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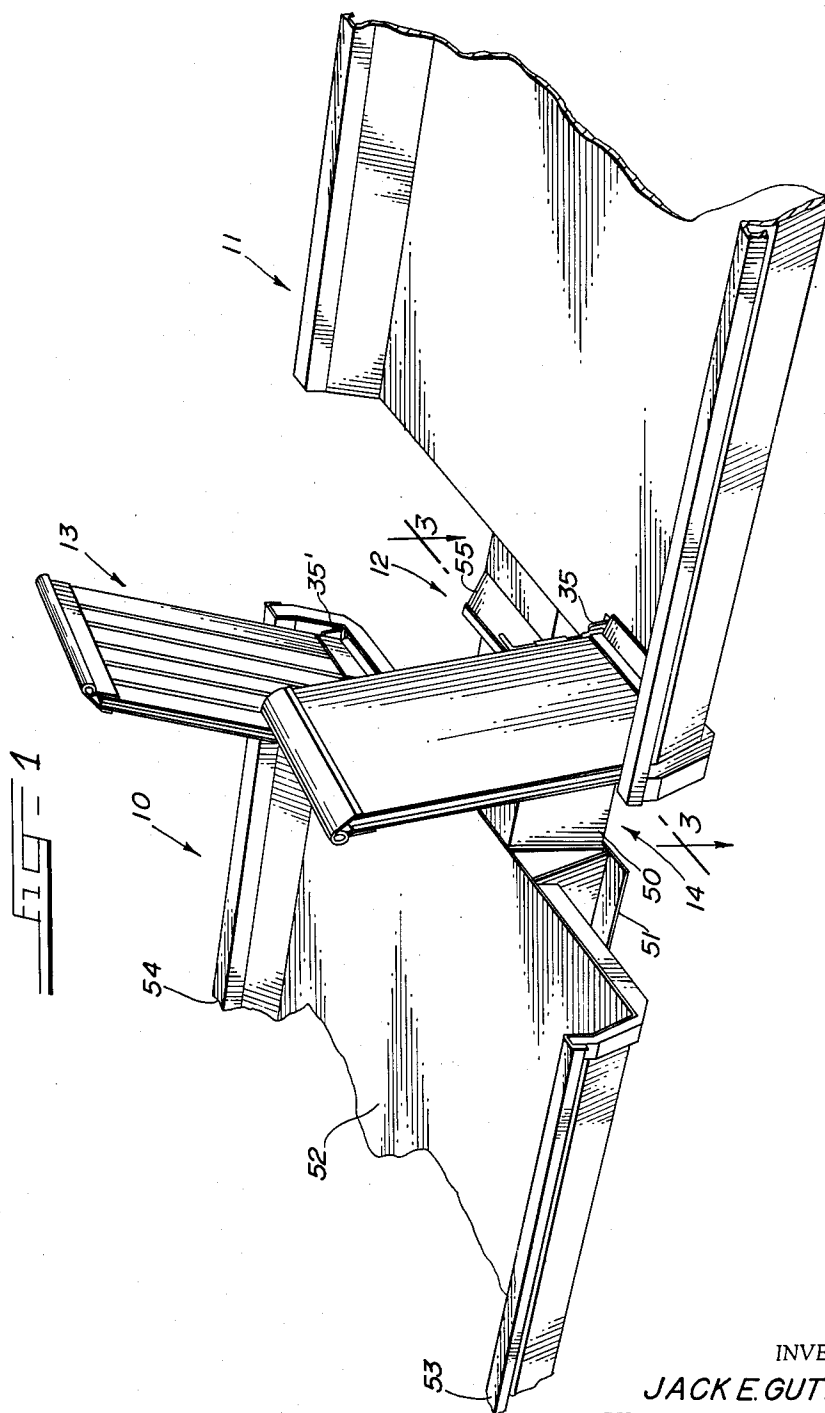
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BRIDGE PLATE ASSEMBLY

