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Hawthorne

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[54] **RAILWAY CAR CUSHIONING APPARATUS**

[75] Inventor: **Vaughn T. Hawthorne,** Mechanicsburg, Pa.

[73] Assignee: **Keystone Industries, Inc.,** Chicago, Ill.

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[52] **U.S. Cl.** **213/8;** 213/9; 213/22; 213/43

[51] **Int. Cl.²** **B61G 9/16**

[58] **Field of Search** 213/7, 8, 9, 10, 22, 43, 213/50, 50.5, 54, 69, 62, 67

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Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Gene A. Church
Attorney, Agent, or Firm—Hibben, Noyes & Bicknell

[57] **ABSTRACT**

This disclosure deals with mounting structure and a spring return assembly for an end-of-car cushioning apparatus of a railway car. The railway car includes a center sill having an opening formed in each vertical side thereof, and the mounting structure includes a casting secured in each opening. A vertical slot is formed in each casting. The apparatus further includes a cushioning unit having lugs formed integrally therewith, and the slots receive the lugs, with the result that the lugs and the castings transfer loads from the unit to the sill. The spring return assembly includes at least one stack or set of compression springs coiled on a rod, the springs being connected to the unit. A tube is positioned over the springs, and the rod and the tube guide the springs. A bushing on the rod prevents the tube from sliding on the springs. The connections in the spring return assembly are loosely made to accommodate shifting of the parts.

