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O'Leary et al.

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[54] METHOD AND MEANS FOR SECURING LADING ON RAILWAY FLAT CARS

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[52] **U.S. Cl.**.....**105/369 A**, 248/361 A

[51] **Int. Cl.**.....**B60p 7/10**, B61d 45/00

[58] **Field of Search**.....105/369 A, 369 U, 368 T; 280/179 A; 248/361 A

[56] **References Cited**

UNITED STATES PATENTS

3,462,137	8/1969	Grube	105/369 A
1,503,083	7/1924	Amey et al.	248/361 A
1,208,667	12/1916	Sammel	248/361 A
2,628,397	2/1953	Olson	105/369 A
1,867,352	7/1932	Churgay et al.	105/369 A
3,152,693	10/1964	Anderson	105/369 A
2,539,997	1/1951	Graves	280/179 A
2,559,185	7/1951	Carroll	280/179 A
2,947,514	8/1960	Goss	105/369 A

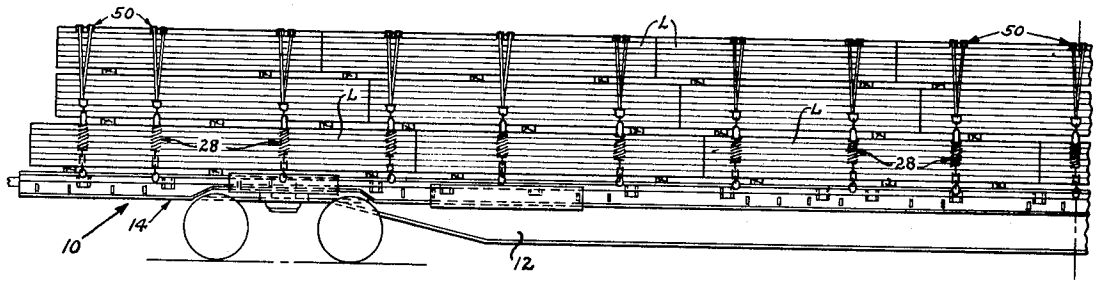
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[57] **ABSTRACT**

A railway flat car for carrying loads, such as lumber, on the deck of the car with resiliently anchored banding providing tie-downs to secure the loads onto the deck so that a minimum travel or shifting of the loads longitudinally along the deck is obtained when the loads settle and impact forces are exerted against the car. The banding is arranged in an endless double loop over the load with the free ends of the bands positioned over the upper surface of the load for tensioning and securement. The double loop permits the banding to slip longitudinally about its anchor points thereby to provide a mechanical advantage and permitting a relatively high initial tensioning to be obtained with conventional tensioning equipment without the use of power tools. Various means are employed to reduce any pretensioning in the banding upon removal of the banding and unloading the flat car.

9 Claims, 15 Drawing Figures



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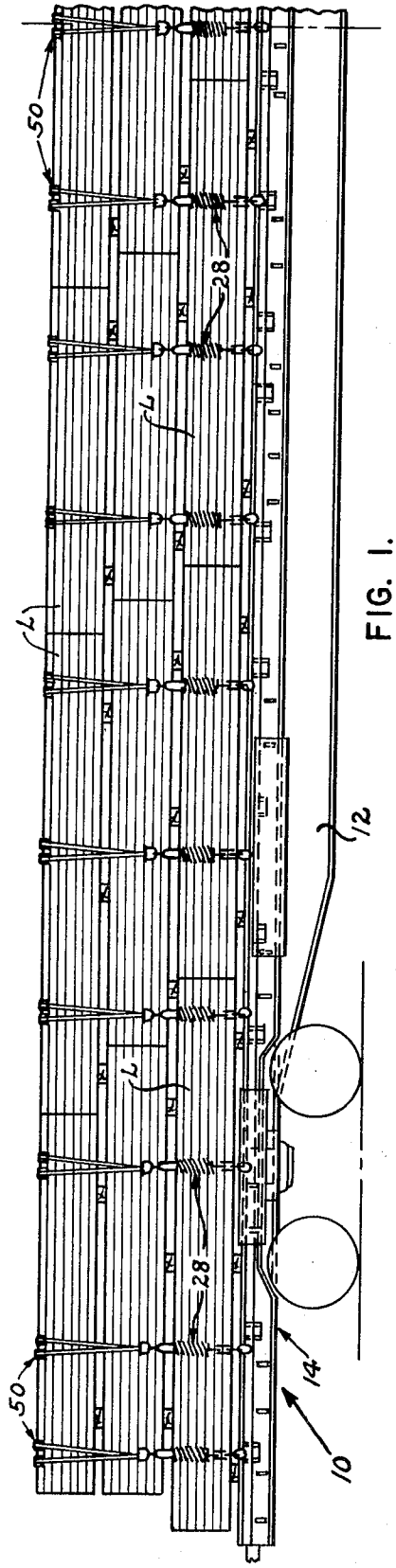


FIG. 1.