Filed Dec. 11, 1963

3 Sheets-Sheet 1



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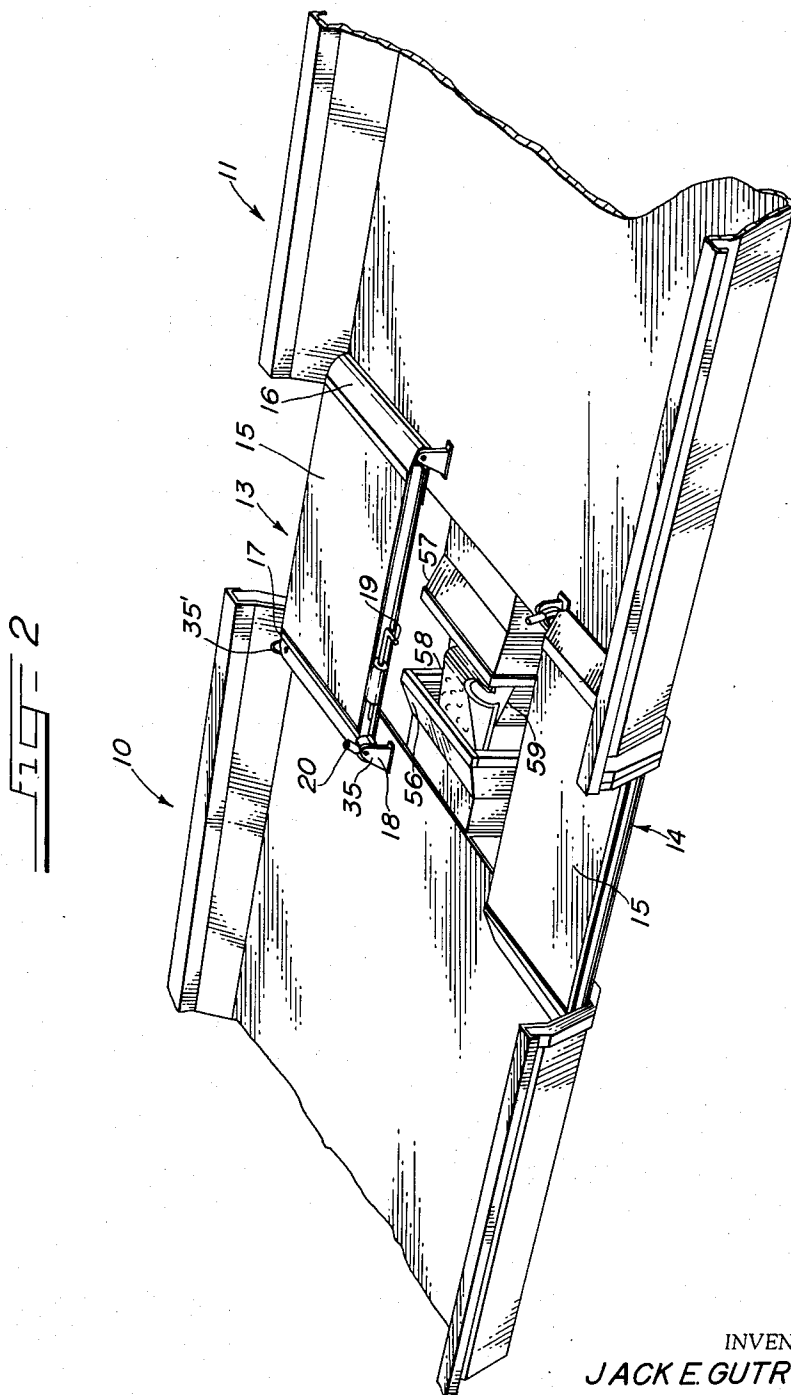
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3 Sheets-Sheet 2



