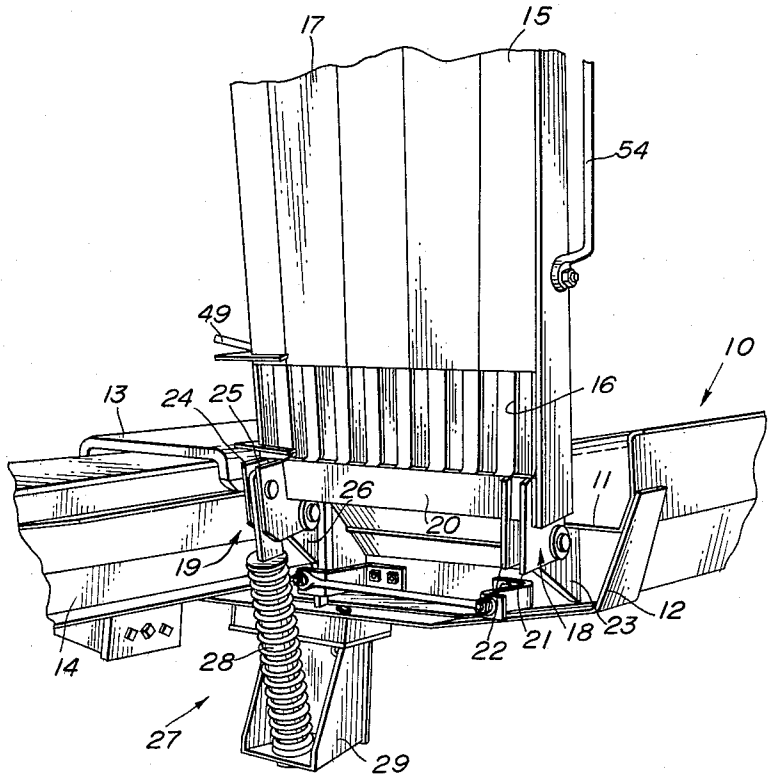
Nov. 9, 1965 A. M. BOONE 3,216,373

BRIDGE PLATE COUNTERBALANCE DEVICE

Filed Dec. 16, 1963 4 Sheets-Sheet 1

FIG. 1



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BRIDGE PLATE COUNTERBALANCE DEVICE