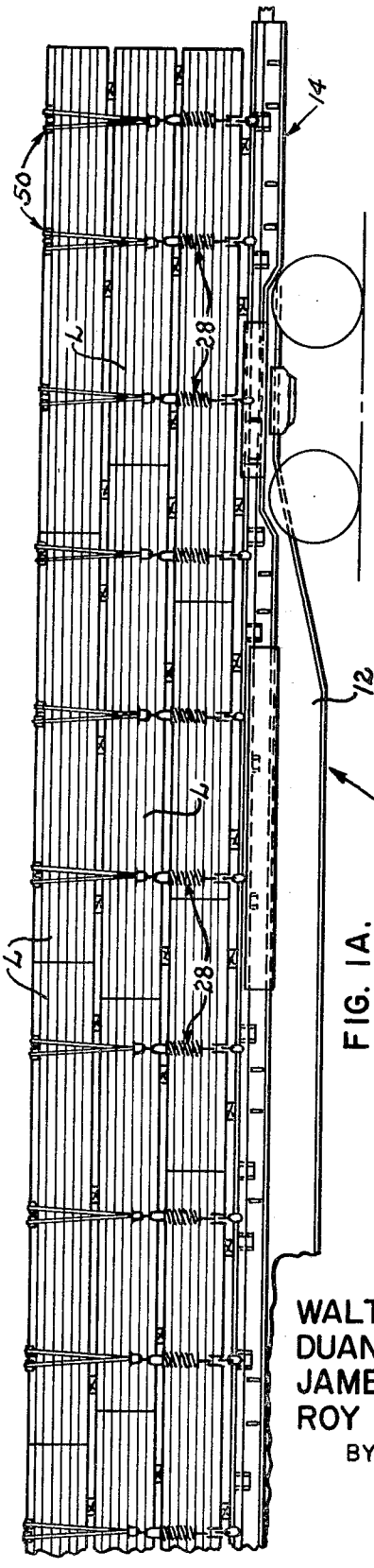


FIG. 1A.



FIG. 8A

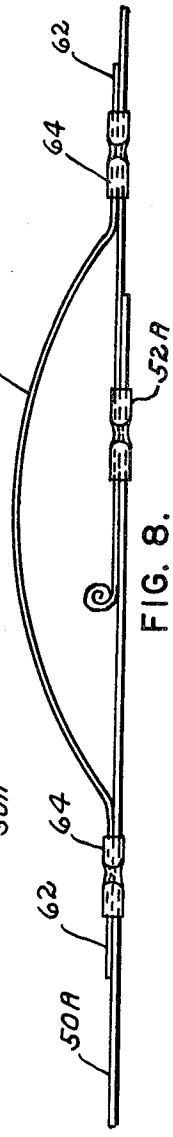


FIG. 8.

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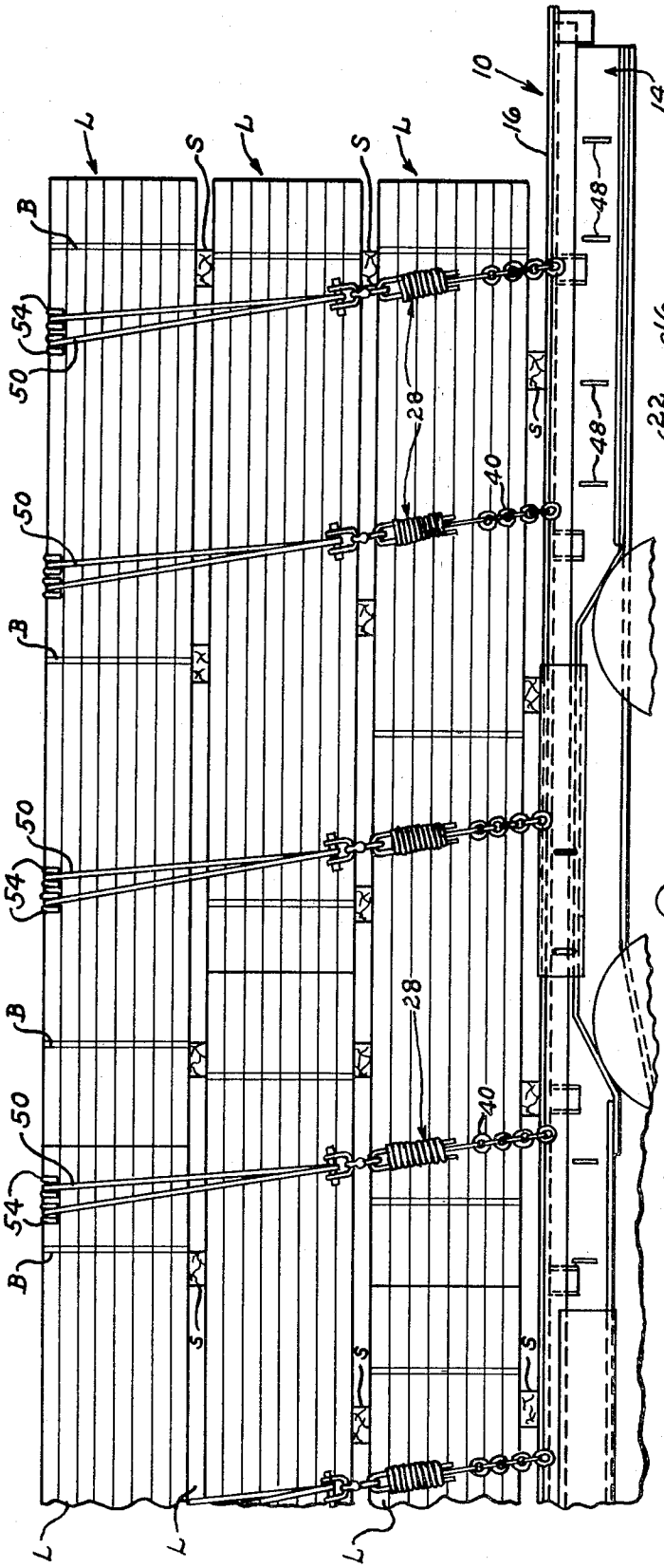


FIG. 2.