12 Claims, 8 Drawing Figures

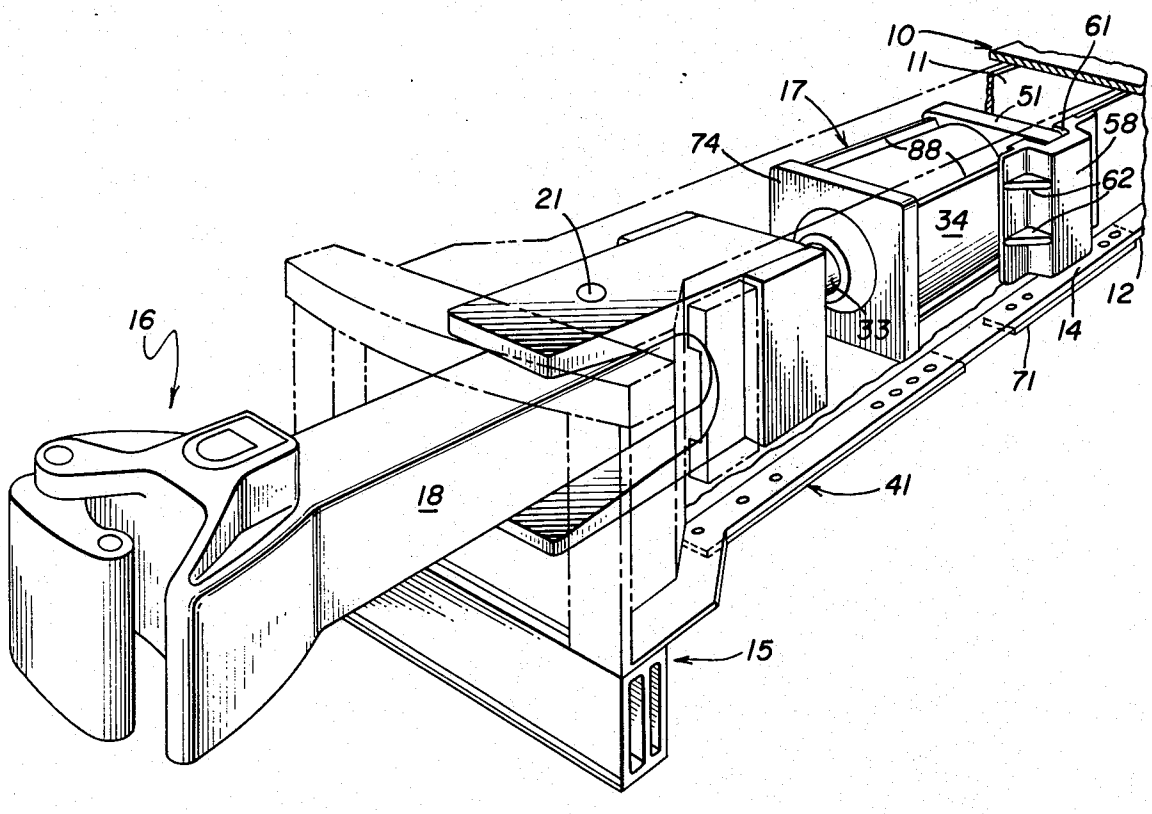

FIG. 1

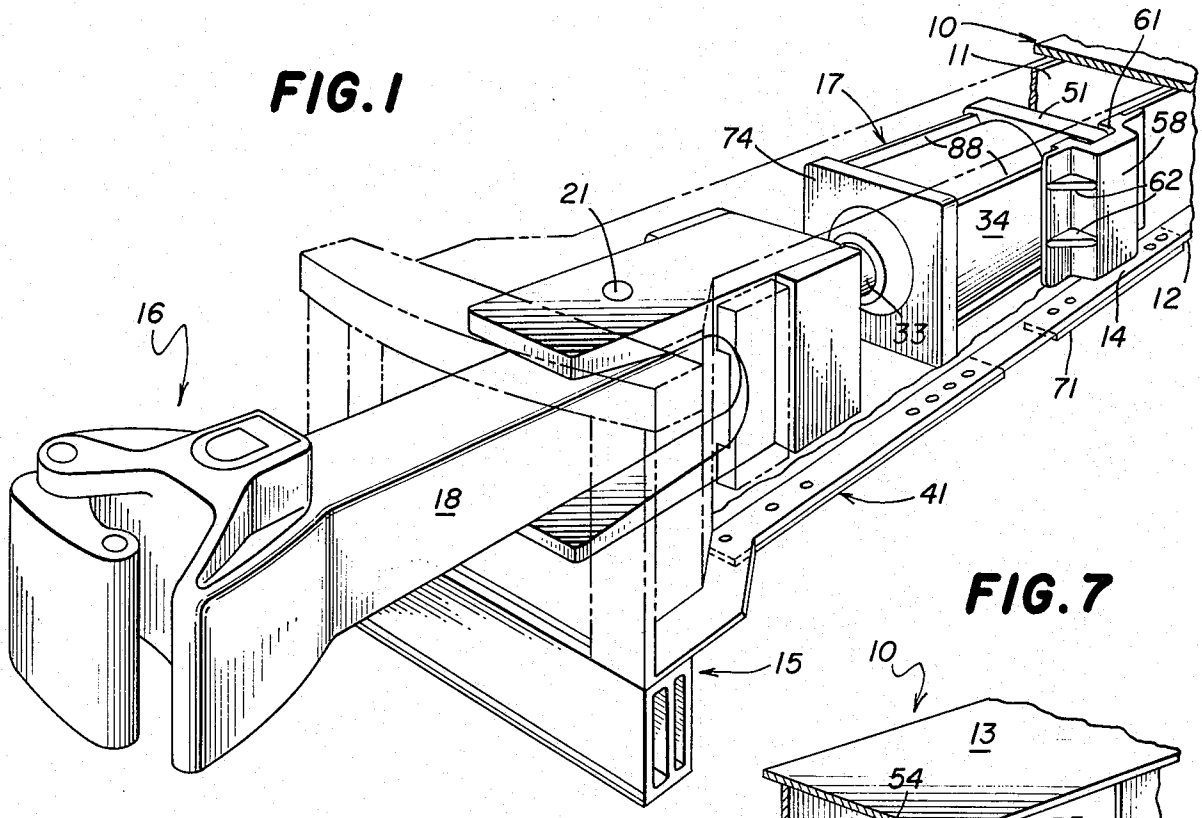

FIG. 7

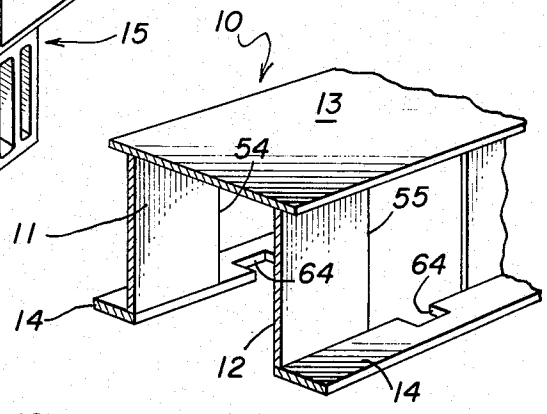

FIG. 8

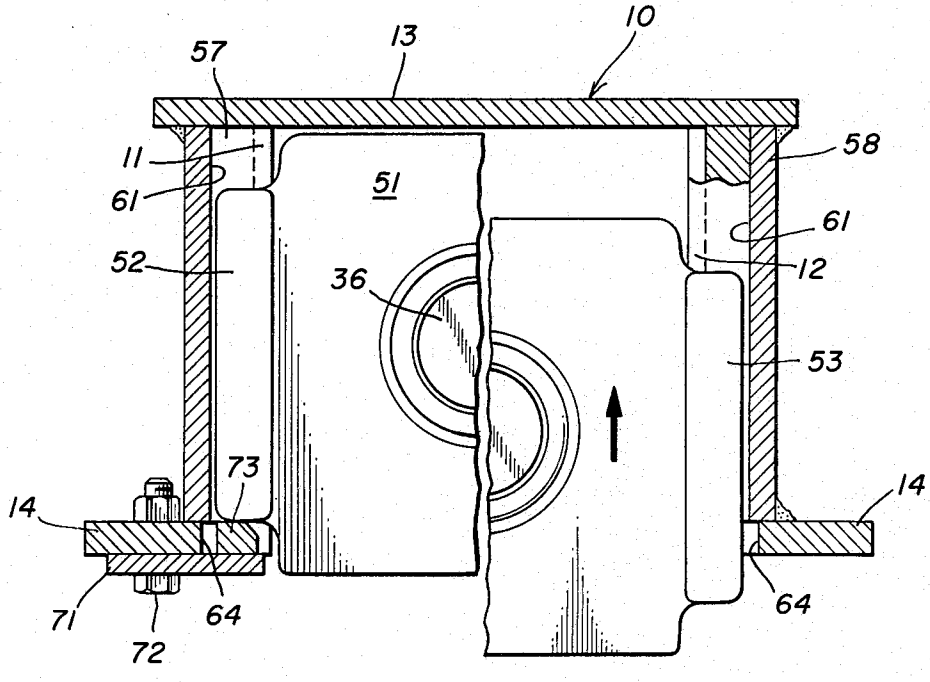

FIG. 2

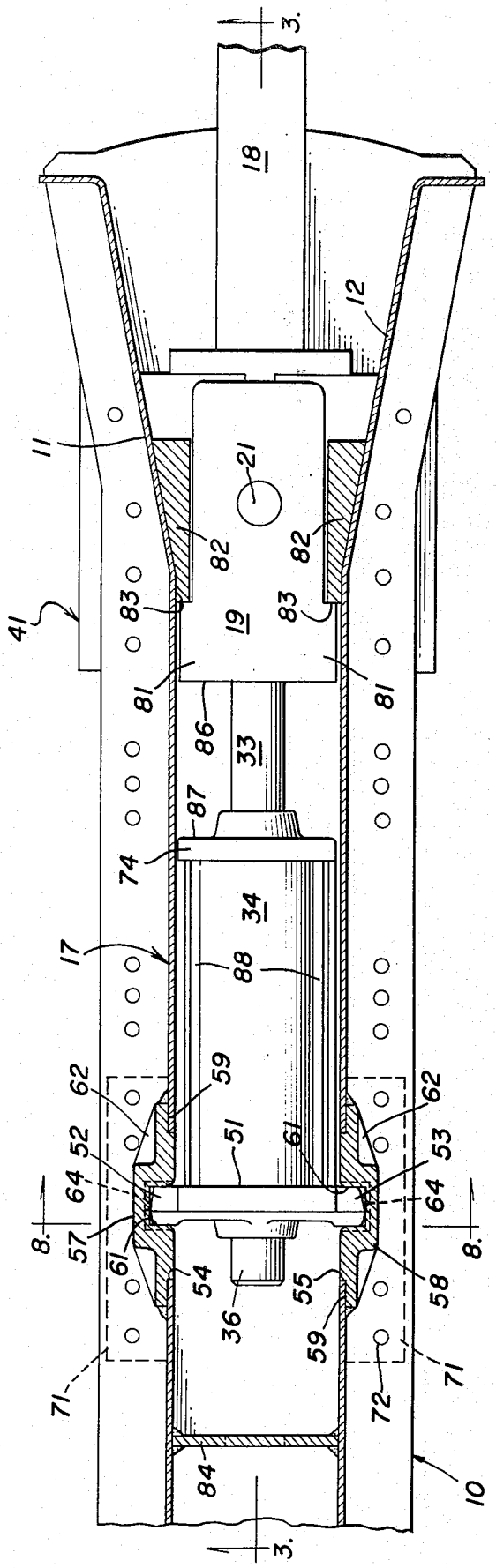
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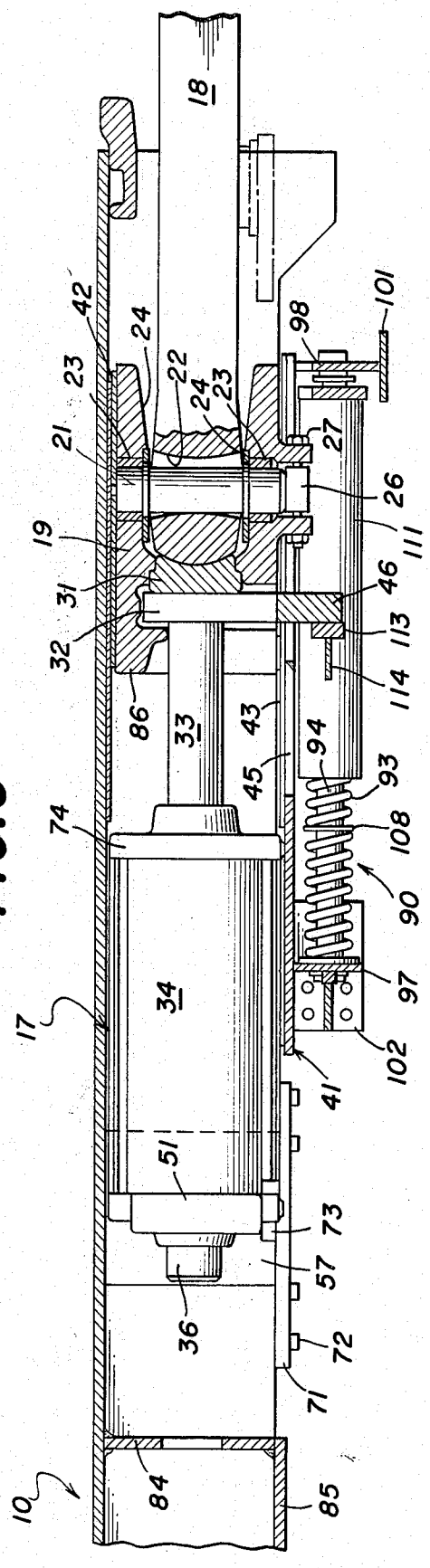
FIG. 3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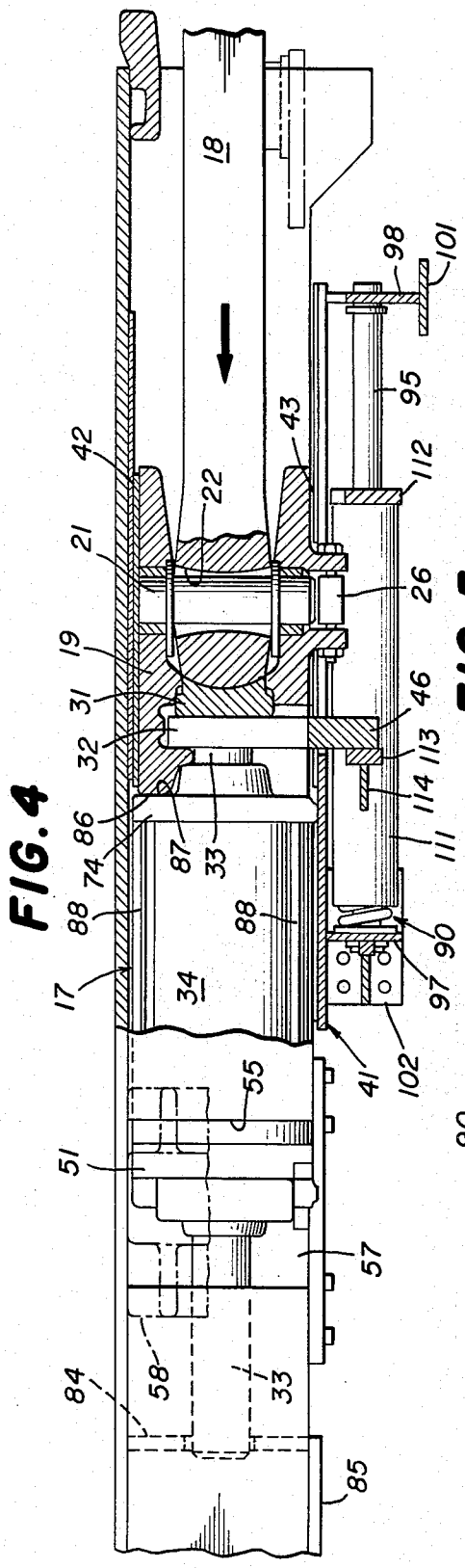

FIG. 4

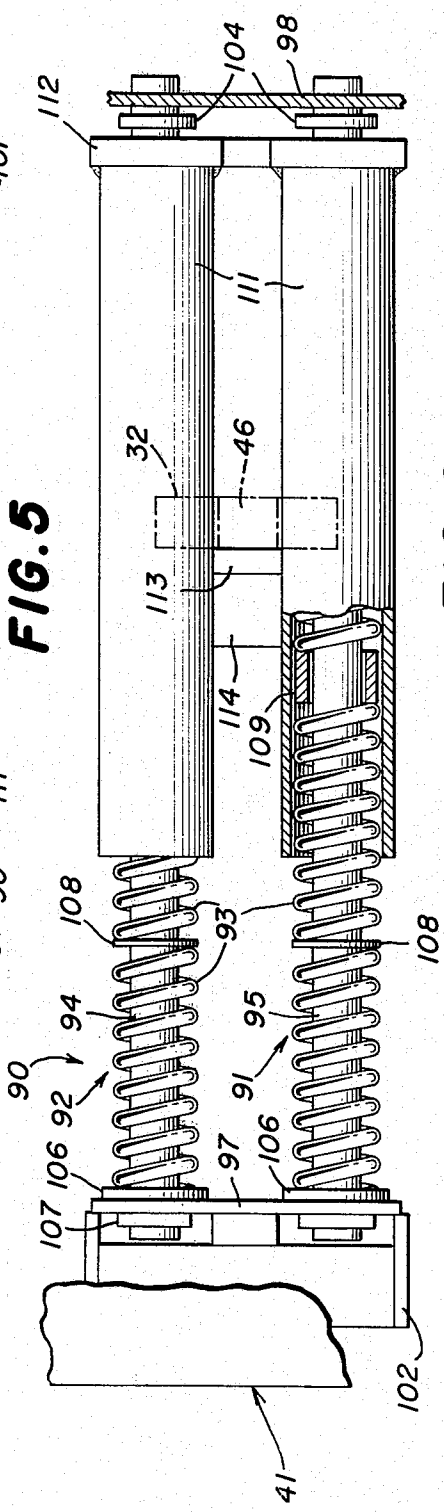

FIG. 5

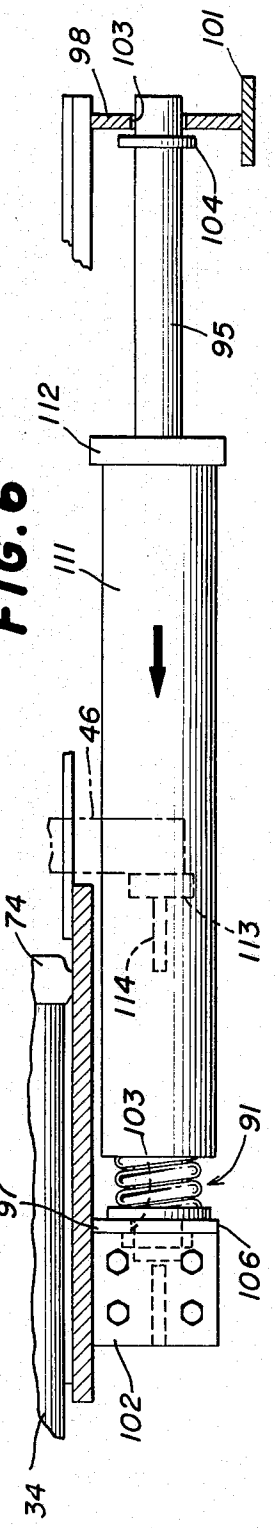

FIG. 6

RAILWAY CAR CUSHIONING APPARATUS

End-of-car cushioning apparatus is of course well known in the railway industry, and the industry has adopted a standard pocket or receiving space for such cushioning apparatus. In the standard pocket arrangement, an open space is formed in each vertical side of the center sill of a car, and each manufacturer of the cushioning apparatus provides means for mounting its apparatus in the center sill, utilizing the openings.

The applicant has devised novel and improved structure for mounting cushioning apparatus in such an arrangement.

In addition, such cushioning apparatus includes a spring return assembly for moving the apparatus from a loaded position to a normal position. A problem encountered in the design of such a spring return is that it must be able to exert considerable force and be very sturdy, but at the same time it must also be able to accommodate a large amount of shifting of the parts of the railway car. Such shifting occurs primarily when the car is loaded or unloaded and under impact conditions, and it also occurs with thermal expansion and contraction.

It is a general object of the present invention to provide novel and improved apparatus which meets the foregoing requirements.

Apparatus in accordance with the present invention is designed for use with a railway car including a center sill having openings formed in the vertical side walls of the center sill. The apparatus includes a member positioned in each opening and secured to the sill, each member having a generally vertically extending slot formed in its side which faces the interior of the sill. The apparatus further includes a cushioning unit which is positioned within the interior of the center sill. The unit has laterally extending lugs formed as an integral part thereof, the lugs being located in the slots. Since the lugs are integral with the unit, a separate member is not required between the unit and the members attached to the sill.

The apparatus further includes a spring return assembly connected to the unit, the assembly including at least one stack of compression springs coiled on a rod. A tube is mounted over the springs, and means is provided for preventing the tube from sliding on the springs. The rod is connected to the sill and the assembly is connected to the unit, such connections being nonrigid and thereby accommodating shifting of the parts.

The foregoing and other objects and advantages of the present invention will be apparent from the following detailed description taken in conjunction with accompanying figures of the drawings, wherein:

FIG. 1 is a fragmentary perspective view of a portion of a railway car including apparatus embodying the invention;

FIG. 2 is a fragmentary plan view of the apparatus, with some parts broken away to show underlying parts;

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 2;

FIG. 4 is a sectional view similar to FIG. 3 but showing different positions of some of the parts;

FIG. 5 is a further enlarged plan view of a portion of the apparatus;

FIG. 6 is a side view of the portion of the apparatus shown in FIG. 5;

FIG. 7 is an enlarged fragmentary perspective view of a center sill of the car; and

FIG. 8 is a still further enlarged sectional view, taken on the line 8—8 of FIG. 2.

In FIG. 1, a portion of the undercarriage or frame of a railway car is illustrated, parts of the frame being in phantom in order to show otherwise concealed parts. The frame includes a center sill 10 which has the shape of an inverted U. The center sill 10 includes two laterally spaced vertically extending sides 11 and 12 (FIGS. 1 and 7), a top wall 13 and two bottom flanges 14. The foregoing parts of the center sill 10 may be formed integrally or they may be formed in separate parts and welded together. As shown in FIG. 7, the top wall 13 extends horizontally outside the upper edges of the side walls 11 and 12, and the bottom flanges 14 extend horizontally outwardly from the bottom edges from the two sides 11 and 12. Other parts of the frame are indicated by the numeral 15 in FIG. 1 and are of course connected to the center sill 10.

The coupler of the railway car is indicated by the reference numeral 16 and is connected to the center sill 10 through a hydraulic end-of-car cushioning unit 17, which provides cushioning for draft and buff forces on the car. As shown in FIGS. 1 to 4, the shank 18 of the coupler 16 extends longitudinally from the end of the car rearwardly or toward the center of the car, and the inner end of the shank 18 is connected by a pin 21 to a yoke 19. The yoke 19 extends across the top and bottom sides and the rearward end of the shank 18, and the pin 21 extends vertically through a hole 22 formed in the shank 18 and through holes formed in the top and bottom sides of the yoke 19. Bushings 23 are positioned in the holes formed in the yoke 19 around the ends of the pin 21, and wear plates 24 are preferably provided between the shank 18 and the yoke 19. The pin 21 is supported by a pin support 26 which is positioned under the lower end of the pin 21 and is fastened to the lower side of the yoke 19 by a bolt 27.

Positioned against the rearward end of the shank 18 of the coupler 18 is a coupler follower 31, the engaging surfaces of the follower 31 and the coupler 16 being rounded, as shown in FIGS. 3 and 4, so that the coupler 16 may swing in a lateral direction about the axis of the pin 21. The inner or rearward side of the coupler follower 31 is flat and bears against a rod end plate 32 which is secured to a piston rod 33 of the cushioning unit 17. The piston rod 33 extends into the interior of a cylindrical housing 34 of the unit 17, the interior mechanisms of the unit 17 being conventional and therefore not being illustrated. The rearward end 36 of the piston rod 33 extends out of the other end of the housing 34.

The forward end of the housing 34 and the yoke 19 are supported in the center sill 10 by a yoke and unit carrier assembly indicated generally by the reference numeral 41. The assembly 41 consists of a plurality of plates which are bolted to the undersides of the two flanges 14 of the center sill 10, as shown in FIGS. 1, 2 and 3, and which extend underneath the yoke 19 and the forward end of the housing 34. Wear plates 42 and 43 are preferably provided across the bottom and upper sides of the yoke 19. While the assembly 41 extends under the yoke 19 and the housing 34 in order to support it, a longitudinally extending opening 45 (FIG. 3) is provided along the center line of the sill 10, to provide clearance for the pin support 26 and the bolt 27,

and for a downwardly extending lug **46** formed on the lower end of the plate **32.** The function of the lug **46** will be described hereinafter.

The rearward or inner end of the housing **34** of the cushioning unit **17** is mounted in the sill **10** in a novel manner. The cylindrical housing **34** includes a rear cylinder head **51** (FIGS. **1** through **4** and **8**) which has a centrally located hole for the end **36** of the piston rod **33.** The rear cylinder head **51** includes two laterally extending projections or lugs **52** and **53,** the outside dimension of the two lugs **52** and **53** being greater than the distance between the two sides **11** and **12** of the sill **10.** Except for the two lugs **52** and **53,** the cylinder head **51** and the remainder of the housing **34** are sufficiently narrow that they can be mounted between the sides **11** and **12** of the sill.

The cylinder head **51** is held against longitudinal movement by two castings **57** and **58.** As shown in FIGS. **2** and **7,** the two sides **11** and **12** of the sill **10** are cut out to form open spaces **54** and **55,** the spaces being adjacent the rear cylinder head **51** and being substantially longer than the length of the head **51.** The spaces extend from the bottom flanges **14** to the top wall **13.** The rear casting **57** is positioned in the space **54** and the casting **58** is positioned in the space **55,** the two castings **57** and **58** being sturdily constructed of a strong metal. The length of the castings is longer than the length of the spaces and the ends of the castings overlie the outer surfaces of the sides **11** and **12** adjacent the spaces **54** and **55.** As shown in FIG. **2,** rabbets **59** are formed in the rear castings **57** and **58,** the rabbets receiving the sides **11** and **12.** The portions of the inner faces of the two castings, which are between the vertical edges of the spaces **54** and **55,** are substantially flush with the inner surfaces of the sides **11** and **12** as shown in FIG. **2.** As shown in FIG. **8,** the castings extend from the top wall **13** substantially to the flanges **14** and are secured to the walls of the sill as by welding. A vertically extending slot **61** is formed in the inner surface or face of each of the castings **57** and **58,** the slots **61** extending vertically from the lower to the upper ends of the castings. As shown in FIG. **2,** the dimensions of the slots **61** are slightly greater than the lugs **52** and **53** so that the slots snugly receive the lugs. The castings **57** and **58** are sufficiently thick that they can withstand great shock loads, and strengthening ribs **62** (FIGS. **1** and **2**) are preferably formed on the outer surface of each of the castings to ensure adequate strength.

In addition to the spaces **54** and **55,** the bottom flanges **14** are also cut out as indicated at **64** (FIG. **7**), the cutouts **64** being located midway between the vertical edges of the associated cutouts **54** and **55** and below the slots **61** of the castings. In addition, as shown in FIG. **8,** the cutouts **64** are sufficiently large that the lugs **52** and **53** of the rear cylinder head **51** can be moved upwardly through them.

The cushioning unit **17** is installed in the center sill **10** as follows: first, the spaces **54, 55** and **64** are formed in the sides **11** and **12** and in the bottom flanges **14.** This may be accomplished, for example, using a cutting torch. After the cutouts have been formed, the two castings **58** and **59** are positioned in the spaces **54** and **55** with the rabbets **59** receiving the edges of the sides **11** and **12,** and the castings **57** and **58** are firmly secured to the top wall **13** and the sides **11** and **12** as by welding. The unit **17** is moved upwardly and, as shown in the righthand portion of FIG. **8,** the lugs **52** and **53** of the rear cylinder head **51** move through the cutouts **64** and slide through the slots **61** of the rear castings **57** and **58.** When the rear cyliinder head **51** has moved upwardly to the position indicated in the lefthand portion of FIG. **8** where the upper edge of the head **51** nearly meets the top wall **13** and the lower ends of the lugs **52** and **53** are substantially flush with the upper surfaces of the bottom flanges **14,** a support plate **71** (FIGS. **1, 2** and **8**) is fastened to the underside of each of the bottom flanges **14.** They may be fastened to the flanges as by bolts **72.** As shown in FIG. **8,** the laterally inner ends of the two plates **71** extend underneath the lugs **52** and **53,** and a block **73** is fastened to the upper surface of each of the plates **71** immediately below the associated lug. The blocks **73** are secured to the support plates **71** as by welding and provide support for the lugs. Thus, the support plates **71** and the blocks **73** secured to the bottom flanges **14** of the center sill **10** support the lugs **52** and **53** of the rear cylinder head **51** and therefore provide support for the rearward end of the cushioning unit **17.** Of course, the unit **17** may be readily removed for servicing and replacement should it be necessary, simply by unfastening the bolts **72** and removing the support plates **71,** thereby permitting the cushioning unit to be moved straight downwardly out of the sill **10.**

The foreward end of the cushioning unit **17** is supported by the previously mentioned yoke and unit carrier assembly **41,** as shown in FIGS. **1** and **3,** The assembly **41** extends under a front cylinder head **74** of the unit **17,** and the head **74** rests on the support plate assembly **41.** It is not necessary however for the head **74** to be secured against longitudinal movement because the lugs **52** and **53** and the castings **57** and **58** provide support in this direction.

With reference to FIGS. **2** and **4,** the foregoing described construction provides support in both the draft and buff directions. FIG. **2** shows the positions of the parts at the maximum forward position whereas FIG. **4** illustrates the parts in the maximum rearward position. A draft force on the coupling **16,** as when the railway car is being pulled, causes the yoke **19** to be pulled forwardly, and if the piston of the unit **17** is initially in an intermediate position, the lugs **52** and **53** and the castings **57** and **58** support the draft load until the parts reach the maximum forward position shown in FIGS. **2** and **3.** At this position, the laterally extending flanges **81** of the yoke **19** meet the stops **82** which are secured to the sill **10** which then support the load. The stops **82** are sturdy members which are secured as by welding to the inner surfaces of the vertical sides **11** and **12** of the sill. Rearwardly facing surfaces **83** of the stops **82** are located to engage the flanges **81** at the maximum forward position of the yoke **19.** Thus, a draft force on the coupler **16** is transferred to the pin **21,** from the pin to the bushings **23** and the yoke **19,** and from the yoke **19** to the stops **82,** when the parts are in the maximum forward position, and to the sill **10.**

In the maximum rearward position, shown in FIG. **4,** the coupler **16** applies a rearwardly directed force on the coupler follower **31,** the plate **32,** and the piston rod **33,** and forces the piston rod **33** toward the left or rearwardly as seen in FIGS. **2** to **4.** The rod **33** is displaced toward the rear, as shown in FIG. **4,** and the rearward end of the rod **33** extends through a hole formed in a gusset **84** (FIGS. **2** to **4**) which extends between the sides **11** and **12** of the sill **10.** A horizontal

bottom cover plate **84** extends across the underside of the bottom flanges **14** and is secured to the gusset **84**, the cover plate **85** extending rearwardly from the gusset **84** as shown in FIGS. **3** and **4**. The cylindrical housing **34**, as is well known in the art, includes a hydraulic mechanism which cushions such an impact load. The load is transferred to the rear cylinder head **51** of the cylindrical housing **34**, and from there to the lugs **52** and **53**, the castings **57** and **58** and the center sill **10**. At the maximum buff position, the rearwardly facing end surface **86** of the yoke **19** is moved into engagement with the forwardly facing surface **87** of the front cylinder head **74** of the housing **34**. After the surfaces **86** and **87** have been moved into engagement, any additional buff forces are transferred through the cylindrical housing **34** to the rear cylinder head **51** and from there to the castings **57** and **58** as previously described. Braces or supports **88** are provided to give structural support between the two heads **87** and **51** of the unit **17**, these supports being shown in FIGS. **1**, **2** and **3**, and consisting of longitudinally extending bars which are spaced at 90° intervals around the outer surface of the housing **34** and are secured at their ends to the heads **51** and **74**. As best shown in FIG. **1**, the braces **88** are located at 45° angles from a vertical plane. The two castings **57** and **58** of course transfer the impact load from the unit **17** to the center sill **10** in both draft and buff forces. In addition to being exceptionally sturdy, the construction of the rear cylinder head **51** and the two castings **57** and **58** enable the cushioning unit **17** to be easily installed or removed for servicing or replacement.

With reference to FIGS. **3** and **6**, the apparatus also includes a return spring assembly in accordance with the present invention, which moves the piston rod **33**, the yoke **19**, and the coupling **16** from the rearward position shown in FIG. **4** toward the forward position shown in FIG. **3**. The return spring assembly **90** comprises two packs or sets **91** and **92** of springs, each set of springs **91** and **92** including four coiled compression springs **93** (FIG. **5**). The springs **93** of each set are coiled on rods **94** and **95** which are supported at their ends by rear and front support plates **97** and **98**. As shown in FIGS. **3** and **6**, the plates **97** and **98** are secured, as by welding, to and extend downwardly from the underside of the yoke and unit carrier assembly **41**. The rods **94** and **95** extend longitudinally of the railway car and are located below the unit **17** and the yoke **19**, and are positioned on opposite sides of the lug **46** and the pin support **26**. The front support plate **98** has a lower horizontally extending stiffening plate **101** secured thereto, and the rear support plate **97** has vertically extending side plates **102** secured thereto which are fastened to the underside of the carrier assembly **41**. The two rods **94** and **95** are slidingly mounted in holes **103** (FIG. **6**) formed in the plates **97** and **98** and are free to move slightly within the holes **103**. On the rearward side of the front support plate **98**, a collar **104** is secured to each of the rods **94** and **95**, and similar collars **107** are secured to the rods on the rearward side of the plate **97**. Also adjacent the rear support plate **97**, washers **106** are positioned on the rods **94** and **95** between the plate **97** and the springs **93**.

As previously mentioned, each of the spring packs **91** and **92** includes a plurality of coiled springs **93**, and washers **108** are provided between adjacent pairs of springs **93**. As shown in FIG. **5**, a bushing **109** is provided between the center pair of springs. Further, each set includes a tube **111** positioned around the springs. Each of the tubes **111** is located adjacent the forward end of the associated set and is fastened as by welding to a laterally extending plate **112**. The length of each of the tubes **111** is such that it extends rearwardly over the associated bushing **109**, but the length of the tubes **111** is short enough that, when the tubes **111** are forced to their maximum rearward position, shown in FIGS. **4** and **6**, the rearward end of each of the two tubes **111** is spaced from the rear support plate **97** and the washers **106**. The function of the bushings **109** is to hold the tubes aligned on the springs and to prevent the tubes from sliding on the associated springs **93**.

The plate **32**, which is fastened to the forward end of the unit piston rod **33**, is located to move the two tubes **111** during rearward movement of the plate **32**. The previously mentioned downwardly extending lug **46** formed on the lower end of the plate **32** extends between the two tubes **111** (FIG. **5**), and the lug **46** is positioned on the forward side of and closely adjacent a laterally extending bar **113**. A horizontal plate **114** is secured to the rearward side of the plate **113**, the plates **113** and **114** having their ends secured to the inner sides of the two tubes **111**.

It will be apparent from the foregoing description that a rearwardly directed force exerted by the coupling **16** on the plate **32** will force the plates **113** and **114** and the two tubes **111** rearwardly. Since the tubes **111** are secured to the plate **113**, it will also move rearwardly and exert a compressing force on the springs **93**. The plate **97** at the rear of the assembly is fixed in place and consequently the springs **93** are compressed as the tubes **111** and the plate **32** move rearwardly. FIG. **4** and FIG. **6** show the maximum extent of rearward movement of the tubes **111** and consequently the maximum compression of the springs **93**. As previously mentioned and as shown in FIGS. **4** and **6**, the rearward ends of the tubes **111** are spaced from the plate **97** and the washer **106** at the position of maximum compression. After the rearwardly directed force has been removed from the coupler **16**, the force of the springs **93** moves the plate **98**, the tubes **111**, the plate **32**, and the yoke **19** forwardly until the flanges **81** of the yoke **19** meet the stops **82**. As previously mentioned, the two rods **94** and **96** are not secured to the support plates **97** and **98**, and this floating arrangement is highly advantageous because it avoids any difficulties which might otherwise arise due to misalignment of the parts. In addition, there is a considerable amount of shifting of the parts due to loading of a car and to temperature changes, and the free floating arrangements avoid any difficulties which might arise due to such shifting.

It will be apparent from the foregoing description and the drawings that a novel and useful shock control apparatus has been provided. In spite of the fact that the unit is relatively easily installed in the center sill of a railway car, it is very sturdy and economically constructed. The return spring assembly is compact and is also very sturdy. The use of a plurality of relatively small inexpensive springs arranged in two sets forms an economical construction which exerts a considerable amount of force, and the loose or floating mounting of the parts accommodates misalignment and shifting of the parts.

I claim:

1. Cushioning apparatus for use with a railway car including a longitudinally extending center sill, the sill having openings formed in the vertical sides thereof and the openings being generally laterally aligned, said apparatus comprising a housing, a piston rod extending into said housing and adapted to be connected to a coupler of said car, said housing having a pair of lugs formed integrally therewith and extending laterally outwardly from the remainder of said housing, and a member adapted to be positioned in each of said openings and secured to said sill, each of said members having a generally vertically extending slot formed therein, said slots receiving said lugs and thereby holding said housing against longitudinal movement relative to said sill.

2. Cushioning apparatus as in claim 1, wherein said slots extend to the bottom ends of the respective members, said lugs being moved into said slots from the lower ends thereof, and further including a support block associated with each of said members and mounted underneath the slot of the associated member, each of said lugs resting on one of said support blocks and being supported thereby.

3. Cushioning apparatus as in claim 2, and further including means for fastening said support blocks to said sill.

4. Cushioning apparatus as in claim 1, wherein said housing comprises a cylinder head at one end thereof, said lugs being formed integrally with and extending laterally from said cylinder head.

5. Cushioning apparatus as in claim 4, wherein said housing further includes another cylinder head at the other end thereof, and longitudinally extending braces extending between and secured to said cylinder heads.

6. Cushioning apparatus as in claim 4, wherein said cylinder head is at the end of said housing which is away from said coupling.

7. Cushioning apparatus as in claim 1, and further including a piston rod plate secured to the end of said piston rod, a spring return assembly mounted below said housing and said piston rod plate, said assembly comprising spring means, a bar connected to said spring means and urged in the direction of said coupling by said spring means, and said bar being nonrigidly connected to said piston rod plate and urging said plate in the direction of said coupling.

8. In a railway car including a longitudinally extending center sill, said sill having openings formed in the vertically extending sides thereof, and a coupler at one end of said car, the improvement of an end-of-car cushioning apparatus for connecting said coupler to said sill, said apparatus comprising a generally cylindrical housing positioned in said sill adjacent said openings, a piston rod extending into said housing and connected to said coupler, a member positioned in each of said openings and secured to said sill, each of said members having a vertically extending slot formed therein, and a pair of lugs formed on said housing and extending laterally outwardly therefrom and into said slots, whereby said housing is held against longitudinal movement relative to said sill.

9. Apparatus as in claim 8, and further including support members extending underneath said housing including said lugs and holding said housing in said sill.

10. Apparatus for use with a hydraulic cushioning unit in a railway car, the cushioning unit including a movable piston rod, comprising a cylinder head adapted to form one end of said hydraulic cushioning unit, said head including lugs formed integrally therewith on laterally opposite sides, said head further including a centrally located opening through which said piston rod extends, and a pair of members adapted to be separately secured to a center sill of the car on laterally spaced opposite sides of said unit, said lateral spacing enabling passage of said piston rod between said members, each of said members having a slot formed therein which receives one of said lugs.

11. A spring return assembly for use in cushioning apparatus of a railway car, comprising a pair of laterally spaced longitudinally extending rods, a support plate at each end of said rods and having holes therein which loosely receive said rods, a set of springs coiled on each of said rods, a tube positioned on each of said rods and covering at least a portion of said springs, one end of each of said tubes being connected to the adjacent end of the springs of the associated set of springs, and means connected to said tubes and adapted to be connected to a piston rod of said apparatus.

12. An assembly as in claim 11, and further including means in each set of said springs for preventing said tubes from sliding on said springs.

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