Filed Dec. 16, 1963 4 Sheets-Sheet 2

Fig - 2

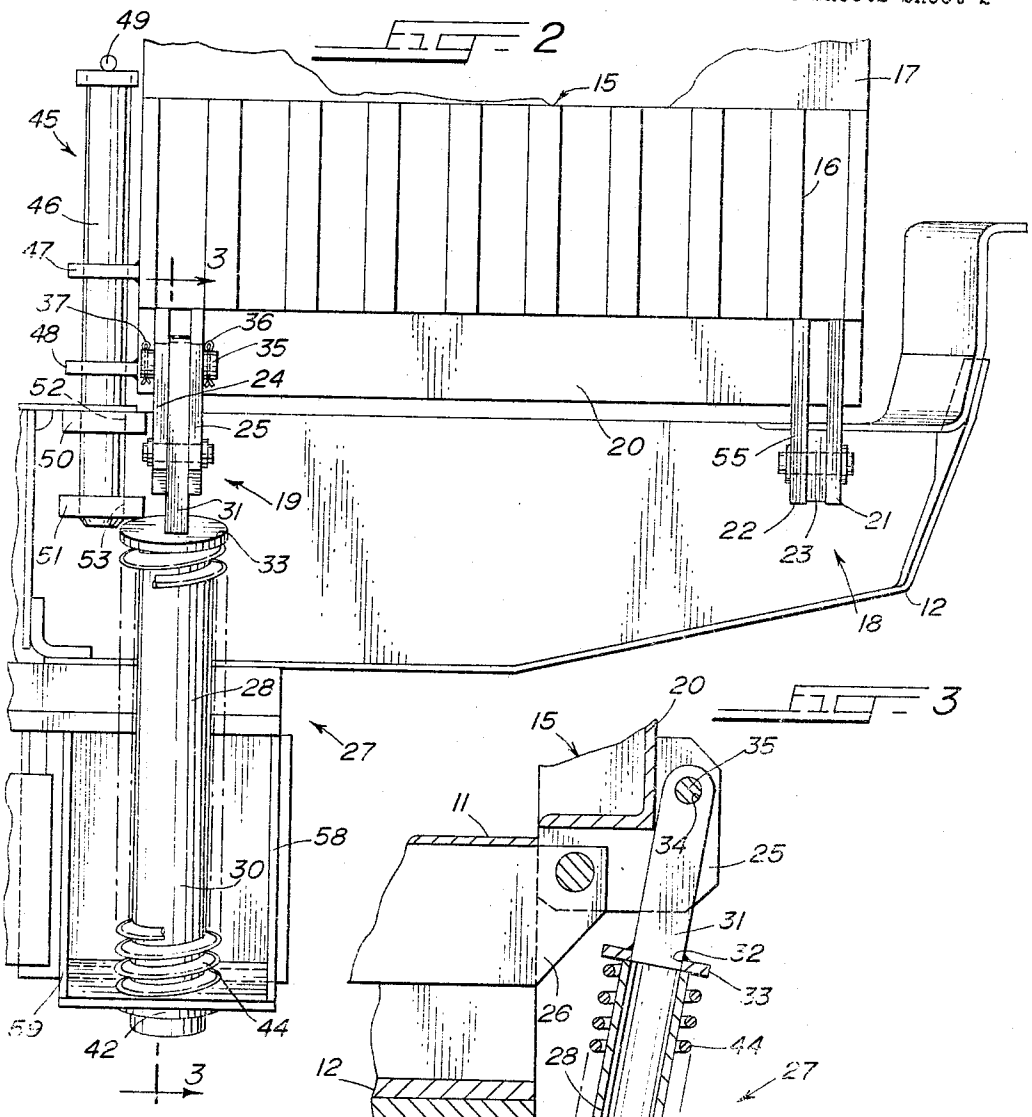


Fig - 3

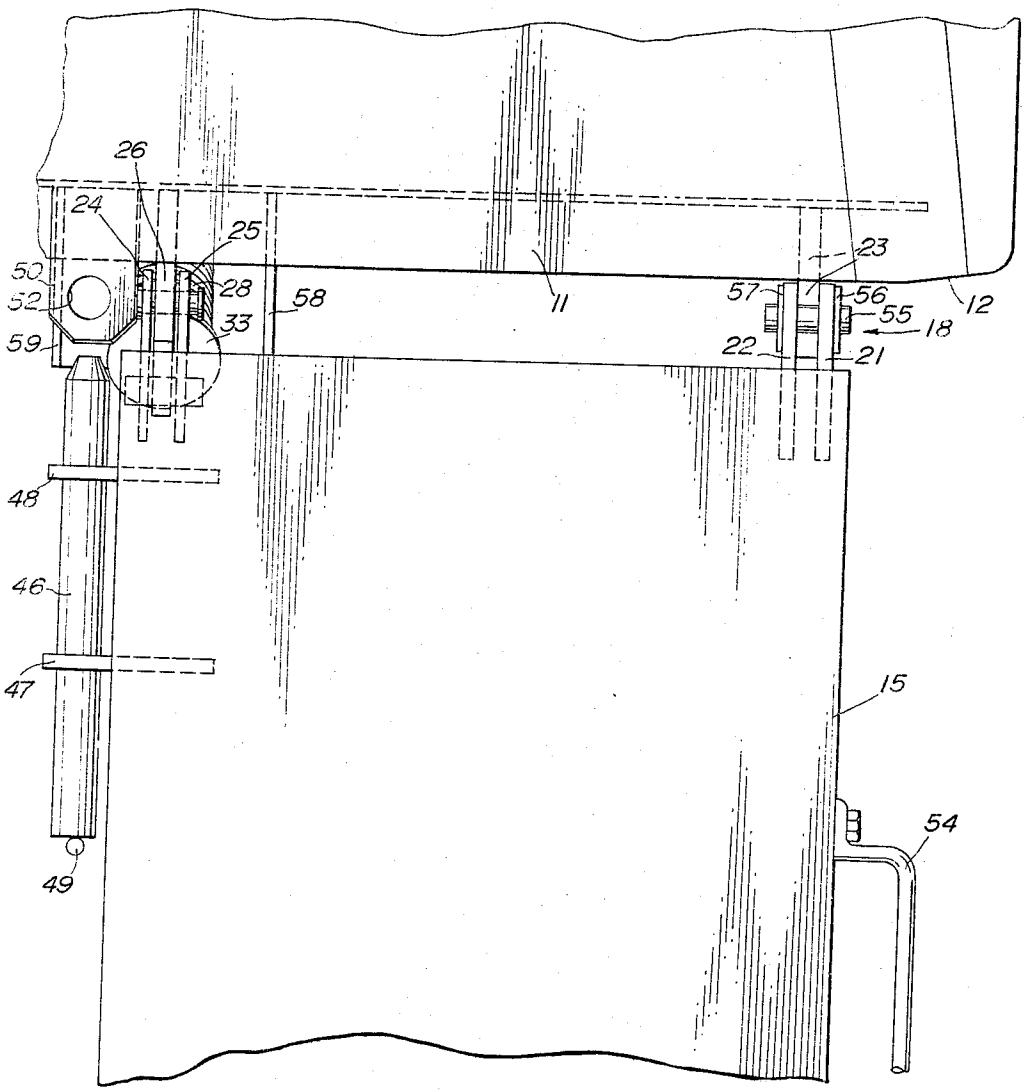
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BRIDGE PLATE COUNTERBALANCE DEVICE