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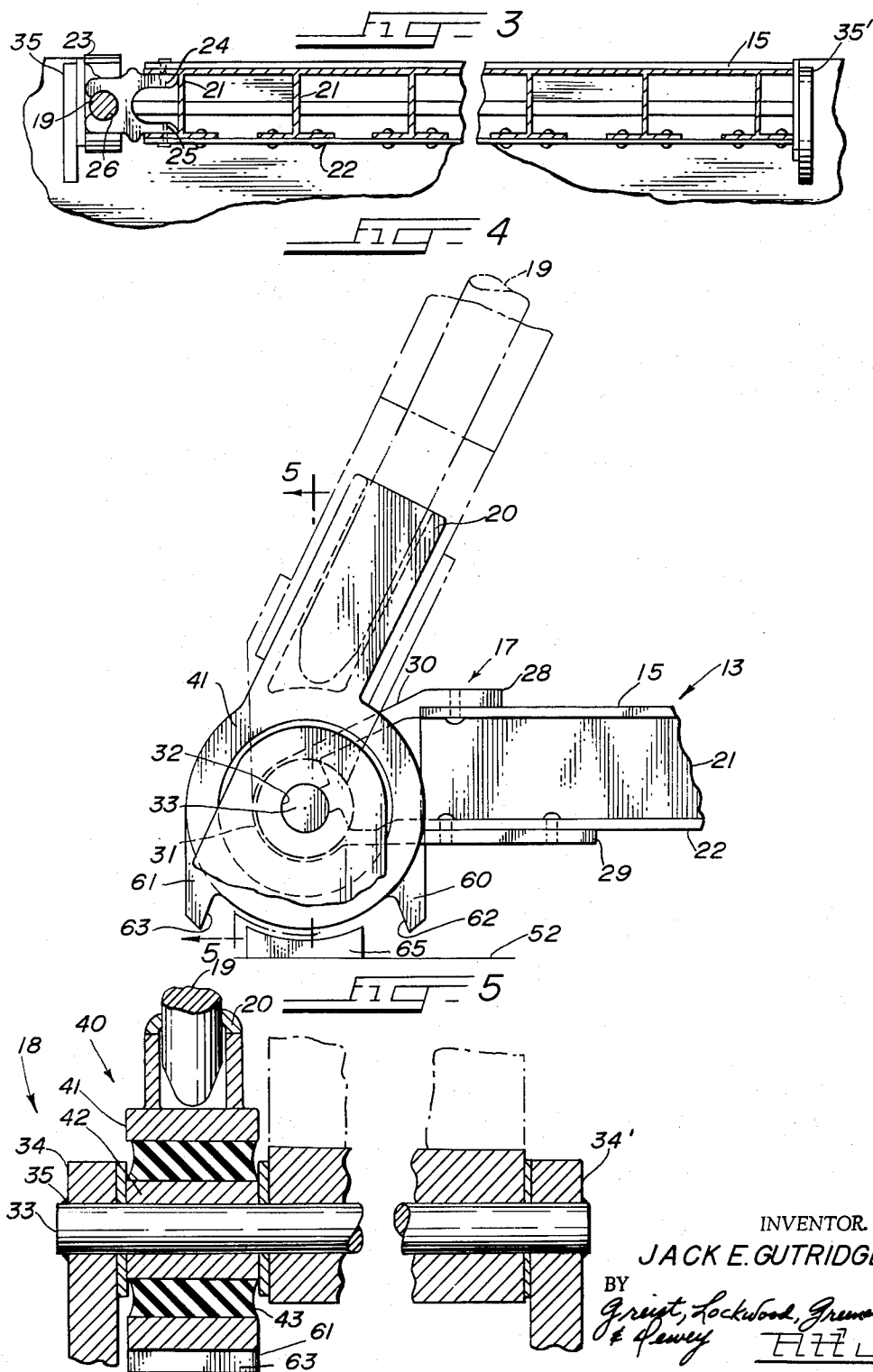
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BRIDGE PLATE ASSEMBLY

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3 Sheets-Sheet 3



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BRIDGE PLATE ASSEMBLY

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6 Claims. (Cl. 105-458)

This invention relates to a railroad car of the low side open deck variety particularly adapted for piggyback hauling service and more specifically relates to a new and improved lightweight bridge construction including means to maintain the bridge in a cushioned upright position when not in use.