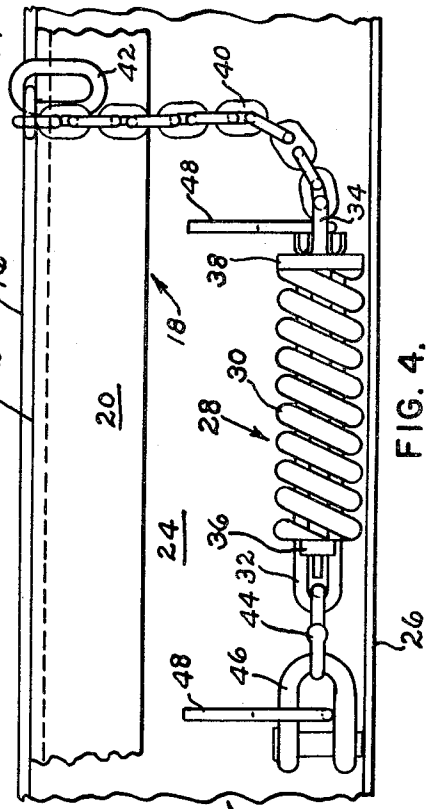


FIG. 4.

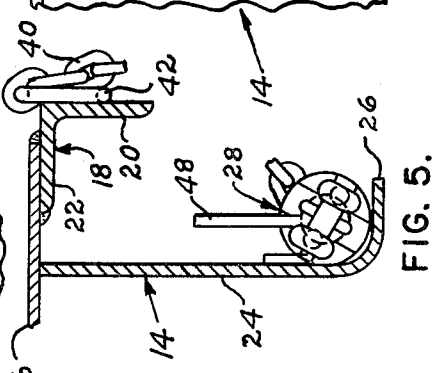


FIG. 5.

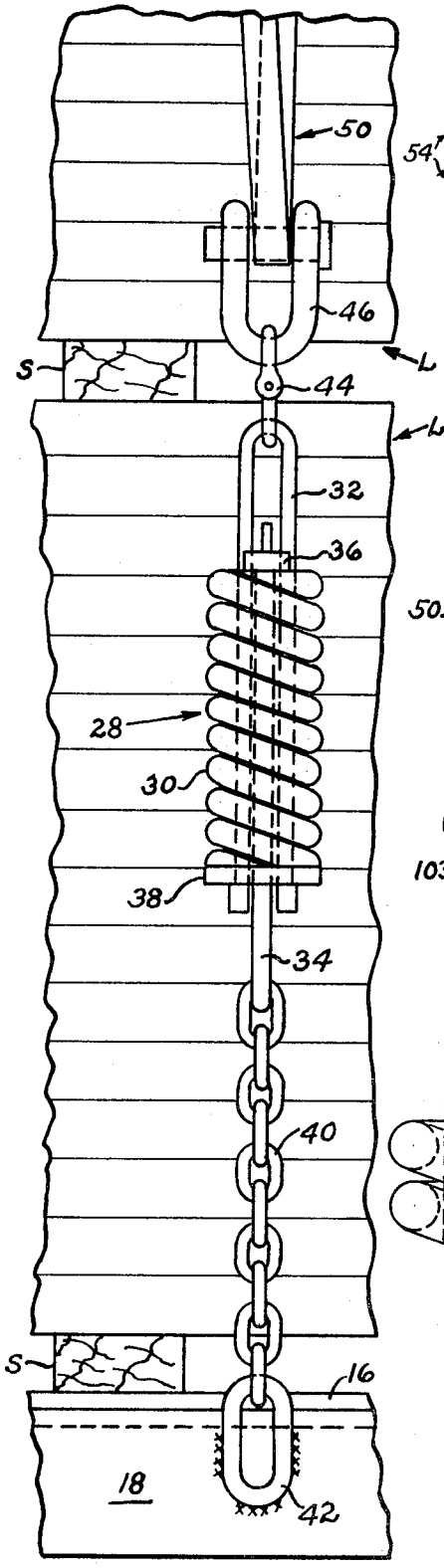


FIG. 3.

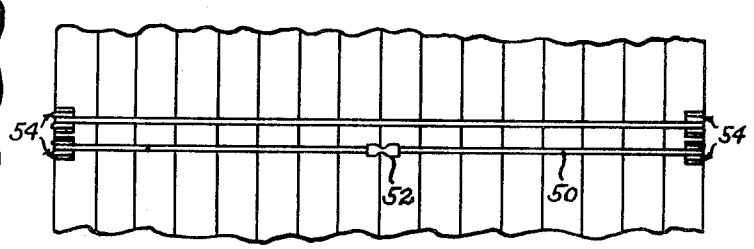


FIG. 6.