Filed Dec. 16, 1963 4 Sheets-Sheet 3

FIG. 4



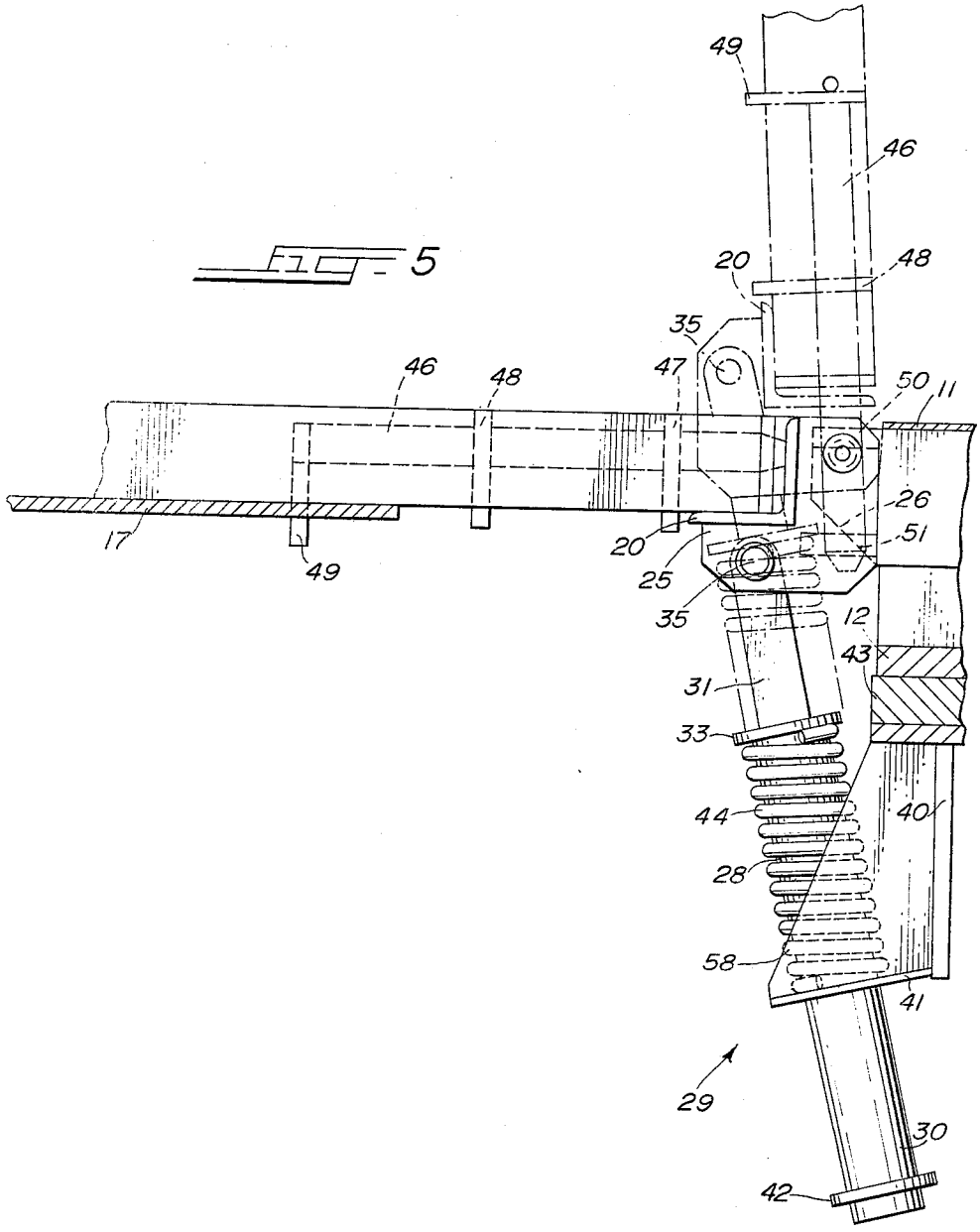
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FIG. 5



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BRIDGE PLATE COUNTERBALANCE DEVICE

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4 Claims. (Cl. 105—458)

This invention relates to a new and improved bridge plate assembly for railway vehicles of the piggyback type. More specifically, the present invention relates to a new and improved bridge plate assembly having a simplified but efficient counter-balancing device associated therewith, in order to minimize the effort required to move the bridge plate from a horizontally disposed or operative position to a substantially vertical or transit position or vice versa.

The popularity of piggyback type hauling has been ever increasing due to the improved car structures and associated shock dissipating means which serve to protect the piggyback lading through transit. The individual railway cars employed in piggyback lading operations are provided with bridge plates to assist in the rapid loading and unloading of the various forms of lading by permitting the same to be driven or pulled to the particular car occupied during transit.

Shock dissipating devices have resulted in the couplers of the associated cars to be extended up to several feet from the end of the car in order to accommodate the more popular types of shock dissipating means. Accordingly, the bridge plates on such cars must be increased in total length in order to span the increased distance between adjacent cars having extended couplers in coupled relationship. As a result, the increased length of the bridge plate generally requires the central section thereof to be increased in vertical depth to resist the anticipated increase in shear forces. Normally, this requires bridge plates to be heavier and bulkier than predecessor types and therefore requires considerable effort to move the same between the operative and inoperative positions. As a result, what was once a one man job in storing or lowering bridge plates oftentimes now requires the effort of two men.

Loading and unloading of trailers is presently a one man operation since the development of the pull-up types of fifth wheel stands and tractors to cooperate with the same. Obviously, it would be highly desirable if suitable means could be provided to enable bridge plates to be raised and lowered by one man without fear of overexertion or injury thereby to maintain the loading and unloading operation a one man job, with the expected reflections in the overall cost of piggyback hauling.

The present invention is directed to a simplified and economical answer to the problem set out above. A counterbalance device is provided for ready attachment to existing bridge plate designs as well as being easily applied to new models of integrated transportation types of specialty cars having extended bridge plates. The present invention serves to materially reduce the effort required to move the extended bridge plates between the inoperative and operative positions and permits easy operation by the efforts of one man.

Broadly speaking, counterbalances have been used in a wide variety of applications ranging from double hung windows, draw bridges and the like to primitive types of lever means to assist in withdrawing water from lakes and rivers. In the railroad intustry, counterbalance devices have been provided on platforms of passenger cars and the like, such devices usually acting on a spring means in torsion. In the freight transportation end of the industry, the special sill struture required to accommodate

the shock dissipating means, eliminates any possibility of using most of the known prior art types. Other types are automatically eliminated for other reasons such as inefficiency, or in the great bulk of the cases, the complex and expensive construction required.

The present counterbalancing device provides a number of advantages in the form of reduced costs of construction, generally attributable to the overall minimization of working parts, and is exceedingly simple to install on existing cars as well as those currently being manufactured. The placement of the counterbalancing device of the present invention is such that it will not interfere with the cushioned travel of sliding sills, or the uncoupling mechanisms associated therewith. In addition, maximum efficiency will be obtainable to minimize the total effort required to move the bridge plate and associated locking mechanisms from a substantially vertical position to a substantially horizontal position. The relatively few working parts of the counterbalance device are disposed out of the path of travel of the lading as it passes from one car to the other car over the bridge plate during loading and unloading operations, without such placement impairing the efficient and smooth operation of the device. Numerous other benefits and advantages will become apparent upon a consideration of the more prominent objects achieved and a full description of the present invention.

It is therefore an object of this invention to provide a bridge plate assembly having a new and improved counterbalance device thereon.

It is a further object of this invention to provide a bridge plate assembly in a piggyback lading car having a counterbalance device to greatly reduce the effort required to move the bridge plate assembly into and out of service.

It is a still further object of the invention to provide a simplified counterbalance device for bridge plate assemblies on railway vehicles of the piggyback lading type, which counterbalance device is easily installed, highly efficient and of an economical and lightweight design.

It is a still further object of this invention to provide a new and improved counterbalance device of simplified design particularly adapted for use with bridge plates on piggyback type railway vehicles and which assists in moving the bridge plate between operative and inoperative positions.

Further and fuller objects will become readily apparent when reference is made to the accompanying drawings wherein like reference characters refer to like parts.

FIG. 1 is a fragmentary perspective view of an end portion of a car having a bridge plate locked in the upright position and illustrating the counterbalance device of the present invention in the extended position;

FIG. 2 is a fragmentary enlarged front elevational view of the bridge plate and end portion of the car of FIG. 1 with the counterbalance device of the present invention in the extended position;

FIG. 3 is an enlarged cross sectional view taken generally along the lines 3—3 of FIG. 2;

FIG. 4 is a top plan view of a fragmentary end portion of the railway car and bridge plate illustrating the transverse location of the counterbalance device of the present invention; and

FIG. 5 is an enlarged side elevational view showing the bridge plate and counterbalance device of the present invention in solid lines when the bridge plate is in the operative position with phantom lines indicating the position assumed when the bridge plate is in the inoperative or transit position.

Referring now to FIG. 1, reference character 10 indi-

cates a railway car **10** having an end portion **11** which terminates in the usual end sill **12**. A stationary center sill **13** is provided centrally of the car having a sliding sill **14** telescopically received therein in a well known manner.

A bridge plate assembly is indicated at **15** being shown fragmentarily having an open web end portion **16** with center plates **17** in the central region of the bridge plate **15**. A pair of hinge assemblies **18** and **19** are attached to a trim piece **20** covering the raw ends of the open webbing **16** for joining the bridge plate to the car **10** for pivoting movement relative thereto. The counterbalance device of the present invention is indicated generally by the reference character **27** and generally includes a guide member **28** extending between the hinge assembly **19**, and a fixed guide means, indicated generally at **29**, carried by the end sill **12** of the car **10**. The specific details of the counterbalance device of the present invention will be given hereinafter in connection with FIGS. 2–4.

The hinge assembly **18** includes a pair of hinge plates **21** and **22** attached to the end trim piece **20** carried by the bridge plate **15**. The hinge plates **21** and **22** are in spaced relationship and receive a co-operating fixed hinge bracket **23** therebetween for joining therewith through the use of suitable hinge pin means which will be specifically described hereinafter. The hinge assembly **19** is also provided with a pair of spaced hinge plates **24** and **25** which are in overlapping engagement with opposite sides of a fixed hinge bracket **26**. Plates **24** and **25** are of increased depth with respect to plates **21** and **22** for reasons to become apparent.

Referring now to FIGS. 2–4, the construction of the counterbalance device and the means for attaching the same to the bridge plate assembly **15** and railway car **10** will be described. The guide member **28** is formed of a generally cylindrical tubular member **30** having a disk-like collar **33** of greater diameter capping off the upper end thereof, to provide a shoulder for abutment by one end of a spring **44**. A rectangular bar member **31** has one end received in a rectangular opening in the central portion of the collar **33** and welded thereto. The tubular member **30** may be joined to the collar **33** in a similar fashion.

The upper end of the bar member **31** is provided with a suitable transverse aperture **34** aligned with co-operating apertures in the enlarged hinge plates **24** and **25** with suitable means such as the connecting pin **35** joining the plates and bar member **34** for pivoting movement therebetween. The pin **35** may be equipped with cotter pins **36** and **37** in suitable transverse holes at opposite ends to maintain the guide member **28** joined to the bridge plate **15** by retaining the pin **35** in operative association with the hinge plates **24** and **25** and bar member **31**.