Railroad cars particularly suited for piggyback type hauling have found widespread acceptance in the railroad industry. Each of the cars is equipped with bridge plates at diagonally opposite corners so that when a plurality of cars are coupled together the bridge plates may be lowered to span the gap between the cars to permit the loading of wheeled vehicles by merely driving them to the appropriate car. In many instances the vehicle or lading will comprise one or more highway trailers, which are usually loaded two to a car. Since most of the highway trailers are of great length, it is virtually impossible to fold the bridge plate to a horizontal position overlying a portion of the deck when not in use, since the ends of the trailers are closely adjacent the front and rear end of the car. Assuming that a satisfactory clearance was available, it is exceedingly laborious, difficult and cumbersome to rotate the bridge through a 180° arc to put the same into or out of use.

Accordingly, it has been customary to lock the bridges in a generally vertical position when not in use. The many forms of shock loading well known in the rail industry require that the bridges be securely mounted and locked in such a fashion that the hinge and locking structure will be protected. Shock mechanisms of varying complexities have been tried, however have been unsatisfactory for one reason or another such as requiring great expense in construction, occupying valuable load space and being unable to withstand repeated shock loading to mention a few.

Further problems have been encountered since the perfection of shock dissipating cushioning means for railway cars. Many of the piggyback flat cars now being manufactured include such cushioning means, and many existing flat cars are being modified to incorporate shock dissipating and cushioning means. Cushioning means for flat cars quite often include a sliding sill type cushioning arrangement which basically includes a longitudinally continuous sill structure slidably received in a box-like center sill in the underframe of the car. Couplers are mounted at the opposite ends of the sill while a suitable hydraulic or other type of cushion operatively interconnects the sliding sill with the underframe of the car. When a railway car is so equipped and receives an operational shock in buff or draft, the cushioning arrangement absorbs substantially all of the shock which results in a relative longitudinal movement between the sliding sill and the underframe of the railway car.

In order to accommodate this movement of the sliding sill, it has been necessary to space the couplers at the ends of the sliding sill a substantial distance beyond the ends of the flat cars. With the attendant increase between coupled cars, due to the increased spacing of their respective couplers, it has been necessary to provide each of the cars so equipped with bridge plates of a long length, and accordingly the problems alluded to above with respect to storing such bridge plates is greatly magnified.

A unique solution to these problems is presented by the present invention. The bridge plate about to be de-

scribed in detail, employs a central plate member of light-weight construction trimmed at opposite ends by a pair of identical ramps. One of the ramps is equipped with the central bore which receives a hinge pin carried by the car; an elastic locking means is also carried by the hinge pin having suitable means to co-operate with a sliding lock member on the bridge plate. Although the bridge plate may be of unusual lengths compared to existing prototypes, the light-weight construction allows the elastomeric locking means to maintain it in a substantially upright position throughout periods of operational shock. Moreover, the elastic locking means serves to dissipate energy generated by operational shock being transferred to the bridge plate. Accordingly, it is a principal object of this invention to provide a new and improved form of bridge plate particularly adapted to obviate the problems enumerated above.

It is a further object of this invention to provide a new and improved light-weight bridge plate construction for use on a piggyback railway car having a new and improved form of locking means to resiliently maintain the bridge in an upright position when not in use.

It is a further object of this invention to provide a novel locking mechanism of uncomplicated and relatively inexpensive construction which will limit and control the angular movement of the bridge in an upright position.

It is a still further object of this invention to provide a new and improved locking means for a bridge plate assembly which may be easily operated from the locked to unlocked position.

Further and fuller objects will become readily apparent when reference is made to the accompanying drawings wherein:

FIG. 1 is a fragmentary perspective view of the end portions of two cars coupled together with their respective bridge plates in the upright position;

FIG. 2 is a view similar to FIG. 1 with the bridges in the lowered position to permit passage of vehicles from one car to the other;

FIG. 3 is a cross sectional view taken along the lines 3-3 of FIG. 1;

FIG. 4 is an enlarged fragmentary side elevational view of the locking mechanism of the instant invention; and

FIG. 5 is a cross sectional view taken along the lines 5-5 of FIG. 4 with the bridge plate broken in the central section.

FIG. 1 illustrates the ends of two cars indicated generally at 10 and 11 held in coupled engagement by a coupling mechanism indicated generally at 12. One end of a longitudinally continuous sliding sill 50 is shown, being received in a box-like center sill 51 which is rigidly secured as a part of the underframe structure of the car. The car 10 includes a bed or deck portion having low side portions 53 and 54 to insure that the lading remains on the car as it is pulled over the deck 52.