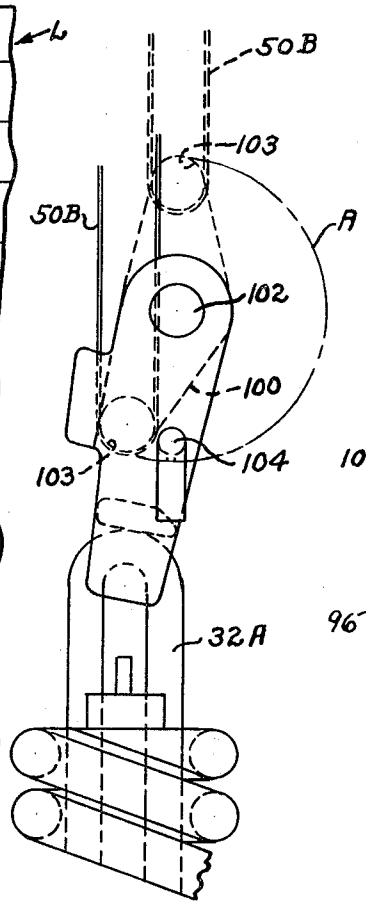


FIG. 12.

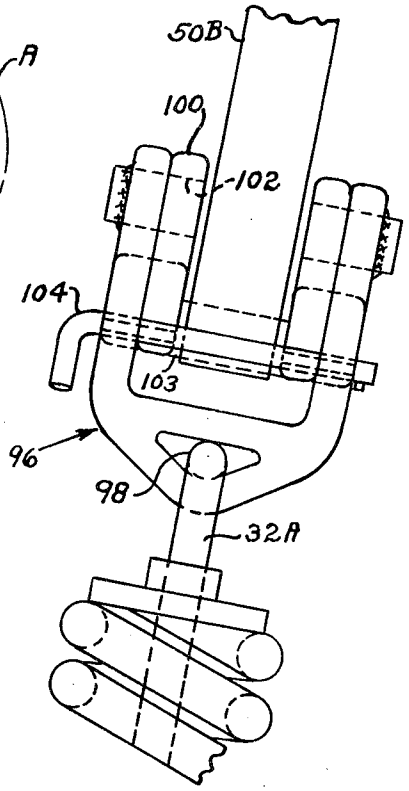


FIG. 13.

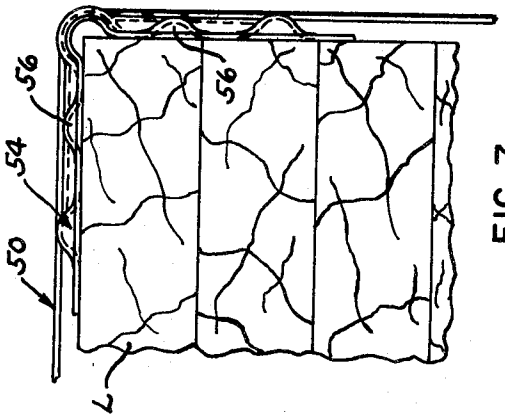


FIG. 7.

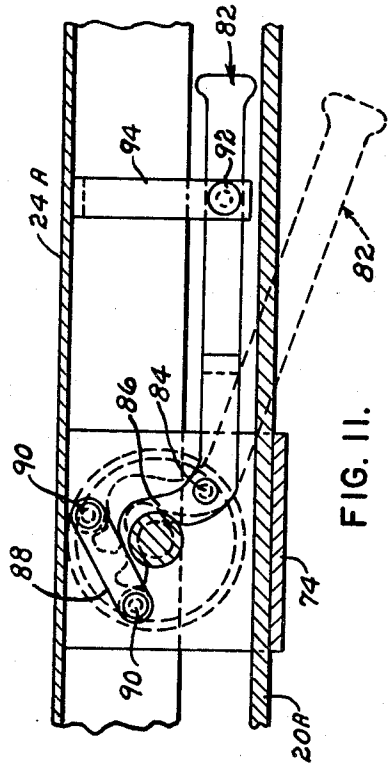


FIG. 11.

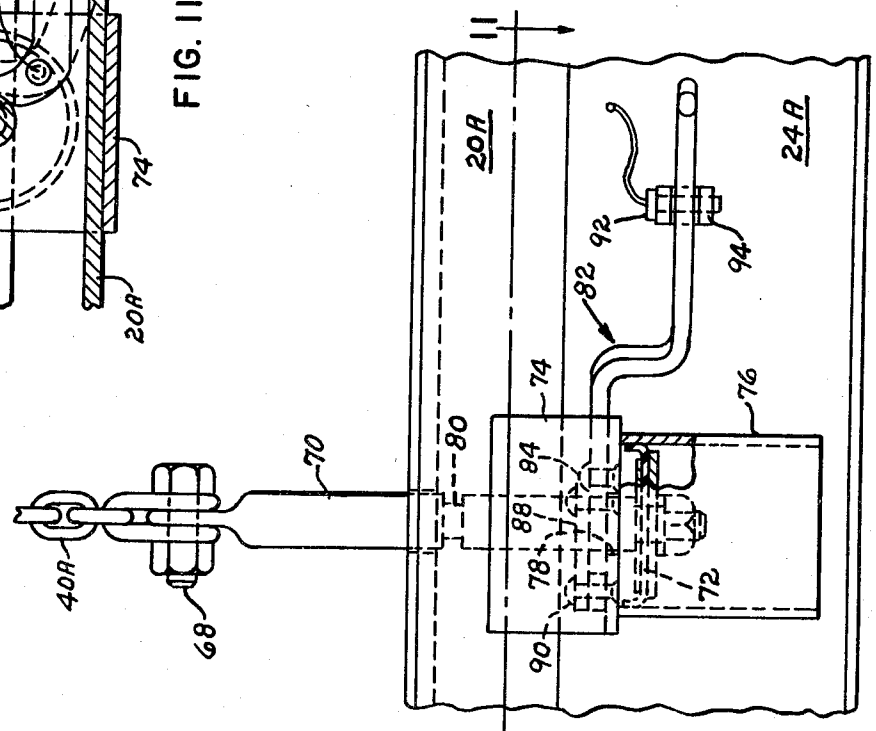


FIG. 10.

