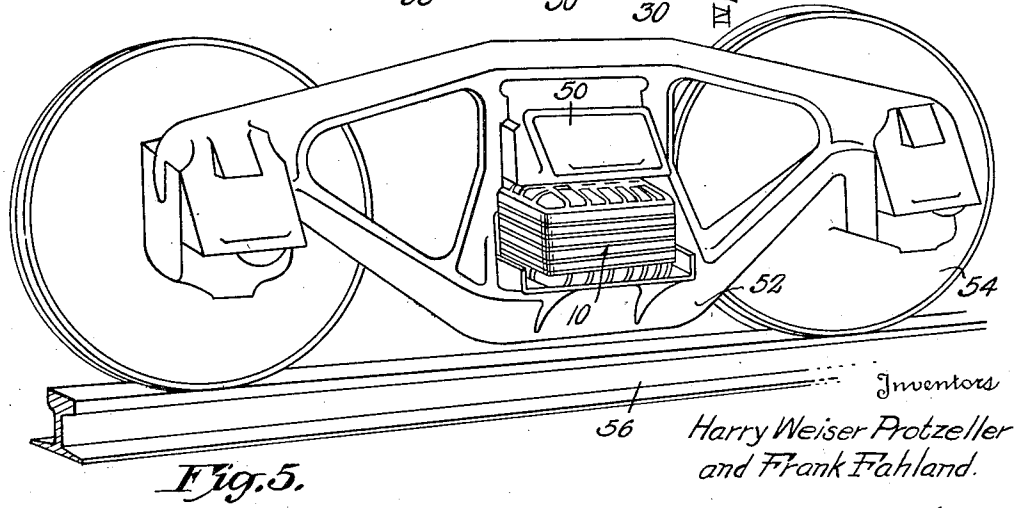


Fig. 5.

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RUBBER CUSHION

Filed Jan. 11, 1935 3 Sheets-Sheet 3

Fig. 3

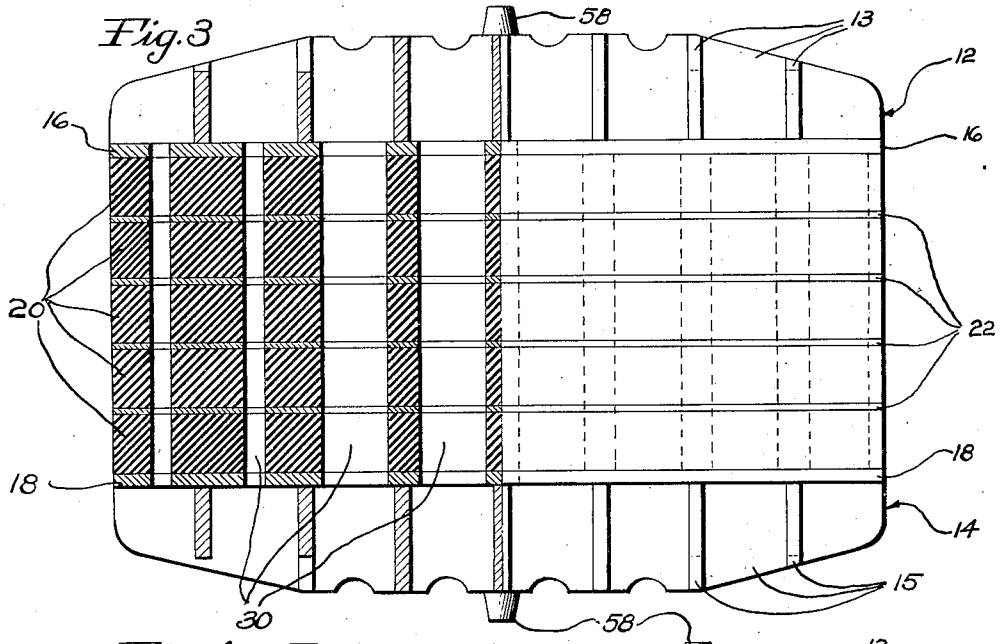
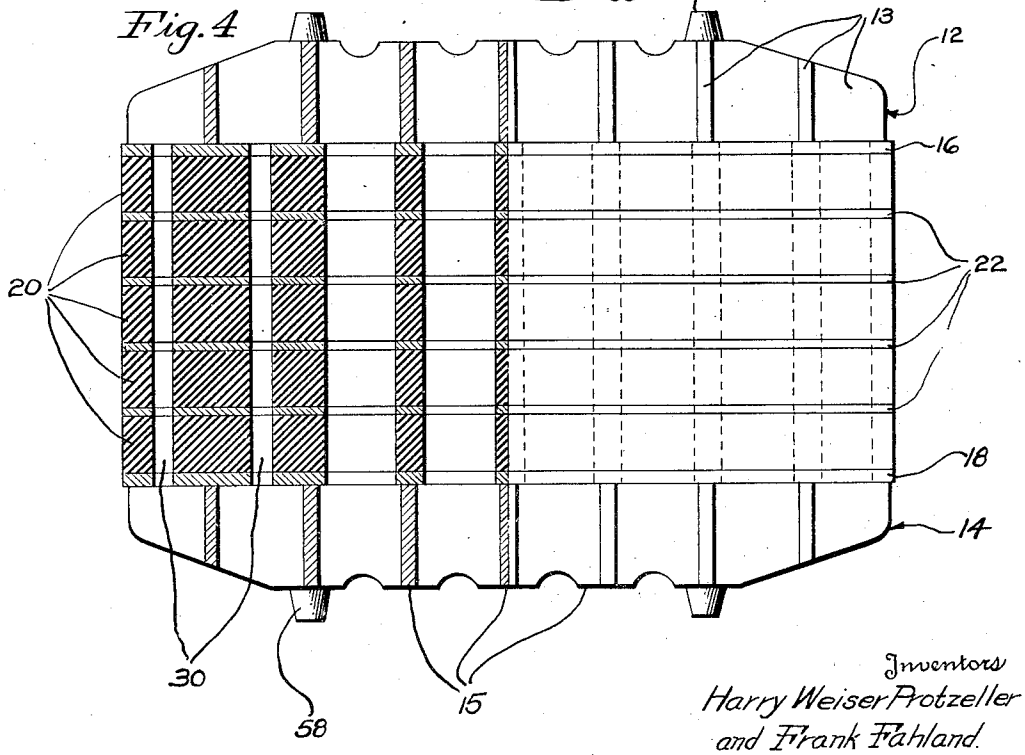