The guide means **29** is formed by a backing plate **40** with side reinforcing plates **58** and **59** joined to an angularly disposed bottom portion **41**, the latter being provided with a central aperture **39** slidably receiving the lower end of the guide member **38**. A lower collar member **42** is joined on the tubular member **30** and limits the upward travel of the guide member **28** keeping the spring under slight compression at its fully extended position. The backing plate **40** and side reinforcing plates **58** and **59** are attached to the end sill **12** through the interposition of a spacer member **43** which is joined to the end sill by means of bolts, riveting or the like.

The compression spring **44** surrounds the guide member **28** being bottomed on its upper end of the enlarged disk-like collar **33**, with the opposite end in abutting engagement with the angularly disposed portion **41** of the bracket **40**. As relative movement occurs between the guide member **28** and the guide means **29**, the spring is compressed and extended, storing and releasing energy to assist in movement of the bridge plate **15** in a manner to be more completely described in connection with FIG. 5, when a full description of the operation of the counterbalance device is given.

The bridge plate **15** is provided with a locking means indicated generally at **45** and including a locking pin **46** carried on the bridge plate **15** by means of a pair of spaced guide brackets **47** and **48**. The locking pin **46** is provided with a transverse handle portion **49** to facilitate easy manual movement thereof along the central longitudinal axis between fixed limits, from a locked position to an unlocked position. The lower end of the guide pin **46** is received in a pair of apertures **52** and **53** formed in fixed locking brackets **50** and **51**, with the latter being attached to web portion of the end sill **12** by means of welding or the like. The locked position can only occur when the bridge plate assembly is in the vertical position allowing the guide pin to be slidably received in the apertures **52** and **53** in the locking brackets **50** and **51** respectively. Other forms of locking means which will not interfere with the counterbalance device **27** are equally suitable. If the locking means for some reason is accidentally unlocked, the lower collar **42** on the guide member **28** will engage the guide means **29** to limit the angular travel of the bridge plate **15** towards the lading on the car to prevent contact therewith, while the spring will resist angular travel in the opposite direction.

As seen in FIGS. 1 and 4, a handle **54** (shown fragmentarily) may be provided along a marginal edge portion of the bridge plate **15** to allow the manual movement thereof between the vertical or transit position and the down or operative position shown in FIG. 4. The construction of the hinge assembly **18** is also evident in FIG. 4, illustrating the hinge plates **21** and **22** joined to the fixed hinge bracket **23** by means of a hinge pin **55** having a pair of collar members **56** and **57** welded on opposite ends to prevent lateral displacement of the hinge pin **55**. An identical connection is provided for the hinge assembly **19** so description thereof is not deemed necessary.

In operation, the bridge plate **15** will be moved to the position shown in solid lines in FIG. 5. Vehicles may pass from the end portion **11** of the car **10** across the bridge plate **15** to an adjacent railway car in order to allow the rapid loading and unloading of the lading. During the transportation of the lading or the empty car, the bridge plate is in the position shown in phantom lines in FIG. 5 with the locking pin **46** disposed within the locking brackets **50** and **51** in the manner best illustrated in FIG. 2. Upon arrival at the destination, the bridge plate may be lowered by pulling upwardly on the handle **49** to withdraw the locking pin **46**, unlocking the bridge plate and allowing it to be subsequently lowered by slight manual effort. With the bridge plate **15** in the transit or upright position, the center of mass is practically in vertical alignment with the hinge pins **55** connecting the bridge plate **15** to the end sill **12**. Thus, the hinge assemblies **18** and **19** will carry substantially all of the weight of the bridge plate **15**. As the bridge plate **15** is swung about the hinge assemblies **18** and **19** toward the extended position, the center of mass will move in a generally arcuate path with the horizontal distance between the pin **35** and the center of mass increasing. Less and less downward weight or force will be distributed on the hinge pins **55** since the greater portion, acting through a lever arm of increasing length will be transferred through the pin **35** to the guide member **28** with the hinge pins on the bridge plate **15** ultimately acting as a fulcrum. This causes the guide member to move relative to the guide means **27** placing the spring **44** in compression due to the action of the collar **33** on one end, and the resistance of the bottom plate **41** on the other end to movement of the spring **44**. In the lowered position of the bridge plate **15**, shown in solid lines in FIG. 5, the spring **44** is in the fully compressed position, having maximum potential energy available to assist in moving the bridge plate **15** to the upright position.