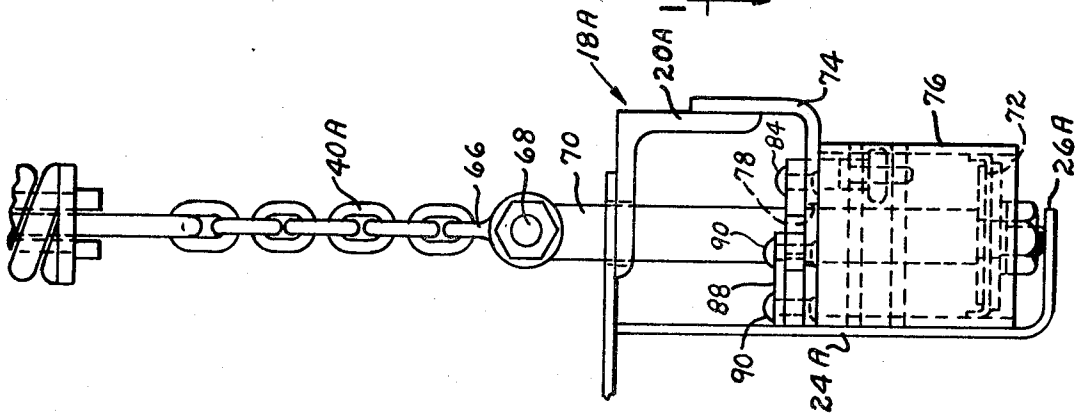


FIG. 9.

METHOD AND MEANS FOR SECURING LADING ON RAILWAY FLAT CARS

BACKGROUND OF THE INVENTION

Various types of tie-downs have been employed heretofore on railway flat cars to secure loads thereon. For example, chains have had their ends resiliently anchored over loads to hold the loads onto the deck of the car. However, prior art tie-downs employing banding are characterized in that only a relatively small amount of takeup is provided upon a settling or compaction of the load during transit thereby reducing or eliminating any pretensioning in the tie-downs upon such settling of the load. The elimination or reduction in any pretensioning permits the load to shift on the deck of the car particularly during impacts. The shifting of the load is undesirable and particularly if a shift of over around twelve (12) inches is permitted. Some shifting will probably result upon repeated impact loads being exerted against the car, particularly repeated impact loads from the same end, and as long as the shifting of the load is held within a minimum range then such shifting is not particularly harmful.

DESCRIPTION OF THE INVENTION

The present invention is directed to a method or system of banding loads on flat cars so that a minimum shifting of the load results. The system employs a relatively high pretensioning of the banding over the load to be secured and such pretensioning is maintained, although at a lower level, even upon a compaction or settling of the load as much as two or three inches. The banding is arranged in an endless double loop over the lading which permits the banding to slip lengthwise and to provide a two to one mechanical advantage when the ends of the banding are drawn tight for pretensioning and securement. This permits conventional hand tools to be employed for drawing the ends of the banding tight and for supplying a pretensioning load of around three thousand (3,000) to four thousand (4,000) pounds. A compression spring for each banding tie-down is arranged on each side of the flat car and the banding extends about a clevis connected to the spring with the ends of the banding positioned in overlapped fashion over the upper surface of the load. The ends of the banding are drawn tight and the spring arrangement on each side of the car is compressed to provide a pretensioning load on the associated banding. Several separate embodiments are shown for reducing the tensioning in the banding prior to removal of the banding and unloading of the load. When under high pretensioned loads, the cutting or snipping of the banding could be a safety hazard and it is desirable to release at least a portion of the pretensioning before removal of the banding.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated,

FIGS. 1 and 1A are side elevations of a railway flat car illustrating bundled lumber secured thereon by the banding arrangement comprising the present invention, FIG. 1 showing one-half the length of the flat car and FIG. 1A showing the other half of the length of the flat car;

FIG. 2 is an enlarged fragment of FIG. 1A showing the load and banding thereon after the load has shifted longitudinally of the flat car;

FIG. 3 is an enlarged side elevation of the tensioning device for tensioning the steel banding about the load on the flat car;

FIG. 4 is a side elevation of the tensioning device in a stored position along the outer surface of the side sill structure;

FIG. 5 is an end elevation of the tensioning device illustrated in stored position in FIG. 4;

FIG. 6 is a top plan of the banding arrangement over the upper surface of the load on the flat car indicating the end portions of the banding secured by a crimped connector;

FIG. 7 is an elevational view of a corner protector for the load over which the banding is positioned;

FIG. 8 is a modified form of the invention in which a separate banding loop is provided to release the tensioning of the banding for removal of the banding;

FIG. 8A is a further embodiment of the banding loop;

FIG. 9 is a further modification of means to release the tension on the banding for removal of the banding and illustrates a gradual release of the pretensioned load;

FIG. 10 is a section taken generally along line 10—10 of FIG. 9;

FIG. 11 is a section taken generally along line 11—11 of FIG. 9;

FIG. 12 is an elevation of a further form of means for releasing tensioning on the banding and illustrates an overcenter device, and

FIG. 13 is a side elevation of the tensioning release means shown in FIG. 12.