Fig. 4



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UNITED STATES PATENT OFFICE

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RUBBER CUSHION

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Application January 11, 1935, Serial No. 1,291

20 Claims. (Cl. 267—63)

This invention relates to resilient rubber bodies and more particularly to devices adapted for cushioning railroad car bodies on the wheel trucks.

Prior to the present invention much difficulty has been experienced in railroad transportation due to the many severe forces occasioned by rough road beds, gaps between rail ends, car swaying and the like. Considerable damage is done every year in transporting all kinds of goods and particularly those which are susceptible to shocks and jars. Improvement in the flatness and stability of road beds has considerably helped the riding qualities of the cars, as has improved manufacturing methods in the production of truer truck and wheel assemblies. However, for many years there has been little or no improvement in the characteristics of springs or other cushioning means supporting the car body on the wheel trucks. These means have comprised for many years ordinary coiled steel springs which are placed in clusters below the end of the truck bolster and the truck.

It has been found that these coil springs have a certain period or resonance of vibration which means that if the car passes at a certain fairly uniform speed over the rail joints and is subjected to a slight jar at each rail joint, a gradual vertical reciprocating movement of the car body will be built up which has been found to be so severe as to cause much damage to the car and contents.

Some attempts have been made in the past to break up the natural resonance of the coil spring by bearing a part of the weight of the car upon elliptical springs or other steel friction elements which have a different period of vibration. This improvement has somewhat bettered the cushioning capacities of the metallic spring assemblies but has not proven entirely satisfactory due to considerable breakage as well as other maintenance expense.

It has been determined that the chief difficulty with coiled or other metallic springs is that the hysteresis of the metal is ordinarily about 5%, which means that the actual energy absorbed by the spring due to internal heating or deformation is only the said 5% of the amount of energy put into the spring. Thus 95% of the force impact in the ordinary metal spring will be given up by the spring, which in a case of a railroad car means a prolonged vibrating movement of a car body. A single vibrating movement imparted to the spring has been found to result in as many as 100 subsequent vibrations of gradually diminishing magnitude. In actual use the vibrations are somewhat reduced due to car friction and other losses, however ordinarily the vibrations are continued at least 10 times. The shaking which these vibrations will naturally impart to the associated car body is accordingly apparent, particularly where the initial vibration-producing force is periodically repeated, possibly in synchronism.