In FIG. 1 the bridge plates 13 and 14 are illustrated in the locked or upright position, however as seen in FIG. 2, each of the bridge plates 13 and 14 has been unlocked and rotated to the down position to provide a pair of generally flat deck portions 15 and 15' respectively, to support vehicles or other forms of wheeled lading passing from one car to the other. Bridge plate 14 is identical in construction to the one illustrated at 13, as well as the bridge plate at the other ends of the cars (not shown), so in the interest of brevity, the description will be limited to the bridge plate 13.

With the bridge plate 13 in the down position, the coupling arrangement between the cars 10 and 11 is exposed to show the sliding sills 50 and 55 having outwardly flared coupler housings 56 and 57 respectively. Each of the coupler housing 56 and 57 carries a conven-

tional coupler 58 and 59 respectively which is pivotably mounted in a conventional manner within the flared coupler housing slidably receiving each of the sills.

It is to be understood that a hydraulic or other type cushion, such as that shown in the U.S. Patent No. 3,003,436, operatively interconnects each of the sills 50 and 55 to the underframe of the respective cars 10 and 11. Operational shock in buff or draft applied to the couplers of the railway cars 10 and 11 are absorbed by the cushioning means, which results in relative movement between 10 the sill and the cart. Such relative movement can be on the order of 20 to 40 inches in either direction making it necessary to space the couplers a substantial distance from the end sill of the car in order to accommodate this relative movement. This increased spacing requires 15 bridge plates used in conjunction therewith to be of sufficient length to span the increased distance between the end sills.

The flat deck portion 15 of the bridge plate 13 is provided at each end with a ramp 16 and 17 to allow a smooth transition of the vehicle from the deck of one car across the bridge plate and onto the deck of the other car. The ramp 17 also forms a housing for co-operation with a hinge assembly indicated at 18 to mount the bridge plate on the car for pivoting or angular movement. A locking pin 19 is slidably carried on one side of the bridge plate 13 for slidable reception in a locking receptacle 20 carried by the hinge structure 18. The details of the construction will be described more specifically in connection with FIGS. 4 and 5.

As illustrated in FIG. 3, the flat deck portion 15 has a series of webs 21 depending therefrom with each web 21 terminating in a transversely extending flange portion 22 to resist the tensile forces when the bridge plate is loaded. This section of the bridge may be formed in any suitable manner as by joining a series of I beams having a wide upper flange, or alternatively through an extrusion or like process. The unique construction minimizes the weight of the bridge with the attendant reduction in manufacturing cost without sacrificing available strength to support expected loads. Additional benefits are gained from the overall reduction in weight in that the bridge can be moved from the locked position or upright position to the down position with a minimum amount of effort.

In addition, when the bridge plate is in the locked or upright position, dynamic forces generated by rotational acceleration are minimized by reducing the overall mass to a minimum. The torque applied to the locking mechanism under impact is equal to the mass of the body times the radius to the center of the mass squared, times the angular acceleration. Therefore, evaluating the total applied torque, any reduction in mass of the rotating body results in a proportionate reduction in the applied torque allowing considerable reduction in the required strength of the hinge and locking structure.

Adjacent one edge portion of the bridge structure, a pin guide is provided for slidably supporting the locking pin 19. The pin guide is bifurcated to form a pair of leg members 24 and 25 one on one side, and has a generally cylindrical slot 26 to guidingly receive the pin 19 on the opposite side. The pin guide 23 may be fastened to the bridge structure by means of rivets, welding or the equivalent, and may be positioned at any point along the edge so long as the pin is of sufficient length to engage the pin receiving receptacle 20.

The enlarged views of FIGS. 4 and 5 illustrate the co-operative engagement of the locking pin 19 and the associated receptacle 20, together with an elastomeric means which resiliently holds the bridge in an upright position. The ramp portion 17 is attached to one end of the bridge plate, and is of uniform extruded construction having a pair of spaced leaf members 28 and 29 disposed on opposite sides of the bridge plate 13 and fastened thereto by means of rivets, bolts, welding or the like. Ramp 16 is of identical construction permitting a single extrusion

to be used which will trim both ends of the assembly and protect the tires of vehicles from damage which could be caused by exposed sharp edges.

The leaf portions 28 and 29 of the ramp 17 extend across the end of a bridge, with the portion 28 being integral with a gentle incline 30 which merges in an arcuate manner (as at 31) with the lower leaf 29. The central section of the arcuate portion 31 of the ramp 17 is provided with a cylindrical bore 32 to receive the hinge pin 33. A pair of mounting brackets 34 and 34' are fastened to the end sill of the car with the hinge pin 33 being welded to each bracket in the manner illustrated on mounting bracket 34 at 35.

The elastic support means is shown generally at 40 as including an outer bushing 41 coaxially disposed about an inner bushing 42. The inner bushing 42 is received on the hinge pin 33 with a press fit so as to be non-rotatable with respect thereto. Obviously, the hinge pin 33 may be formed of non-circular configurations to prevent the occurrence of relative rotation between a complementary configured bore in the inner bushing 42. For example, the hinge pin 33 may be provided with a rectangular cross section, keyed connection or the like for joining to the inner bushing 42. An elastomeric sleeve 43 is shot between the coaxial bushings 41 and 42, and due to the substantial compression rigidly grips the outer circumferential surface of the bushing 42 and the inner circumferential surface of the bushing 41 so as to prevent relative rotation between each of the bushings and the associated surface of the elastomer 43. In one specific embodiment, the elastomeric material comprised rubber of the order of 60-65 Durometer hardness, having a radial thickness of about five-eighths of an inch.

A pair of downwardly projecting lug members 60 and 61 are integral with the outer bushing 41 and have inwardly facing stop surfaces 62 and 63 for co-operation with a fixed stop block 65 attached to the deck 52. In this connection, it is to be appreciated that all the structure associated with the bridge plate is disposed above the deck so as to be completely clear of the underframe, sliding sill and the like so as to not interfere therewith. In addition, the bridge plate and locking assembly of the present invention is installed on new or existing cars with a minimum amount of effort.

The pin receiving pocket 20 is formed integral with or affixed to the outer bushing 41 by means of welding or the like. As illustrated in FIGS. 4 and 5, the pocket 20 receives the free end portion of the pin 19 which has a tapered arcuate end portion to assist in guiding the pin into the socket. When the bridge plate is in the position shown in phantom in FIG. 4, the pin 19 is received within the pocket 20 to hold the bridge plate section in a substantially upright position. Unlocking of the bridge plate is easily accomplished with the novel locking means of the present invention. The resilient mounting of the pin receiving pocket permits the bridge plate to be rocked back and forth to free the locking pin to allow withdrawal thereof, should it become "frozen" or stuck in the pin receiving pocket.

During switching operations, coupling and uncoupling of the cars, as well as in transit, substantial impact loads will cause the bridge plate to attempt to pivot. In the past, a variety of complicated mechanisms have been provided in an effort to prevent and/or control the pivoting movement thereof, however have not been successful, or alternatively are far too expensive for widespread commercial application. In addition, prior art prototypes generally are fastened beneath the deck structure and are not suited for applications wherein the whole end of the car moves in response to shock loading forces.

In the present invention, impact loading forces which attempt to rotate the bridge plate are transmitted through the pin guide to the lock pin 19, and then to the outer bushing 41. Under this arrangement, outer bushing 41 attempts to rotate with respect to the non-rotatable inner bushing 42, causing torsional forces to arise in the elas-

tomer section 43. Since the elastomer section 43 is resilient, a slight rotation of outer bushing 41 occurs with the rubber being placed in shear, permitting the bridge structure to move through a slight angle either clockwise or counterclockwise from the static point shown. In the event the dynamic loading forces are sufficient to rotate the outer bushing 41 to a degree that the elastomer approaches a maximum shear condition, further rotation is prevented by the appropriate lug 60 or 61 coming into contact with the stop block 65 to prevent further rotational movement. This serves to protect the elastomeric bushing from being stressed beyond its elastic limit. It is to be appreciated however that a greater portion of the dynamic forces developed are dissipated in the elastomeric bushing 43 before the lugs 60 and 61 engage the stop block 65, so the final impact will be of a low order of magnitude. The total angular swing of the bridge plate is easily governed from about 40° or 50° on either side of a neutral position to lesser angles by adjusting the longitudinal dimension of the stop block 65.