Referring now to the drawings for a better understanding of this invention and more particularly to the embodiment shown in FIGS. 1–7, a railway flat car is generally indicated **10** having a center sill **12**, a side sill structure generally indicated **14**, and a deck **16** forming the upper surface of flat car **10**. As shown particularly in FIGS. **4** and **5**, side sill structure **14** comprises an outer angle **18** having an outer vertical leg **20** and a horizontal leg **22** to which deck **16** is welded. A vertical web **24** of side sill structure **14** has an outturned lower flange **26** at its lower end.

Mounted on deck **16** are a plurality of loads L comprising bundles of lumber banded together by bands B. Wooden transverse support members S are placed on deck **16** and between separate loads L of the banded lumber to space loads L from each other and from the deck to permit a forklift truck to load and unload the lumber from car **10**.

Spaced along the length of flat car **10** are a plurality of compression spring assemblies generally indicated **28** and arranged in pairs aligned transversely of flat car **10**. Each spring assembly **28** comprises a compression spring **30** mounted around a pair of yokes **32** and **34**. A follower **36** on the end of yoke **34** and a follower **38** on the end of yoke **32** engage opposite ends of spring **28** for compressing spring **30** upon outward movement of yokes **32** and **34**. A chain **40** has one end mounted about yoke **34** and has an end link **42** on its opposite end welded to the outer face of leg **20** thereby to prevent removal of compression spring assembly **28** from railway flat car **10**. A link **44** connects yoke **32** with a clevis **46**. Hooks **48** are secured to the outer face of vertical web **24** and are adapted to engage yokes **34** and clevis **46** as shown in FIGS. **4** and **5** for maintaining compression spring assembly **28** in a stored position when not in use.

To secure the bundles of lumber L onto the deck of flat car **10**, a plurality of tie-downs are spaced along the length of car **10** each comprising an endless metal banding generally indicated **50** and positioned over loads L. Each endless looping of metal banding **50** is connected to a pair of compression spring assemblies **28**. To mount metal banding **50** over loads L, a strip of metal banding is first positioned over the upper surface of the load and the free ends are threaded through clevises **46**. The banding strip is then passed upwardly over load L with end portions overlapping each other over the upper surface of load L. In this position, metal banding **50** is ready to be tightened or tensioned. A conventional windlass tensioning tool with a handle extension may be employed to pretension steel banding **50** to around three thousand (3,000) pounds. As an example, steel banding **50** may be 1¼ inches wide and 0.035 inch thick with a breaking strength at around twelve thousand (12,000) pounds. After the banding has been pretensioned a predetermined amount, a splice or connector **52** is placed about the end portions of banding **50** and is crimped about the banding to hold the end portions of banding **50** together in a pretensioned relation. The tensioning tool is also employed to crimp splice **52** about the banding.

To prevent steel banding **50** from damaging or biting into the corners of the bundled lumber, steel corner protectors **54** as shown particularly in FIGS. **6** and **7** are provided and have a central groove formed between raised portions **56** to receive banding **50**.

As an example of spring assembly **28**, spring **30** may be a length of twelve (12) inches and have a total compression of around three (3) inches with a spring rate of fifteen hundred (1,500) pounds per inch of compression. Thus, to obtain a tensioning of three thousand (3,000) pounds in banding **50**, spring **30** would be compressed two (2) inches which would leave one (1) inch of compression remaining after pretensioning of bands **50**. Thus, even if loads L compacted or settled as much as one and one-half inches (1-½) some pretensioning would remain in banding **50**. Further, springs **30** would not bottom out until the total 3 inch travel had been effected in spring **30**. As end bulkheads are not provided to restrain the longitudinal shifting of loads L, it is desirable that the longitudinal shifting be minimized particularly to repeated impact loads from the same end. The amount of restraint by the tie-down would be dependent on the total number of tie-downs and on the amount of cushioning the flat car has. For example, with only conventional draft gear employed, the spacing of the tie-downs would be relatively small while with a long travel end of car cushioning unit, such as a cushioning unit at each end of the car having a travel of fifteen (15) inches, a relatively large spacing between the separate tie-downs for the loads might be provided.

As a specific example, a flat car eighty-nine (89) feet in length was loaded with 165,000 pounds of finished pine lumber consisting of bundles 2 feet by 4 feet in lengths of 8 feet, 10 feet, 12 feet, 14 feet, 18 feet and 20 feet. The flat car employed end of car cushioning with a fifteen (15) inch travel. Steel banding was applied using 1-¼ inch wide by 0.035 inch thick banding as shown in FIGS. **1–7** and the banding was tensioned to around three thousand (3,000) pounds. Seventeen (17) tie-downs were spaced around three (3) feet apart along the length of the railway flat car and the car was impacted by three (3) repeated ten miles per hour impacts with a 220,000 pounds striking car and no backup cars. A total average load shift of around twelve (12) inches was obtained and none of the tie-downs exceeded eighty (80) percent of their breaking strength during the three (3) high speed impacts from the same end.