It has been proposed to dampen the vibrating movement of the metallic spring members by providing artificial hysteresis which may be in the form of friction straps or the like. These have not however proven satisfactory due to the high initial cost and the expensive maintenance features involved.

It will be apparent from the foregoing that for cushioning devices for rail cars or like use, some material having a higher hysteretic factor would be more satisfactory. Vulcanized rubber of the proper character has been found to have an energy absorption or hysteresis of from 5 to 6 times that of spring steel and to possess other characteristics, such as quietness of operation and absence of necessity for lubrication, which render it particularly advantageous for railroad car suspension. It has been proposed heretofore to use rubber in the designated capacity, however various factors have arisen to render prior-known rubber structures unsatisfactory. In the first place the rubber must be subjected to varying and heavy loads for continuous operation during all kinds of weather conditions. Prior-known structures have not been properly designed to produce the desired commercial results due to failure of the rubber body or to impart proper cushioning action. Thus in prior-known devices the resistance of the rubber to stress has not been properly proportioned which has been found undesirable, resulting often in too active a cushioning movement under ordinary conditions.

Again in former types of rubber car supports the rubber bodies have become overheated and failed in use. A rubber block subjected to compression and release will absorb energy and convert it to heat. It does this by means of internal friction. This heat that is generated in the rubber block must be conducted to the surface of the rubber before it can be radiated. The rate of the heat flow is inversely proportional to the length of paths that the heat must be conducted through. The amount of heat that can be radiated from a surface is directly proportional to the area of that surface. Therefore, there is a definite relation between the size of the rubber

block that a given amount of heat can be conducted to the surface of and the area of the surface required to radiate that heat.

In order to determine just what the area and cubical contents of the block shall be there must be known the rate at which heat will be radiated from the rubber surface and also the rate of conduction of heat. These can all be carefully determined and plotted out, which has been done on the design of rubber springs herein disclosed.

It is readily apparent that the maximum amount of service, or rather the maximum efficiency from the rubber as an energy absorption medium can only be obtained when there is a certain balance between the area from which the heat can be radiated and the cubical size of the block itself. This definite balance has been carefully predetermined in this design.

Our contention in this respect has been proved, in the past where rubber has been used in large blocks and without any attention to the above principle. Wherever this has been the case it has almost invariably resulted in overheating of the rubber and failure of the application.

Many of the prior-known structures, moreover, were assembled without vulcanization and the attending difficulties of separation, wear and corrosion of the metal parts of the structures resulted.

Likewise in the past stay-bolts or retaining plates or housings have been employed to assist in guiding the cushioning means in vertical or lateral movement. These are objectionable due to wear, additional cost and the like.

The failure of the rubber-cushioning devices now disclosed in the patented art to really satisfy commercial wants is evident from the fact that there are a number of expired patents on this type of article and yet the railroads have never adopted them even in the face of the many millions of dollars paid annually for damages traceable directly to the poor metallic-type car cushioning springs.

It is an object of the present invention to avoid and overcome the foregoing difficulties of prior-known devices by the provision of a new and improved rubber-cushioning member adapted for long and satisfactory commercial use.

Another object of the present invention is to provide a rubber-type resilient mounting for railroad cars in which the rubber portion is scientifically cooled during use. In the design herein disclosed it is the object of the invention to provide a simplified, unitary rubber-cushioned member, subdivided into blocks with the blocks proportiond between radiating surface and heat that must be conducted through the rubber so as to obtain the most efficient use of the rubber.

Another object of the invention is to provide an improved elastic cushioning body of the character described wherein the resistance to deflection of the unit is designed to materially decrease once a certain load has been reached with the unit still being capable of considerable deflection.

Another object of the invention is the provision of a simplified unitary rubber cushioning member to directly support a rail car on the truck in which the parts are integrally vulcanized together and treated to render the same substantially unaffected by corrosion.

Another object of the invention is to provide a resilient rubber spring adapted to position between a truck bolster and supporting truck frame in which means are incorporated for positioning and mounting the spring in the desired position.