The value of the potential energy is easily determined by multiplying the spring constant times the squared value of the differential distance between its extended and com-

pressed position, with the total product being divided by two, with the qualification that the total deformation remains within the elastic limits of the spring. Accordingly, with changes in weight of bridge plates, a spring having the appropriate constant may be provided to develop maximum potential energy, while permitting the bridge to remain extended (horizontal).

As the bridge is raised to the transit position the distance of the center of mass to the pin **35** decreases in a gradual manner somewhat analogous to the diminution of force exerted by the counterbalance device on the bridge plate. The upward force exerted by the spring **44** is decreasing, however the lever arm between the hinge **55** (measured horizontally) increases reaching a maximum when the bridge plate is at about a 45° angle. This is made possible by connecting the guide member above, and outwardly of the hinge pin **55** when the bridge plate is in a vertical position. As the bridge plate swings to a horizontal position, the spring is loaded with the rear edge of hinge plates abutting the end sill to form a stop, at which time the counterbalance is loaded by compressing the spring **44**. The bridge plate may be raised in the manner described above. Thus, only a light lifting force on the handle **54** is required to move the bridge plate **15** upwardly since the spring member **44** will assist in the movement until it arrives at the locking position shown in phantom.

The counterbalance device prevents bridge plates from being dropped due to the resisting action of the spring, and accordingly reduces the damage to the ends thereof. It is obvious that "short" bridge plates could use the present invention as well as the long bridge plates shown.

It will become immediately obvious to those skilled in the art that certain 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. A railway car having an end sill portion, a bridge plate, hinge means fixed on said end sill and mounting said bridge plate for angular movement between a substantially vertical transit position and a generally horizontal loading position extending outwardly from said end sill, a counterbalance device for assisting in manual movement of said bridge plate from said horizontal loading position to said vertical transit position, said counterbalance device including a guide member, means pivotably attaching one end of said guide member to said bridge plate located at a point outwardly of and eccentric with respect to said hinge means, guide means mounted on said end sill portion outwardly thereof and below said hinge means and slidably receiving said guide member for reciprocating movement in a generally vertical direction, a helical spring surrounding said guide member, said spring having one end thereof movable with said guide member and the other end thereof bottomed on said guide means so as to be compressed upon angular movement from said vertical transit position to said horizontal loading position

whereby the total force generated by said spring will increase as said bridge plate is moved from said substantially vertical transit position to said substantially horizontal loading position.

2. The railway car of claim **1** wherein a collar is provided on the lower end of said guide member to limit the upward travel thereof through said guide means and so that said bridge plate is restrained against angular turning inwardly of said end sill when in said vertical transit position.

3. In a railway car having a longitudinally movable sill extending therefrom and a stationary center sill telescopically receiving said movable sill, a bridge plate assembly, hinge means mounting said bridge plate assembly on said end sill for angular movement between a generally vertical transit position and a generally horizontal loading position and extending outwardly from said end sill, a counterbalance device having a guiding portion mounted beneath an end sill portion of said car closely adjacent said stationary sill, a guide member received in said guide portion for reciprocating movement outwardly of an end sill portion of said car, said guide member having one end thereof pivotally attached to said bridge plate eccentric with respect to the axis of said hinge means, first and second collars on said guide member, one of said collars being on one side of said guiding portion with the other collar on the opposite side of said guiding portion, a helical spring means disposed about said guide member having one end abutting one of said collars with the other end being in abutment with said guiding portion, said spring having a spring constant value with respect to the weight and length of said bridge plate to permit said bridge plate to remain in a horizontal position when moved thereto while exerting sufficient upward force on said bridge plate to assist in movement thereof to a vertical position and which force is of gradually diminishing value as said bridge plate approaches said vertical transit position.

4. The railway car of claim **3** wherein the one of said collars not engaged by said spring serves to limit the angular movement of said bridge plate in the direction urged by said spring.

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