In one specific embodiment of the invention, the angularity of the bridge under static or locked conditions was of the order of about fifteen degrees with respect to a purely vertical plane. Under such circumstances, the angular movement was controlled between a purely vertical position and about 25° on the other side of the static position, limiting the total pivoting movement to a total of about 40°. Obviously, this prevents the bridge from striking lading carried on the car while the elastomeric locking means is resiliently absorbing the energy of impact forces generated by the mass of the bridge plate. The elastomeric locking means controls the angular movement of the bridge plate absorbing and damping the applied shock forces in such a manner that little if any force is left at the point where the lugs 60 and 61 engage the stop block 65 to provide a positive limit to the angular travel of the bridge plate.

Since the static position is slightly angulated with respect to a purely vertical direction, the weight of the bridge constitutes one force which resists counterclockwise movement towards the lading on the car. Under the above conditions, the maximum angular movement from the static position counterclockwise will always be somewhat less in magnitude than the angular movement in a clockwise direction because the forces of gravity will subtract from the total dynamic forces on the bridge section. It is obvious that greater clockwise movement under impact is permissible since no obstructions exist between the cars other than the end of an adjacent car.

While a specific type of lightweight bridge plate has been illustrated and described, it is not intended to limit the invention to this specific type since it is readily apparent that the novel locking means may be applied to other forms of bridge plates. It will become immediately obvious to those skilled in the art, that other modifications and variations of the invention may be made without departing from the spirit and scope thereof and therefore, only such limitations should be imposed as are indicated in the appended claims.

I claim:

1. In a railway car particularly adapted for piggyback lading operations, said car having coupling means projecting from one end thereof to co-operate with the next adjacent car, the provision of pivoting bridge plate means

carried at diagonally disposed ends of said car for projecting over to the next adjacent car, said bridge plate means of sufficient transverse width to permit wheeled lading to be driven thereover when spanning the distance between adjacent cars, said bridge plate means having hinge means at one end thereof for pivotably mounting said bridge plate means on said car for angular movement about a generally horizontal axis, a locking pin member carried by one of said bridge plate means and said car, a pin receiving pocket member on the other of said bridge plate means and said car, and elastomeric means resiliently mounting one of said members to torsionally control and dampen the angular travel of said bridge plate means under shock loading when said bridge plate is locked in a transit position.

2. A railway car of the generally flat deck variety, said car being adapted to receive wheeled vehicles for transportation thereof, a bridge plate positioned at one end of said car to permit said wheeled vehicles to be driven thereover when lowered, a hinge structure supporting said bridge plate for pivoting movement between a horizontal position and a generally upright position, locking means cooperating with said bridge plate and said car resiliently maintaining said bridge plate in a generally upright position between defined angular limits during periods of non-use, said locking means including a pin member and pocket member interposed between said car and said bridge plate and operatively connected thereto for locking said bridge plate in an upright position, resilient means mounting one of said members, said resilient means being stressed in torsion to allow limited angular movement of said bridge plate when locked in a generally upright position to protect said hinge structure and said locking means under conditions of shock loading.

3. The railway car of claim 1 wherein a positive limit means is associated with said elastomeric means to provide a positive stop after a predetermined angular travel of said bridge plate means.

4. The railway car of claim 1 wherein said elastomeric means includes spaced generally coaxial inner and outer cylindrical members having an elastomeric substance therebetween.

5. The railway car of claim 2 wherein said resilient means includes inner and outer cylindrical bushing members being held in coaxial relationship by an elastomeric substance therebetween, said inner cylindrical bushing being non-rotatably held by a cross shaft forming a part of said hinge structure.

6. The railway car of claim 5 wherein said outer cylindrical bushing is provided with a pair of angularly spaced stop surfaces and stop means is provided on said car to positively limit the total shear force on said elastomeric substance.

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