Another object of the invention is the provision of an improved resilient cushion designed with apertures through the resilient body which function to permit the compression of the body.

The foregoing and other objects of the invention are achieved by the device hereafter described in detail and illustrated in the accompanying drawings, wherein

Fig. 1 is a perspective view partly broken away of one embodiment of the invention;

Fig. 2 is a plan view of the form of the invention illustrated in Fig. 1;

Fig. 3 is a side elevation of Fig. 2, with a portion thereof being broken away on the line 3—3 of Fig. 2;

Fig. 4 is an end elevation of the device seen in Fig. 2 with a portion of the end elevation being broken away, as on line 4—4 of Fig. 2, to better illustrate the details of the invention.

Fig. 5 is a diagrammatic perspective view illustrating the manner in which the rubber cushion illustrated in Figs. 1 to 4 is applied in use, and

Fig. 6 is an enlarged fragmentary cross-section through the cushion showing details of the construction not illustrated in the other figures.

In accordance with the patent statutes one best-known embodiment of the present invention has been illustrated and described in detail although it will be appreciated that the exact details of construction other than those specified, as well as the particular relation of the parts is not essential unless otherwise described.

Referring now to Fig. 1 of the drawings, the numeral 10 indicates generally the rubber spring or cushion of the present invention, which include an upper member 12 and a bottom member 14. These members are ordinarily of steel or the like and preferably comprise, as illustrated, a plurality of strengthening vanes or baffles 13 and 15 which form an edge-lattice type of interconnected strengthening vanes, secured to which, as by welding, are a pair of end plates 16 and 18. The strengthening vanes or baffles 13 and 15 and the plates 16 and 18 can be cast integrally, if this is so desired, although the machine work may be rendered somewhat more difficult as a result thereof.

A plurality of rubber slabs 20 and relatively thin metal plates 22 are sandwiched together between the end plates 16 and 18 to form a laminated rubber and metal structure of the type illustrated in the drawings. The exact number of laminations is ordinarily not material, other than that the rubber slabs should be somewhere in the neighborhood of one inch in thickness and some 5 in number for use with ordinary loads on standard refrigerator or like rail cars. By the use of alternate rubber and metal layers we have provided a means whereby springs of various capacities and characteristics can be most easily obtained. For instance, it is apparent that if a certain height is to be maintained and also if the other dimensions of the spring are to be likewise maintained, that it is possible to place between the two end castings one rubber block of the same shape and containing the same apertures as described in our invention. Should one rubber block only be used, it is apparent that a spring of extreme softness and low load-carrying ability would result. Now, however, if in the middle of this rubber block a steel plate were introduced so as to reduce the individual columnar height

of the rubber that a spring of considerably higher load-carrying capacity and with less overall deflection for the same load would be obtained. This can be carried still further by placing two, three, four, five, or any number of steel plates. The principle back of this is that the load-carrying ability of the rubber is a function of the overall height of each layer of rubber—area being the same in both cases.

An essential feature of the invention is the provision of apertures extending completely through the laminated metal and rubber structures in a vertical direction which are designed to effect the desired cooling of the rubber body. The most effective cross section of these openings or apertures, designated in the drawings by the numeral **30**, is that of a square Maltese cross. These apertures **30** extend as illustrated through the rubber slabs **20** and through the interposed metal members **22** and even through the end plates **16** and **18**. Adjacent the lateral edges of the assembly the X type Maltese cross apertures take a T-shape due to the relation of the parts. The edge lattice-like vanes **13** and **15** of the end members **12** and **14** of course define square openings which are in alignment with the Maltese cross opening through the laminated body. In this manner a large number of vertically extending apertures run through the laminated rubber and metal body and during the operation of the device provide a very efficient breathing and cooling action for the rubber springs. The notches **60** in the upper edges of the baffles **13** and **15** provide cross ventilation between the pockets in the lattice work so that when the cushion is in position between the flat seats on the truck bolster and frame indicated by dot-dash lines **50** and **52**, respectively, in Fig. 4, the air which is forced out of the apertures can escape to the atmosphere. The sloping baffles **62** do not need recesses, such as **60**, as they are clear of the supports **50** and **52**. Nor do the cross baffles connecting the sloping baffles **62** need the notches for they also are clear of the supports **50** and **52**.