Thus, the present banding arrangement permits the banding from going slack even with a settlement of the load in transit and thereby minimizes any undue shifting of loads L. A tension is maintained on the load under substantially all conditions and lengthwise shifting of loads L on the car, particularly where long travel end-of-car cushioning devices are provided, is within acceptable limits. The arrangement of the banding in an endless double loop arrangement permits the banding to slip lengthwise upon tightening thereby providing a two to one mechanical advantage which permits a conventional tensioning tool to be employed for providing a three thousand (3,000) pounds pretensioning on each of the tie-downs. The two strands or passes of the banding over the upper surface of the load are laterally spaced from each other and two corner protectors **54** are positioned over each upper corner of the load which also facilitates the slipping of the banding lengthwise upon pretensioning. It is noted that the amount of pretensioning may be determined visually by inspecting the amount of deflection in spring assemblies **28**.

While load L has been illustrated as packaged lumber, it is to be understood that this banding arrangement may be employed on other loads, and is particularly adapted for loads having a generally rectangular cross section. Further, while the resilient means has been illustrated as compression spring assemblies **28**, other resilient means might be employed satisfactorily, such as rubber in shear. However, the deflection of other resilient means would be generally the same as the spring assemblies **28** and would pretension the banding about the same amount as spring assemblies **28**.

When it is desired to remove the load from flat car **10**, it may be hazardous to cut or snip the banding while the banding is under a substantial tensioning, such as 3,000 pounds of tension, since the cut ends may whip or flail about. Thus, it is desirable to remove at least a portion of the tensioning in the steel banding. One arrangement for releasing the tensioning is shown in FIG. **8** in which a loop **60** has its end portions **62** secured by crimped connectors or splicer **64** to the banding **50A** which has its ends secured by connector **52A**. Loop **60** bypasses the connected ends of banding **50A**. To release the tensioning in banding **50A**, a worker cuts band **50A** at a position between the connectors **64** which snaps loop **60** to a taunt relation and releases the tensioning in banding **50A**. With the tensioning released, banding **50A** may then be cut at another position to release the banding from about the lumber.

FIG. **8A** illustrates another manner of forming the banding loop. An extending end portion **60A** of banding **50A** is looped over banding **50A** and a crimped connector **64A** secures the end portion **60A** to banding **50A**. In this position banding **50A** may be cut between connectors **64** and **64A** to release the pretensioning.

Referring to FIGS. **9–11**, a separate arrangement for releasing the tensioning in the banding is illustrated. A clevis **66** on the lower end chain **40A** is pivotally connected at **68** to the upper end of a movable rod **70** and a flexible seal **72** is secured adjacent the lower end of rod **70**. An angle **74** is secured between leg **20A** of side sill angle **18A** and vertical web **24A**. Secured to the underside of angle **74** is a hollow cylinder **76** in which seal **72** is mounted for movement. Rod **70** extends through an opening **78** in the lower horizontal leg of angle **74** which opening is larger in diameter than rod **70** therefore permitting a release of air from cylinder **76** upon an upward movement of seal **72**. Rod **70** has a reduced diameter portion **80** and lock lever **82** is pivotally mounted at **84** to angle **74**. Lever **82** has an end hook portion **86** adapted to fit about the reduced diameter portion **80** of rod **70**. A retainer **88** is mounted over the end of hook portion **86** and pins **90** which secure retainer **88** form stops for the end of hook portion **86**. Lever **82** may be releasably secured in a locked position by pin **92** in bracket **94**. In the position shown in FIG. **9**, with rod **70** having its lower end seated on lower flange **26A** and lever **82** engaged with reduced diameter **80**, the banding is placed about the load and pretensioned as set forth above. When it is desired to release the pretensioning from the band for removal of the banding, pin **92** is removed from bracket **94** and lever **82** is pivoted about pivot **84** to remove hook portion **86** from reduced diameter portion **80** of rod **70**. Longitudinal rod **70** then moves upwardly in a relatively slow manner as seal **72** forces air from cylinder **76** through opening **78** thereby minimizing any snapping action in the banding when the tensioning is released.

Referring to FIGS. **12** and **13**, a further embodiment for releasing the tensioning is illustrated in which a yoke **96** is pivotally mounted to the upper end of yoke **32A** about pivot **98**. An overcenter link **100** is pivoted about pivot **102** to yoke **96** and has an axis **103** about which banding **50B** is mounted. Link **100** thus may be rotated or moved in an arc A between an overcenter secured position shown in solid lines in FIGS. **12** and **13** and an unlocked position shown in broken lines in FIG. **12**. A retaining pin **104** holds link **100** in the overcenter position. To release the tensioning, pin **104** is removed and a pry bar or the like is placed in the opening of yoke **96** beneath axis **103** and link **100** is urged outwardly past a dead center relation with respect to axis **102** thereby effecting movement of link **100** to the broken line position shown in FIG. **12** and a release of tensioning from banding **50B**.

What is claimed is:

1. A railway flat car comprising, a plurality of transversely aligned pairs of resilient means anchored to the sides of the car and spaced along the length of the car at predetermined intervals, lading of a generally rectangular cross section supported on the car, metal banding for each transversely aligned pair of resilient means extending over the lading in an endless fashion, the banding forming loops connected to the associated resilient means in such a manner as to permit slipping of the banding lengthwise and having end portions overlapping each other over the upper surface of the lading to provide a double banding over the lading whereby upon drawing of the end portions taunt for pretensioning of the banding a

mechanical advantage of two to one is obtained and said resilient means deflect to provide the pretensioning of the banding, means securing the overlapping end portions of the banding over the upper surface of the lading after pretensioning of the banding, and means to release the tensioning of the banding; said means comprising a fluid cylinder operatively connected to said banding adjacent each side of the car and having a movable seal therein, and releasable securing means connected to said seal to hold said seal in one position during pretensioning of the banding, said securing means upon release effecting actuation of said seal within said cylinder and a relatively gradual movement of the seal to provide a gradual release of tensioning in the banding.