It will be noted particularly in Fig. 1 of the drawings that each rubber slab **20** is divided by the Maltese cross apertures into a plurality of substantially square rubber blocks, the corners of which extend in to define the square angles of the Maltese crosses. These rubber blocks during the compression movement of the spring move or flow together to substantially close the Maltese cross apertures at which further deflection or compression on the rubber spring will be resisted to a greater degree. It has been found desirable in cushioning for railroad cars to provide a device in which the deflection of the unit increases in direct proportion to the load applied, up to a certain load, at which time the load carried for the resulting deflection is considerably increased for the remainder of the compression travel. This has been found to materially aid the riding qualities of the car under both light and heavy loads and is believed to constitute a distinct step forward in the art.

All of the metal parts in the rubber cushion are preferably made of steel for the purposes of strength but are brass-coated as at **64** (see Fig. 6) in order that the rubber slabs may be very positively secured thereto by vulcanizing during the assembly of the unit. Likewise it is particularly contemplated to coat the still exposed metal parts with corrosion-resisting rubber-base paint **66** which adapts the springs for better all-around use and particularly for use with refrigerator cars in which water, salt brine or ammonia tends to drip from the cars upon the cushioning structure.

By positively vulcanizing the rubber to the plates we have provided a spring that maintains or possesses a constantly increasing resistance to load in all directions. It is apparent that as a load is placed upon the rubber block intending to compress it vertically that the resistance to this compression is a curved line or that the resistance increases as the deflection but not in direct proportion. We might state this in other words by saying that the rate of resistance increases constantly as the deflection for vertical compression. This is true also of motion in a lateral or longitudinal direction. It is apparent that if the rubber spring described herein were set between two members and that the bottom member was rigidly held in position and the top one free to float that it would not only compress the rubber in a vertical direction but that it might move laterally in either one of two directions or combinations thereof. It is also apparent that due to the laminated rubber and steel a constantly increasing resistance tending to prevent such motion is presented by the rubber spring. This is of great value due to the fact that in freight cars it is absolutely essential that the load be free to float on the truck. Many devices have been introduced between the springs and the car body which would allow of this free motion, either by means of steel rollers or things of that nature. We have thus developed a rubber spring that gives us the desired characteristics in a vertical direction so as to reduce shock and have at the same time produced a spring that will provide resistance to the lateral motion but still allow a degree of this motion which has been found necessary.

As seen in Fig. 5 the rubber cushion **10** is adapted to be placed between each end **50** of the truck bolster and the truck frame **52**. The truck frame **52** journals the usual wheels **54** which are adapted to ride on the rails **56**. It will thus be evident that the rubber cushion **10** takes the place of the usual spring clusters positioned between the truck bolster and spring plank or truck.

Means are preferably provided on the end members **12** and **14** to secure these members in place with respect to the bolster **50** and truck frame **52**. As seen in Figs. 1 to 4, these fastening means may take the form of integral pins **58** formed on the upper and lower surfaces of the end members **12** and **14**. These pins **58** fit into cooperating recesses in the bolster bar **50** and the truck frame **52** so that the rubber cushion will be held securely in position at all times.

The pins likewise function to secure the truck and bolster together, not only in a resiliently vertical direction, but also serve to have the rubber cushion resiliently interconnect the truck and bolster in all lateral directions as well. This is due, of course, to the fact that the rubber cushion comprises a plurality of laminated rubber and metal portions securely vulcanized into an integral whole. The normal weight upon the rubber cushion will of course serve to keep the pins **58** securely in their associated recesses at all times and yet permit very ready replacement of the rubber cushion if this be found necessary at any time.

It is believed that the operation of the improved spring will be apparent from the forego-

ing description. It might be well to point out, however, that in use the vertically directed openings through the entire laminated cushion function to very effectively cool the entire unit during use. The very compressing of the rubber between the metal parts acts as a bellows to push and pull air in and out of the vertical apertures **30**. Likewise the Maltese cross shape of the apertures **30** forms a plurality of substantially square rubber blocks which, during compression movement of the cushion, flow outwardly to uniformly close the apertures by four-corner movement of the blocks. In this manner when heavy loads are applied to the spring the apertures are completely closed and further loads can be applied without materially increasing the deflection of the spring as heretofore described. Thus, the assembly functions to carry either light loads or more heavy loads with the cushion being designed to offer a definitely increased resistance to heavy loads over and above that offered by the normally increased resistance of the resilient medium. This feature has been found to break up any possible spring resonance and causes the railroad car to ride comfortably either fully or partly loaded.

The inherent dampening action of the rubber cushion, which is approximately 5 to 6 times as great as that of steel, causes all bounds and vibrations in the car and in the rubber cushion to be quickly dampened and absorbed by the generation of heat in the rubber body, with the heat being carried away by the flow of air through the vertical apertures **30**. The comparatively high hysteretic value of rubber in the type of cushion forming the present invention and its inherent advantages should be fully appreciated.

It will be recognized from the foregoing that an improved resilient mounting has been provided for railroad car use in which rubber and steel have been combined to produce a long-wearing, self-dampening rubber cushion particularly adapted to resist corrosion and to dissipate internal heat formed therein. It should be understood that the exact form of the invention illustrated and described is subject to modification and alteration without departing from the spirit of the invention. For example, the rubber slabs which are apertured to substantially produce a plurality of rubber blocks could be replaced with a plurality of rubber blocks which would be positioned in suitable cups or recesses formed in the plates, or the rubber blocks could be vulcanized to the plates. The plates could, moreover, be made in substantially any number or size and the apertures can be varied to a certain degree, although it has been discovered that making the rubber blocks formed by the apertures substantially from ¾ to 1½ inch square, preferably about 1¼ inch, leads to the best results. Likewise the provision of a large number of relatively small apertures in the rubber cushion has been concluded to be better than a fewer number of larger holes.

The scope of the invention is accordingly not dependent upon the specific illustrations and descriptions contained herein but is defined by the appended claims.

What we claim is:

1. In combination, a railroad truck bolster and a truck spring plank and resilient rubber cushions secured between the ends of the truck bolster and the truck spring plank, said cushions comprising top and bottom metal members in the form of edge lattice castings with substantially square openings therethrough in a vertical direction, means on the members for releasably securing the same to the truck and bolster respectively, substantially flat top and bottom metal plates fastened to the top and bottom members and having square Maltese cross apertures therethrough in alignment with the square openings in the members, and a plurality of alternate rubber slabs and metal plates positioned between the top and bottom plates and having square Maltese cross apertures extending vertically therethrough in substantial alignment with the apertures in the end plates, said slabs, plates and end plates all being vulcanized securely together, said Maltese cross openings dividing the rubber slabs into a plurality of rubber blocks connected by relatively narrow fins with the blocks functioning under heavy compression load to flow and close the Maltese cross openings and thereby increase the resistance offered by the cushion in a greater-than-normal degree.

2. In combination, a railroad truck bolster, a truck spring plank, a resilient rubber cushion secured between each end of the truck bolster and the truck spring plank, each of said cushions comprising top and bottom metal members in the form of edge lattice castings with substantially square openings therethrough in a vertical direction, means on the members for releasably securing the same to the spring plank and bolster respectively, substantially flat top and bottom metal plates fastened to the top and bottom members and having square Maltese cross apertures therethrough in alignment with the square openings in the members and a plurality of alternate rubber slabs and metal plates positioned between the top and bottom plates and having square Maltese cross apertures extending vertically therethrough in substantial alignment with the apertures in the end plates, said slabs, plates and end plates all being vulcanized securely together.

3. In combination, a railroad truck bolster, a truck, resilient rubber cushions secured between the ends of the truck bolster and the truck, said cushions comprising top and bottom metal members in the form of edge lattice castings with substantially square openings therethrough in a vertical direction, means on the members for releasably securing the same to the truck and bolster respectively, substantially flat top and bottom metal plates fastened to the top and bottom members and having square Maltese cross apertures therethrough in alignment with the square openings in the members and a plurality of alternate rubber slabs and metal plates positioned between the top and bottom plates and having square Maltese cross apertures extending vertically therethrough in substantial alignment with the apertures in the end plates, said Maltese cross openings dividing the rubber slabs into a plurality of rubber blocks connected by relatively narrow fins.

4. In combination, a railroad truck bolster, a truck spring plank, resilient rubber cushions secured between the ends of the truck bolster and the spring plank, said cushions comprising top and bottom metal members, means on the members for releasably securing the same to the spring plank and bolster respectively, substantially flat top and bottom metal plates fastened to the top and bottom members and having apertures therethrough, and a plurality of alternate rubber slabs and metal plates positioned between the top and bottom plates and having apertures

extending vertically therethrough in substantial alignment with the apertures in the end plates, said slabs, plates and end plates all being vulcanized securely together, said apertures dividing the rubber slabs into a plurality of rubber blocks, with the blocks functioning under heavy compression load to flow and close the apertures and thereby increase the resistance offered by the cushion in a greater-than-normal degree.

5. In combination, a railroad truck bolster, a truck spring plank, resilient rubber cushions secured between the ends of the bolster and the spring plank, said cushions comprising end members having square Maltese cross apertures therethrough and a plurality of alternate rubber slabs and metal plates positioned between the end members and having square Maltese cross apertures extending vertically therethrough in substantial alignment with the apertures in the end members, said slabs, plates and end members all being vulcanized securely together, said Maltese cross openings dividing the rubber slabs into a plurality of rubber blocks connected by relatively narrow fins, with the blocks functioning under heavy compression load to flow and close the Maltese cross openings and thereby increase the resistance offered by the cushion in a greater-than-normal degree.

6. In combination, a railroad truck bolster and a truck spring plank and resilient rubber cushions secured between the ends of the bolster and the spring plank, each of said cushions comprising top and bottom metal members having square Maltese cross apertures therethrough and a plurality of alternate rubber slabs and metal plates positioned between the top and bottom members and having square Maltese cross apertures extending vertically therethrough in substantial alignment with the apertures in the members, said slabs, plates and members all being vulcanized securely together.

7. A resilient rubber cushion comprising top and bottom metal members in the form of edge lattice castings with substantially square openings therethrough in a vertical direction, substantially flat top and bottom metal plates fastened to the top and bottom members and having square Maltese cross apertures therethrough in alignment with the square openings in the members and a plurality of alternate rubber slabs and metal plates positioned between the top and bottom plates and having square Maltese cross apertures extending vertically therethrough in substantial alignment with the apertures in the end plates, said slabs, plates and end plates all being vulcanized securely together, said Maltese cross openings dividing the rubber slabs into a plurality of rubber blocks connected by relatively narrow fins, with the blocks functioning under heavy compression load to flow and close the Maltese cross openings and thereby increase the resistance offered by the cushion in a greater-than-normal degree.

8. A resilient rubber cushion comprising top and bottom metal members in the form of edge lattice castings with openings therethrough in a vertical direction, substantially flat top and bottom metal plates fastened to the top and bottom members and having apertures therethrough in alignment with the openings in the members and a plurality of alternate rubber slabs and metal plates positioned between the top and bottom plates and having apertures extending vertically therethrough in substantial alignment with the apertures in the end plates, said slabs, plates and end plates all being vulcanized securely together.

9. A resilient rubber cushion comprising top and bottom metal members in the form of edge lattice castings with substantially square openings therethrough in a vertical direction, substantially flat top and bottom metal plates fastened to the top and bottom members and having square Maltese cross apertures therethrough in alignment with the square openings in the members, and a plurality of alternate rubber slabs and metal plates positioned between the top and bottom plates and having square Maltese cross apertures extending vertically therethrough in substantial alignment with the apertures in the end plates, said Maltese cross openings dividing the rubber slabs into a plurality of rubber blocks connected by relatively narrow fins.

10. A resilient rubber cushion comprising top and bottom metal members, substantially flat top and bottom metal plates fastened to the top and bottom members and having apertures therethrough, and a plurality of alternate rubber slabs and metal plates positioned between the top and bottom plates and having apertures extending vertically therethrough in substantial alignment with the apertures in the end plates, said slabs, plates and end plates all being vulcanized securely together, said openings dividing the rubber slabs into a plurality of rubber areas with the areas functioning under heavy compression load to flow and close the openings and thereby increase the resistance offered by the cushion in a greater-than-normal degree.

11. A resilient rubber cushion comprising top and bottom metal members having Maltese cross apertures therethrough and a plurality of alternate rubber slabs and metal plates positioned between the top and bottom members and having Maltese cross apertures extending vertically therethrough in substantial alignment with the apertures in the end members, said slabs, plates and end members all being vulcanized securely together, said Maltese cross openings dividing the rubber slabs into a plurality of rubber blocks connected by relatively narrow fins, with the blocks functioning under heavy compression load to flow and close the Maltese cross openings and thereby increase the resistance offered by the cushion in a greater-than-normal degree.

12. A resilient rubber cushion comprising top and bottom metal members having Maltese cross apertures therethrough and a plurality of alternate rubber slabs and metal plates positioned between the top and bottom members and having Maltese cross apertures extending vertically therethrough in substantial alignment with the apertures in the end members, said slabs, plates and end members all being vulcanized securely together.

13. In a rubber cushion for use on railroad cars or the like the combination of interposed rubber and metal sheets with a plurality of openings extending therethrough completely from one side of the cushion to the other, said openings dividing the rubber into a plurality of blocks connected by relatively thin webs, the shape of the openings and the position of the blocks causing the rubber to flow to substantially close the openings under increased loads and thereby insuring a cooling action on the cushion by the pumping of air into and out of the cushion as occasioned by the usual shocks encountered in use.

14. In a rubber cushion for use on railroad cars or the like the combination of interposed rubber

and metal sheets with a plurality of openings extending therethrough, said openings dividing the rubber into a plurality of areas connected by relatively thin webs, the shape of the openings and the position of the areas causing the rubber to flow to substantially close the openings under increased loads and thereby insuring a cooling action on the cushion by the pumping of air into and out of the cushion as occasioned by the usual shocks encountered in use.

15. In a rubber cushion for use on railroad cars or the like the combination of interposed rubber and metal sheets with a plurality of Maltese cross openings extending therethrough, the shape of the openings causing the rubber to flow to substantially close the openings under increased loads and thereby insuring a cooling action on the cushion by the pumping of air into and out of the cushion as occasioned by the usual shocks encountered in use.

16. In combination a truck bolster and an associated spring plank, a rubber and metal cushion securing the bolster and the spring plank together, said cushion including metal end plates, alternate rubber members and intermediate plates, vertically extending openings through said end plates, rubber members and intermediate plates for the free circulation of cooling air, said metal plates and rubber members being vulcanized together so only the edges of the intermediate plates and the outer faces of the end plates are open to corrosive attack and said exposed metal areas being painted with a non-corrosive paint.

17. In a rubber cushion for use on railroad cars or the like, a combination of interposed layers of rubber and metal with the endmost layers having seats thereon adapted to abut against seats on the supporting and supported portions of the railroad car, said layers having a plurality of aligned holes to form passageways extending through all of said layers from one end of said cushion to the other, the end-most layers having lateral connecting passageways between the said openings in the end plates of said cushion and having at least one passageway communicating with the atmosphere outside the cushion when said seats on said cushion are in engagement with the supporting and supported portions on said railroad car, whereby during the compression and expansion of said cushion in use air may circulate freely through said first and second passageways to and from the atmosphere.

18. In a rubber cushion for use on railroad cars or the like, the combination of superimposed layers of rubber and metal with at least one layer of rubber and with the end plates of metal and formed with outwardly projecting ribs, the outer edges forming seats which are adapted to abut against portions of the railroad car in which the same is to be used, said ribs having lateral passages therethrough beneath the seating portions thereof, whereby to provide circulation of air between the spaces between said ribs, and passages all the way through said layers of rubber and metal from one end thereof to the other and communicating at the opposite ends with the spaces between said ribs whereby air may be circulated through said layers into the atmosphere to dissipate heat.

19. In a rubber cushion for use on railroad cars or the like, a combination of interposed rubber and metal sheets with metal sheets forming the ends of the cushion, one or more passageways extending clear through said metal and rubber plates from one end of said spring to the other, and lateral passageways in said end plates forming lateral communication between said openings when said end plates are seated against the portions of the railroad cars with which these springs are adapted to be associated, whereby the air which is compressed within said openings, due to the expansion of the rubber when compressed, may be dissipated through said openings and passageways into the atmosphere.

20. In a rubber cushion for use on railroad cars or the like, the combination of interposed rubber and metal sheets with a plurality of openings extending therethrough, the sides of said openings being grooved longitudinally whereby ridges are formed between said grooves which move inwardly to close said openings when the rubber is compressed under the load on the cushion, and also cause a circulation of air through said openings by the pumping action resulting from the contraction and expansion of the rubber during the diminishing and increasing of the overall length of the spring, respectively.

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