2. A railway flat car comprising, a plurality of transversely aligned pairs of resilient means anchored to the sides of the car and spaced along the length of the car at predetermined intervals, lading supported on the car, metal banding for each transversely aligned pair of resilient means extending over the lading in an endless fashion, the banding forming loops connected to the associated resilient means in such a manner as to permit slipping of the banding lengthwise and having end portions overlapping each other adjacent the outer surface of the lading to provide a double banding over the lading whereby upon drawing of the end portions taunt for pretensioning of the banding a mechanical advantage of two to one is obtained and said resilient means deflect to provide the pretensioning of the banding, said double banding being laterally spaced at least at the maximum frictional contact areas between the lading and the banding to facilitate the slipping of the banding lengthwise, and means securing the overlapping end portions of the banding over the adjacent outer surface of the lading after pretensioning of the banding; said banding being positioned over the lading in the following steps: first passing a continuous strip of metal banding over the lading, then passing the ends of the metal banding about resilient means for maintaining a pretensioning in the banding and thence about the lading with end portions of the banding overlapping, next drawing the ends of the banding tight and pretensioning the banding a predetermined amount, and then securing the ends of the banding together while under the pretensioning load.

3. A railway flat car as set forth in claim 2 wherein means are provided to release the pretensioning of the banding, said means comprising a link pivotally mounted adjacent the upper end of said resilient means and having a support axis about which said banding extends in a looped fashion, said link being pivoted in a direction parallel to the length of the banding past a dead center position with respect to its pivotal axis to a releasably locked position when the banding is pretensioned and secured about the lading, said link being rotated manually back past the dead center position for unlocking of the link to release at least a portion of the pretensioning in the banding.

4. A railway flat car as set forth in claim 2 wherein said means securing the overlapping end portions comprise a crimped slice, and means are provided to release the pretensioning of the banding, said means to release the pretensioning comprising a separate untensioned loop of banding having spaced ends secured to the banding whereby upon a cutting of the banding between the ends of said separate untensioned loop said separate loop becomes taunt and restrains movement of the cut banding ends in the event the banding is under a pretensioned load.

5. A railway flat car comprising, a plurality of transversely aligned pairs of resilient anchor means mounted at spaced intervals along the sides of the car, lading supported on the car, metal banding for each transversely aligned pair of resilient anchor means extending over the lading in an endless fashion, the banding forming loops connected to the associated pair of resilient anchor means in such a manner as to permit slipping of the banding lengthwise and having end portions overlapping each other adjacent the outer surface of the lading to provide a double banding over the lading, said double banding being laterally spaced at least at the maximum frictional contact areas between the lading and the banding to facilitate the slipping of the banding lengthwise, and means securing the overlapping end portions of the banding over the adjacent outer surface of the lading; said banding before the securement of the overlapping end portions being positioned over the lading and pretensioned by the following steps: passing the ends of the metal banding about the resilient anchor means and thence about the lading with end portions of the banding overlapping and positioned closely adjacent but laterally spaced from the initial banding pass over the lading, drawing the overlapping end portions which are positioned over the lading taunt to deflect the associated pair of resilient anchor means generally around two inches in length to obtain a pretensioning load of generally around three thousand or more pounds in the banding, and crimping a connector over the overlapping end portions while under the pretensioned loading.

6. A railway flat car as set forth in claim 5 wherein a pair of laterally spaced protectors are mounted over the lading at the high frictional areas and said laterally spaced double banding fits over the associated protectors thereby to facilitate the slipping of the banding lengthwise.

7. A railway flat car as set forth in claim 5 wherein said resilient anchor means each comprises a coil spring having a pair of opposed yokes mounted therein for movement in opposite directions upon tensioning of the banding, each yoke having a follower abutting an end of the spring thereby to compress the associated spring upon said tensioning of the banding.

8. A railway flat car as set forth in claim 5, a side sill extending along each side of the car, support means mounted on the outer surface of the associated side sill adjacent each resilient means and supporting the resilient means in a stored inoperable position.

9. A railway flat car comprising, a deck, a side sill extending along each side of the deck, a plurality of transversely aligned pairs of resilient means anchored to the side sills and spaced along the length of the car at predetermined intervals, lading supported on the deck, metal banding for each transversely aligned pair of resilient means extending over the lading in an endless fashion, the banding forming loops connected to the associated pair of resilient means in such a manner as to permit slipping of the banding lengthwise and having end portions overlapping each other over the lading to provide a double banding over the lading, said double banding being laterally spaced at least at the maximum frictional contact areas between the lading and the banding to facilitate the slipping of the banding lengthwise, a crimped connector securing the overlapping end portions of the banding about the lading, and a separate untensioned loop of banding having spaced end portions secured to the banding whereby upon a cutting of the tensioned banding between the end portions of said separate untensioned loop said separate loop becomes taunt and restrains movement of the cut banding ends.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,678,866 **Dated** July 25, 1972

Inventor(s) Walter E. O'Leary, Duane V. Thornton, James C. Jammonds
Roy R. Dare

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 5, line 55, "slice" should be -- splice --.

Signed and Sealed this

Nineteenth Day of October 1976

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks