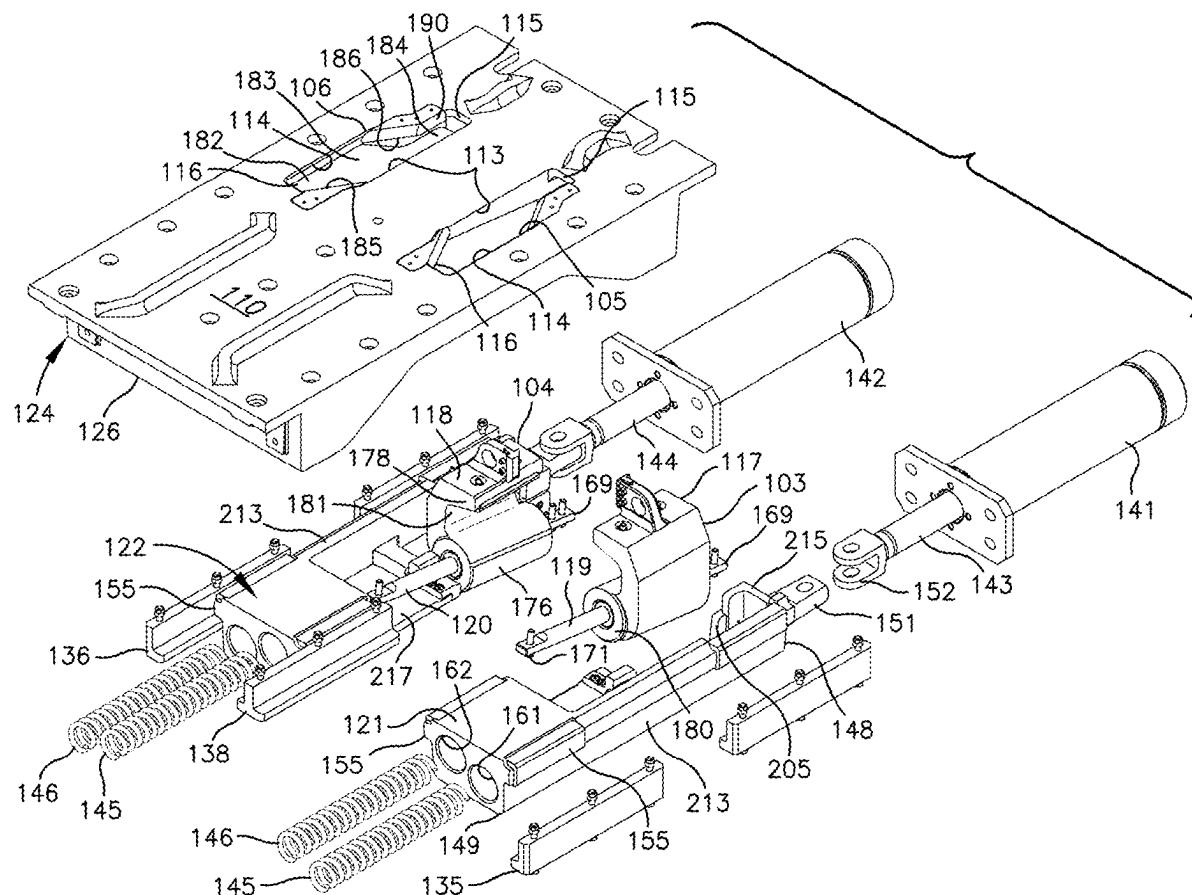


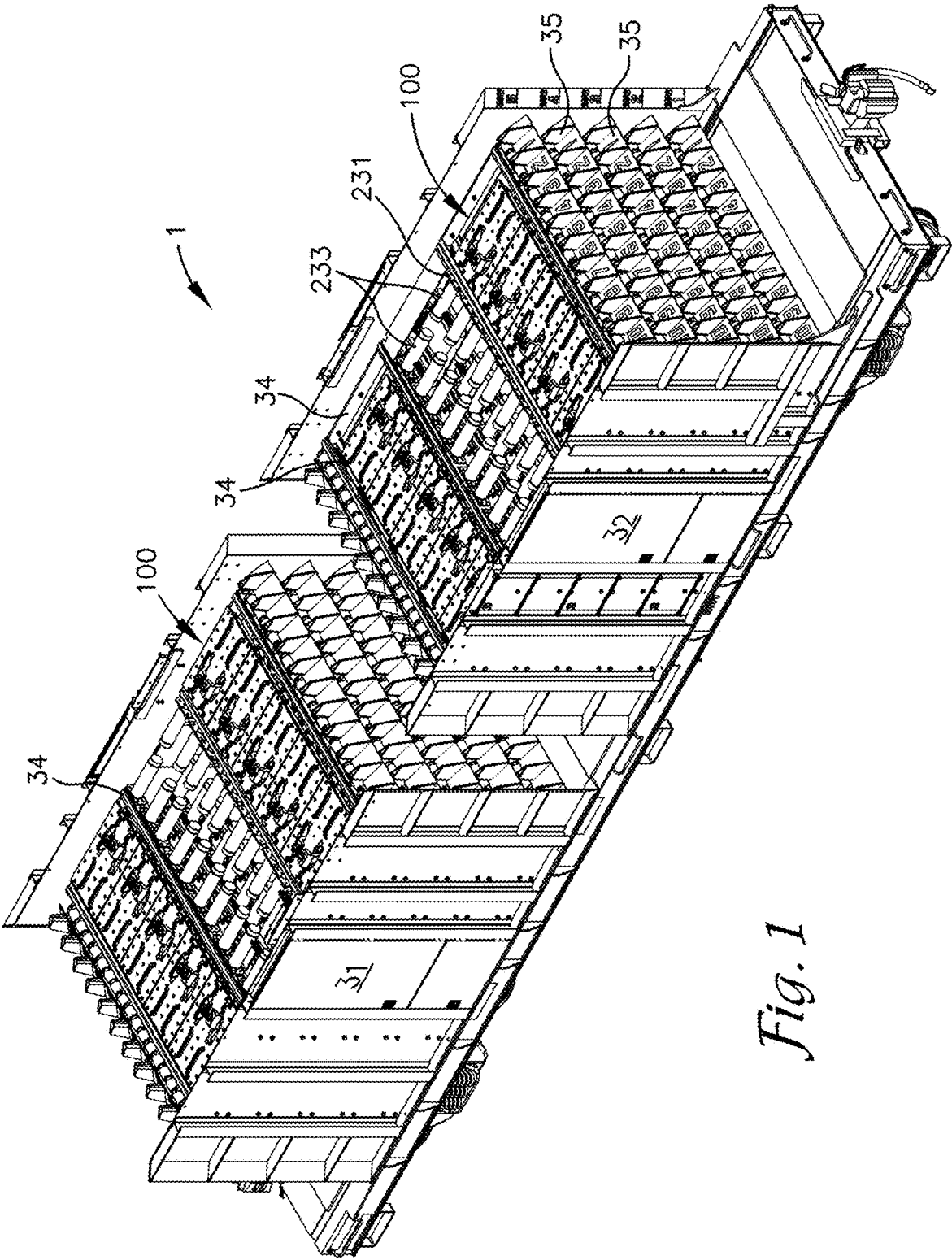


US 20250263892A1

(19) **United States**(12) **Patent Application Publication**
Combs et al.(10) **Pub. No.: US 2025/0263892 A1**(43) **Pub. Date: Aug. 21, 2025**(54) **LOW PROFILE RAIL CLAMP ASSEMBLY**(71) Applicant: **Herzog Railroad Services, Inc.**, St.
Joseph, MO (US)(72) Inventors: **Matthew L. Combs**, Agency, MO
(US); **Alex Jensen**, Fort Worth, TX
(US); **Tony Shirk**, Clarksdale, MO
(US); **Shawn Shivers**, St. Joseph, MO
(US); **Jacob D. Herzog**, St. Joseph,
MO (US)(73) Assignee: **Herzog Railroad Services, Inc.**, St.
Joseph, MO (US)(21) Appl. No.: **19/058,939**(22) Filed: **Feb. 20, 2025****Related U.S. Application Data**(60) Provisional application No. 63/555,637, filed on Feb.
20, 2024.**Publication Classification**(51) **Int. Cl.**
E01B 29/17 (2006.01)
B61D 3/16 (2006.01)
B61D 45/00 (2006.01)(52) **U.S. Cl.**CPC **E01B 29/17** (2013.01); **B61D 3/16**
(2013.01); **B61D 45/001** (2013.01)(57) **ABSTRACT**

A clamp assembly including a clamp base, a clamping member carriage, and a clamp member. The clamp base includes a clamping end and a release end with an elongate member support section extending therebetween, the clamping member carriage slidably connected to and positioned below the clamp base. The clamping member carriage includes first and second ends, the first end extending toward the clamping end of the clamp base and the second end extending toward the release end of the clamp base. The clamp member is pivotally mounted to a guide rod mounted below the clamp base, the clamp member engageable by the clamping member carriage, the clamp member advanceable between a clamp position and an open position upon sliding advancement of the clamping member carriage toward the clamping or release end of the clamp base, and such sliding advancement may be accomplished by a spring and/or an actuator.





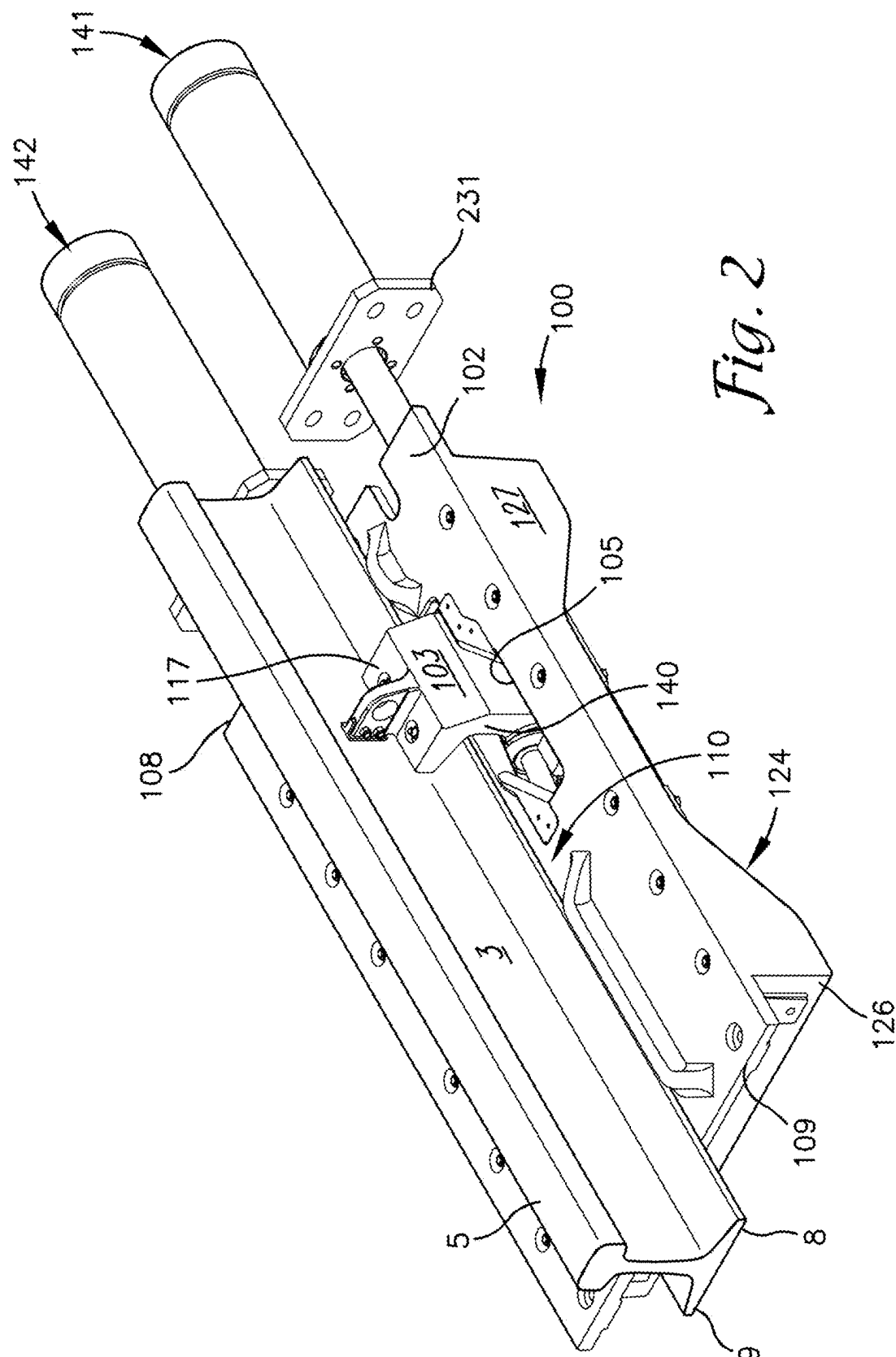
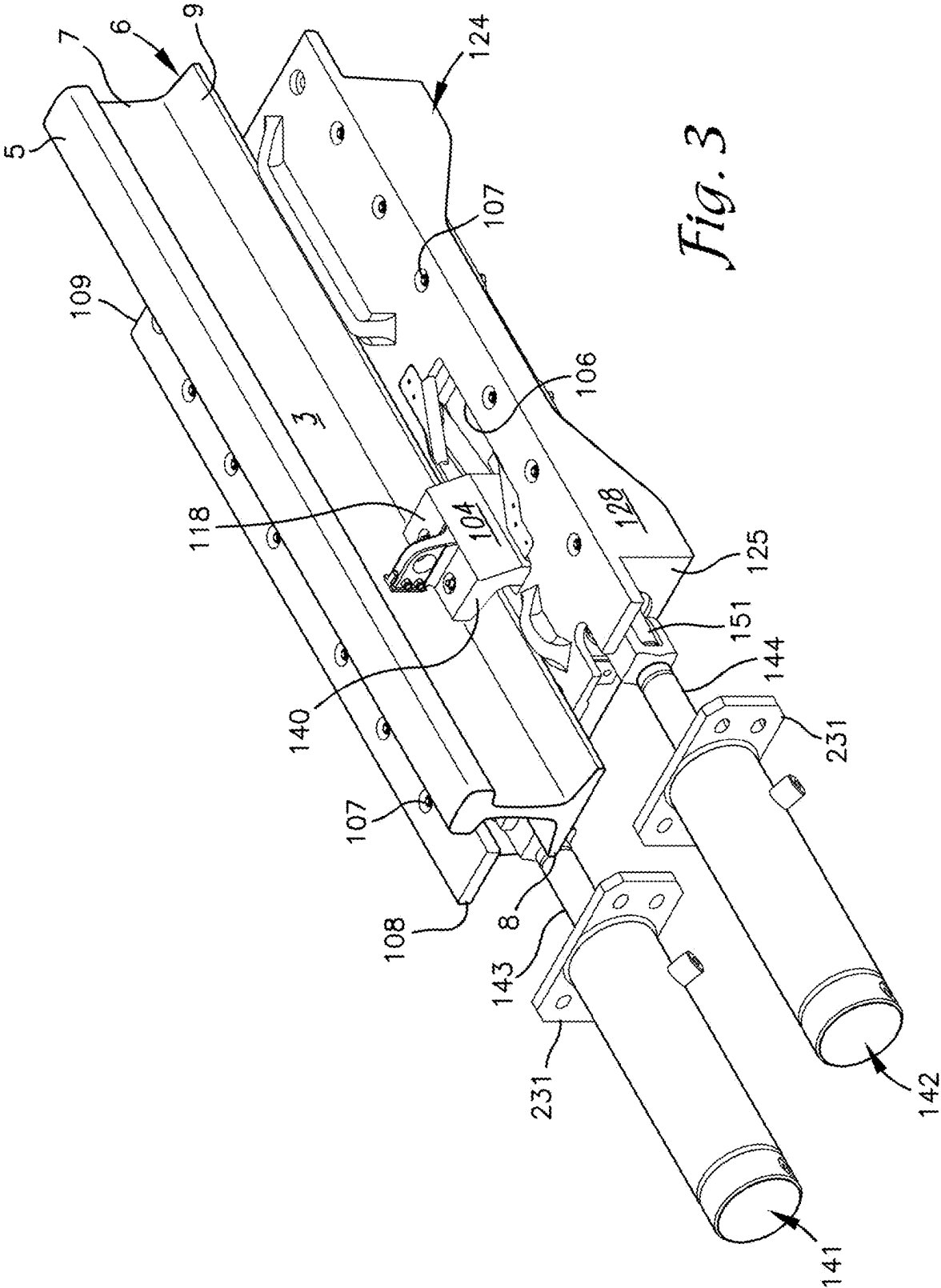
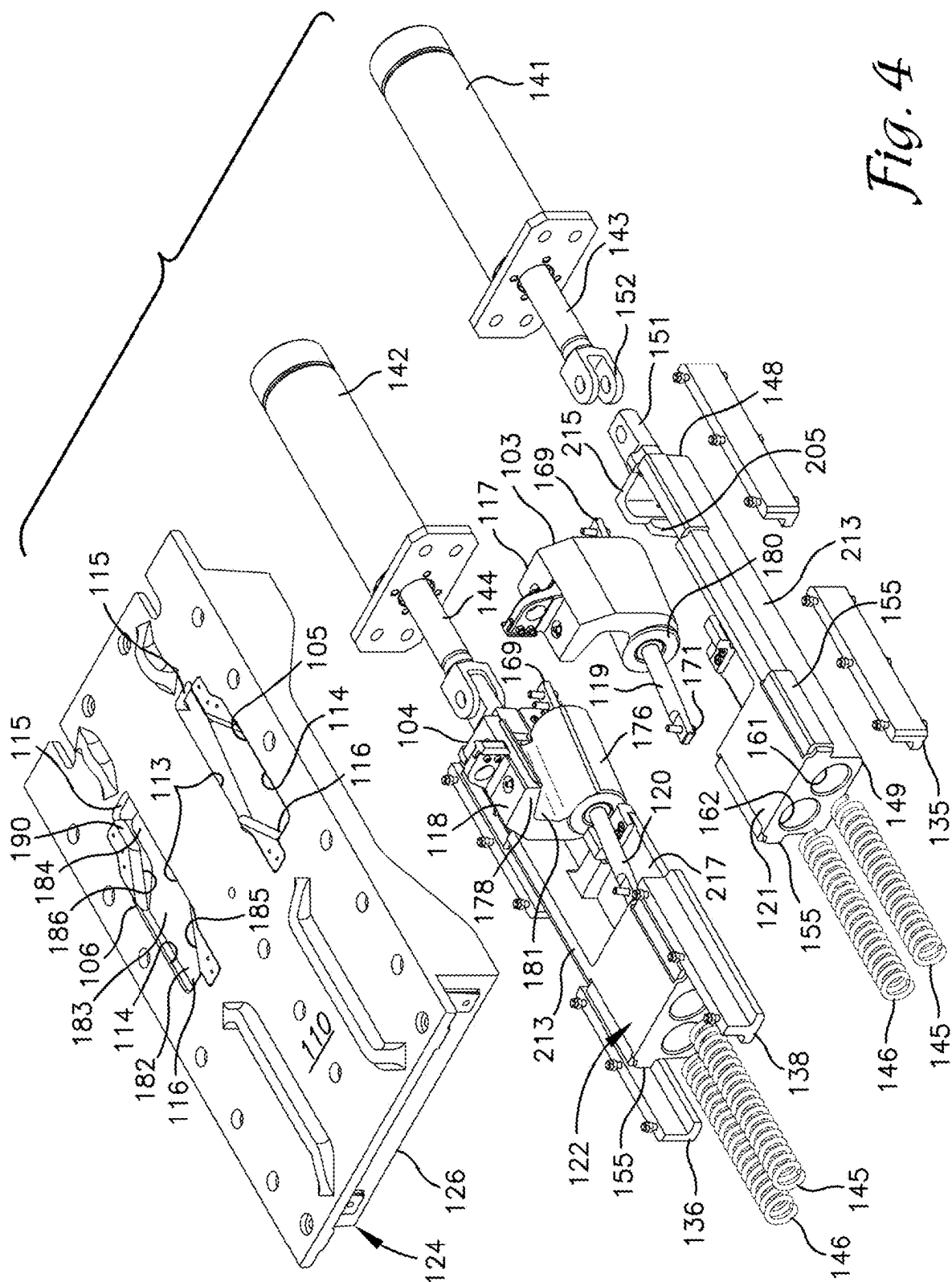


Fig. 2





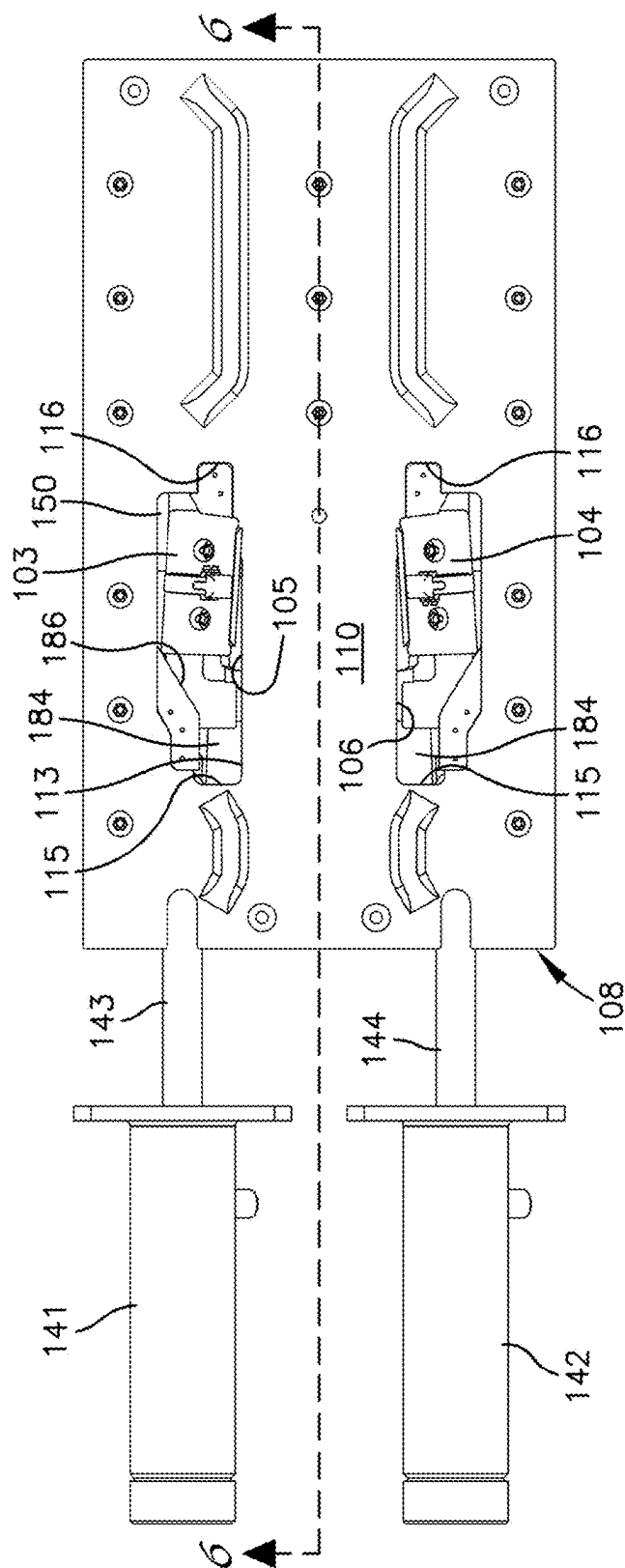


Fig. 5

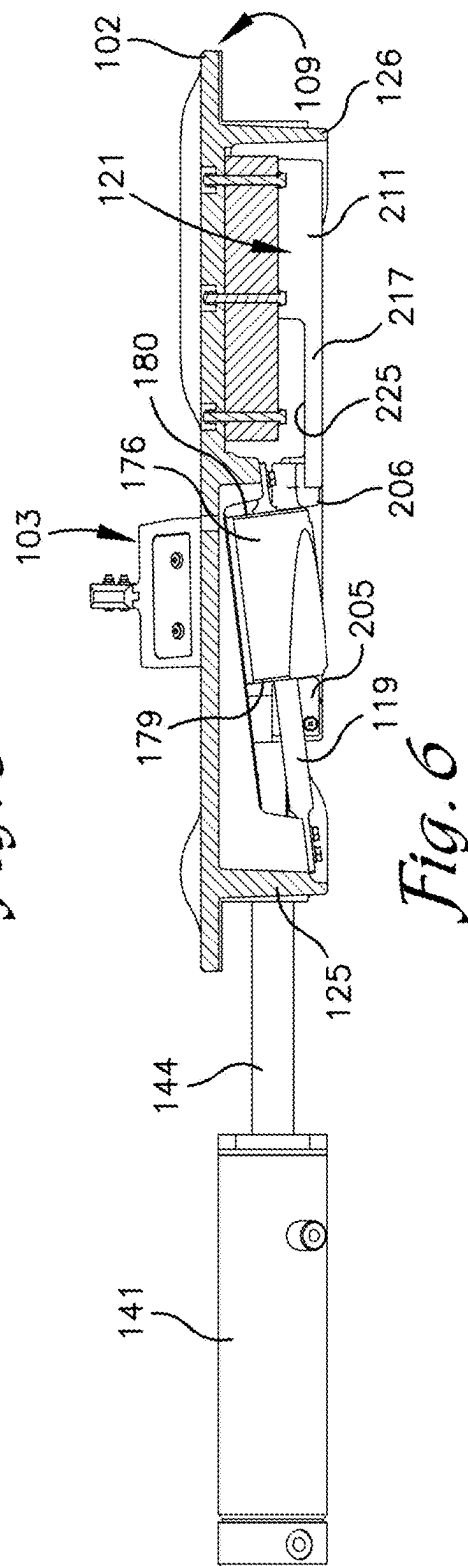


Fig. 6

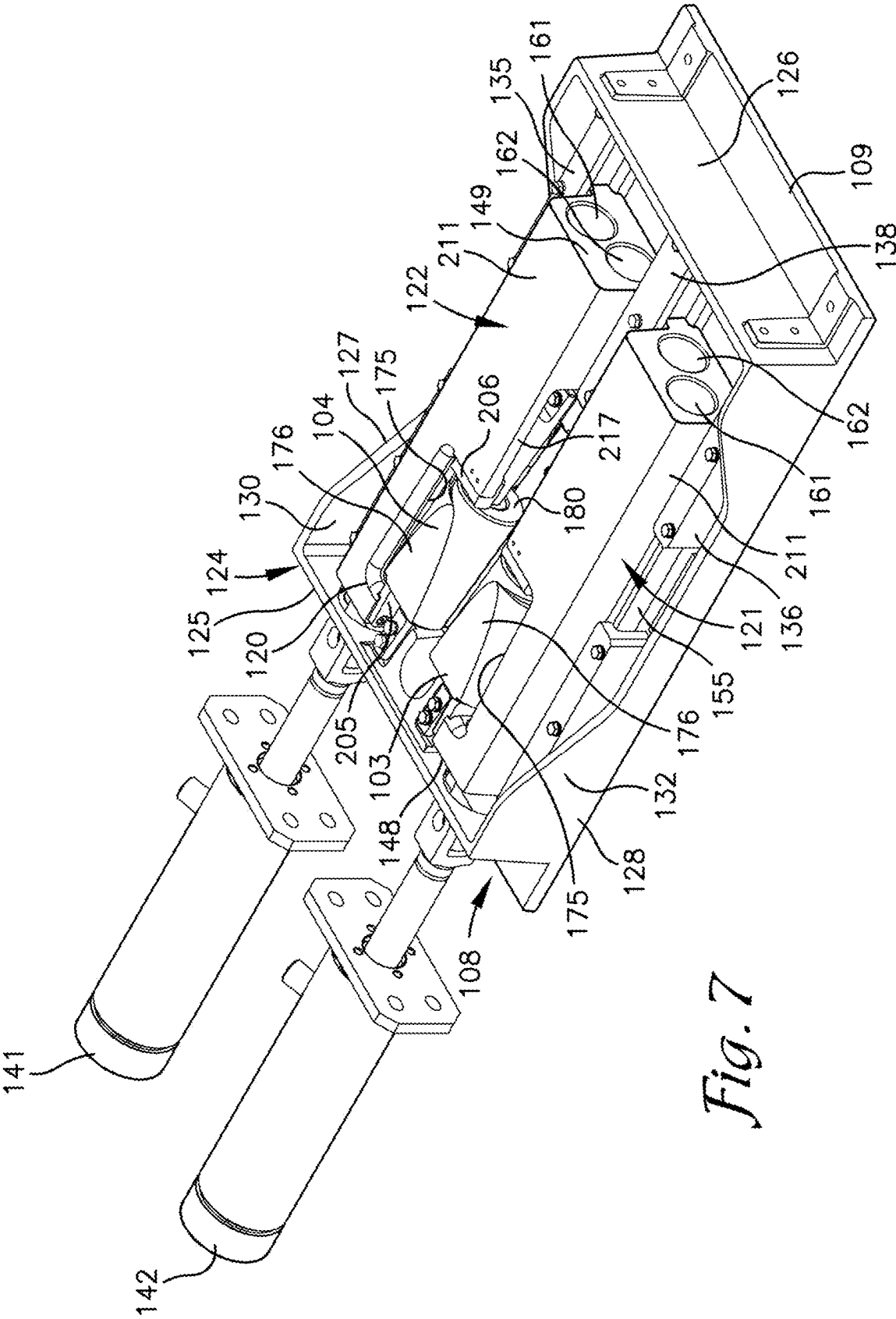


Fig. 7

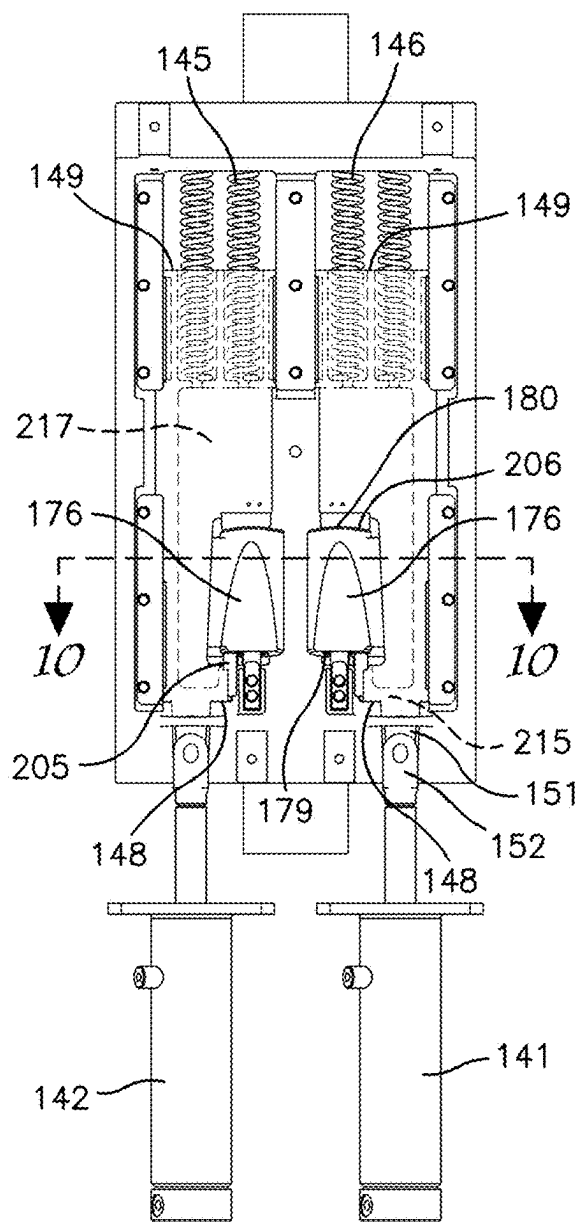


Fig. 8

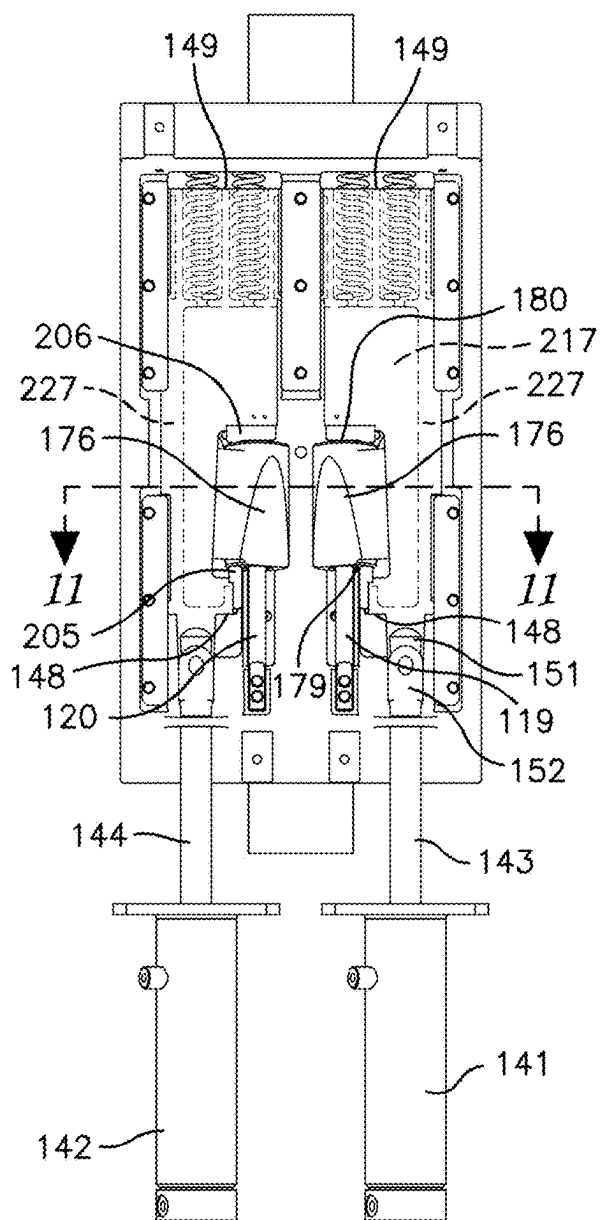


Fig. 9

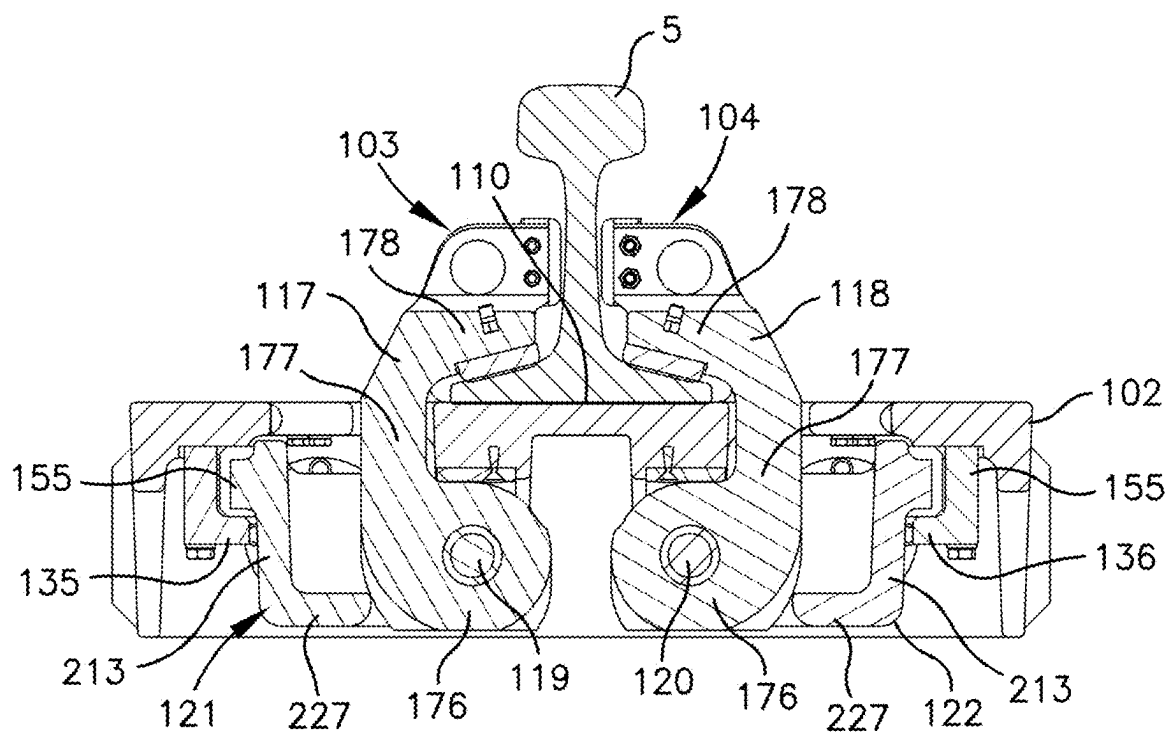


Fig. 10

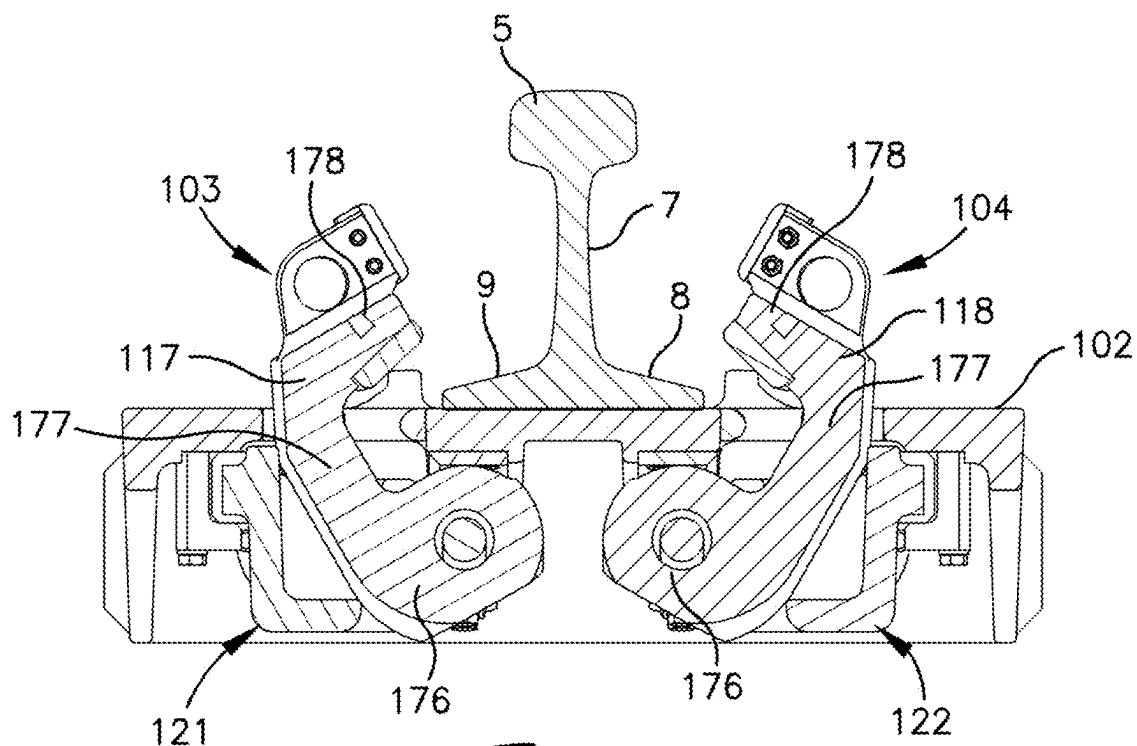
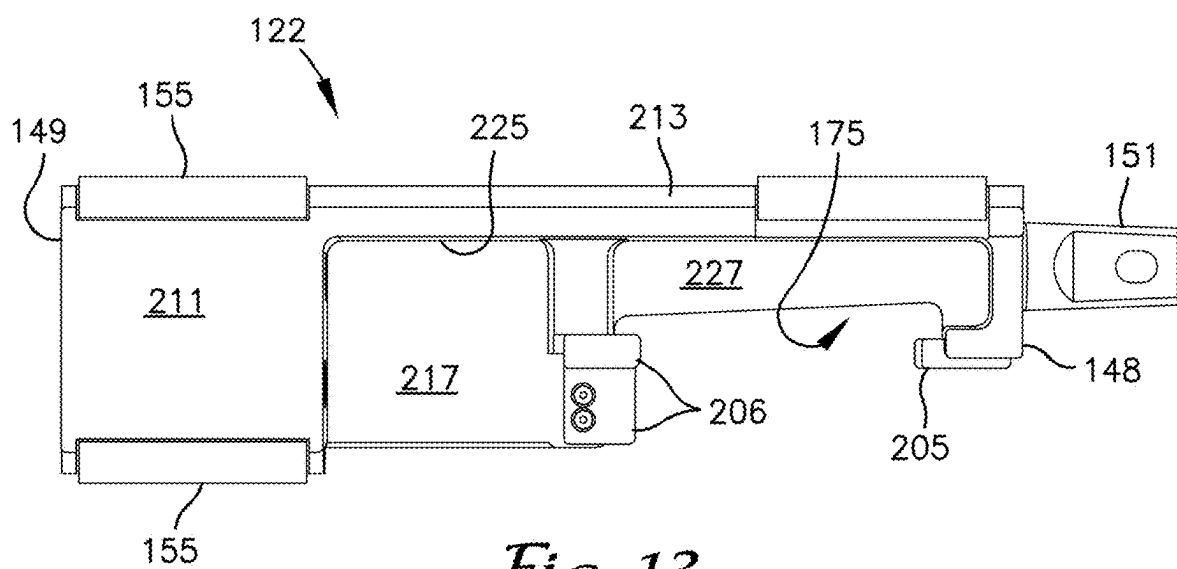
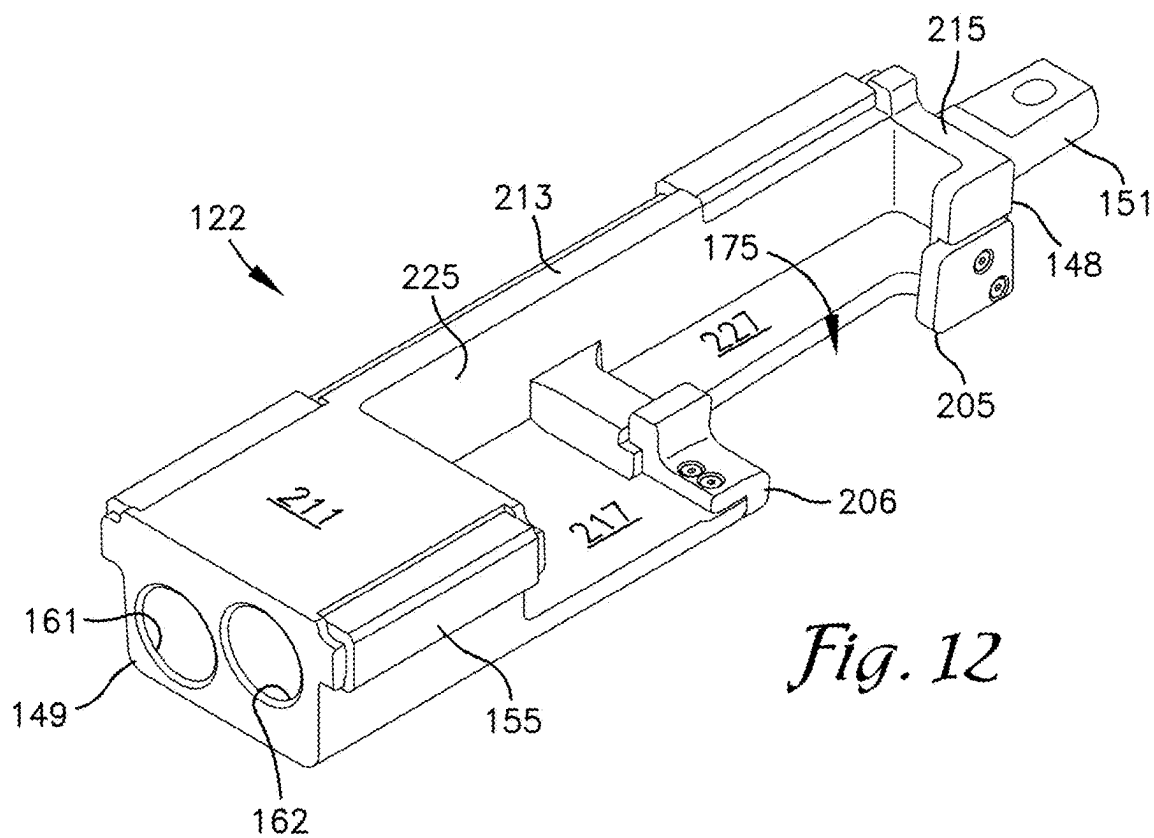


Fig. 11



LOW PROFILE RAIL CLAMP ASSEMBLY

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 63/555,637, filed Feb. 20, 2024, the disclosure of which is hereby incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] This invention relates to improved clamp assemblies for securing long lengths of ribbon rail to a rail train car.

Description of the Related Art

[0003] Devices and methods for securing long lengths of rails for train tracks to rail cars for transport have been described and claimed in Applicant's prior patents U.S. Pat. Nos. 8,181,577 and 8,590,454. In brief, railroad tracks are constructed using long sections of ribbon rail which may be up to 1600 feet in length. These sections of ribbon rail are formed by butt welding multiple sticks of rail, which traditionally come from the steel mill in thirty-nine foot or seventy-eight foot lengths. The welding of the ribbon rails is done at a welding plant and the welded ribbon rails are transported to their installation site on a specially constructed rail train. The rail train includes a plurality of rail rack cars, each typically having one or two racks of shelves per car.

[0004] One car in each rail train is a tie-down car including specialized stands which include means for fixing the rails to racks on the stands to prevent longitudinal movement of the rails relative to the tie-down car. The fixing means generally includes a plurality of clamping blocks which are bolted to the stand on opposite sides of each rail so as to bear against the foot or base flange of the rail and clamp it against the stand. Historically, each clamping block is held down by three or four large bolts which must be installed or removed using an impact wrench or the like. Recent improvements, such as those in the previously referenced patents, utilize a mechanical clamping assembly with hydraulically actuated clamps or hooks which selectively capture and retain the rail without the need of a worker manually clamping and unclamping the rails. It has been learned, however, that the overall configuration of the clamping members which endure repetitive rotation of an actuator system as the clamp moves results in rapid wearing of components with excessive maintenance and repair costs. An improved clamping assembly which significantly reduces wear, increases maintenance intervals and limits repairs is needed.

SUMMARY OF THE INVENTION

[0005] The present invention is an improved clamping assembly for clamping elongate members in place, such as rails to be secured in place on a rail train. The clamping assemblies are mounted on shelves on one or more tie-down cars. Clamp members of each clamping assembly are normally urged to a clamping position by one or more springs to secure the rail in place to the clamping assembly and to the rail car. Linear actuators, such as hydraulic cylinders are utilized to move the clamp members out of clamping engagement with the rails.

[0006] Each clamp assembly includes a base plate fastened to the stand of the tie-down car. The base plate has at

least two openings formed therethrough, one on each longitudinal side of a rail support section of the base plate on which the rail is supported. Respective clamping members extend upwardly through the openings. Each clamping member has a clamping flange which selectively engages a lower flange or foot of the rail, and a clamp hub slidably mounted on a guide rod mounted to and below the base plate. A slidable clamping member carriage includes tubular spring bores in which springs are positioned, with the springs positioned between the carriage and an abutting feature on the base plate to normally bias a respective clamping member in a first direction relative to the guide rod on which the respective clamping member is mounted. The guide rods extend at an angle relative to the base plate such that each clamping member moves generally upward or downward relative to the base plate as the hubs of the clamping members ride along their respective guide rods.

[0007] The springs normally urge the clamping members toward the lower ends of the guide rods, drawing the clamping flange of each clamping member downward onto the foot of a rail positioned between opposed clamping members. Inline hydraulic actuators are connected to the slidable clamping member carriage which moves independently from the fixed guide rods, with the hydraulic actuators selectively acting on the clamping members to urge the clamping members in opposition to the spring and out of clamping engagement with the rail, or in harmony with the spring and into clamping engagement with the rail. In normal or resting orientation, the springs act on the clamping members to urge and hold the clamping members in clamping engagement with the rail when hydraulic pressure to the actuators is released, such as during transport of the rails.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] FIG. 1 is a perspective view of a rail tie-down car.

[0009] FIG. 2 is a perspective view of a rail clamp assembly in a clamped position and viewed from an end opposite a pair of actuators operable to move clamps of the clamp assembly between clamped and unclamped positions.

[0010] FIG. 3 is a perspective view of the rail clamp assembly as in FIG. 2 in the clamped position and viewed from an end from which the actuators extend.

[0011] FIG. 4 is a partially exploded perspective view of the rail clamp assembly as in FIG. 2 with the clamps in the clamped position.

[0012] FIG. 5 is a top, plan view of the rail clamp assembly as in FIG. 3 with the clamps in an unclamped position.

[0013] FIG. 6 is a cross-sectional view of the rail clamp assembly taken along line 6-6 of FIG. 5.

[0014] FIG. 7 is a bottom, perspective view of the rail clamp assembly with the clamps in the clamped position and with springs removed to show detail.

[0015] FIG. 8 is a bottom, plan view of the rail clamp assembly with the clamps in the clamped position.

[0016] FIG. 9 is a bottom, plan view of the rail clamp assembly with the clamps in the unclamped position.

[0017] FIG. 10 is a cross-section view of the rail clamp assembly taken along line 10-10 of FIG. 8.

[0018] FIG. 11 is a cross-section view of the rail clamp assembly taken along line 11-11 of FIG. 9.

[0019] FIG. 12 is a top, perspective view of a clamping member carriage of the rail clamp assembly.

[0020] FIG. 13 is a top, plan view of the clamping member carriage as shown in FIG. 12.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] As required, detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention, which may be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to variously employ the present invention in virtually any appropriately detailed structure. The drawings constitute a part of this specification and include exemplary embodiments of the present invention and illustrate various objects and features thereof.

[0022] Certain terminology will be used in the following description for convenience in reference only and will not be limiting. For example, the words “upwardly,” “downwardly,” “rightwardly,” and “leftwardly” will refer to directions in the drawings to which reference is made. The words “inwardly” and “outwardly” will refer to directions toward and away from, respectively, the geometric center of the embodiment being described and designated parts thereof. Said terminology will include the words specifically mentioned, derivatives thereof and words of a similar import.

[0023] Referring to the drawings and as shown in FIG. 1, the reference number 1 generally designates a clamp car or tie-down car 1 which may be incorporated into a rail train for transporting a plurality of ribbon rails 3 along a railroad track. The rail train may be constructed or assembled similar to the rail train as shown and described in U.S. Pat. No. 8,590,454 of Ivan E. Bounds and assigned to Herzog Contracting Corp. of St. Joseph, Missouri, the disclosure of which is incorporated herein by reference.

[0024] As shown in FIGS. 3, 10 and 11, each rail 3 is of fixed length and includes a head 5, a base flange 6, and a web 7 connecting the base flange 6 to the head 5. The base flange 6 may be described as including opposingly directed feet 8 and 9. The rail train is made up of a plurality of cars, including front- and rear-end cars or tunnel cars, the tie-down car 1, and a plurality of rail support cars. In the embodiment shown, the tie-down car 1 is preferably positioned near the center of the train to accommodate the greatest amount of expansion of the outer periphery of the train as it rounds corners without pulling the rails 3 off of rail support shelves on the front and rear end cars.

[0025] Referring to FIG. 1, the tie-down car 1 includes a plurality of clamp assemblies 100 which are mounted on clamp stands 31 and 32 and clamp the ribbon rails 3 to the clamp stands 31 and 32 and to the train. The clamp stands 31 and 32 are generally mirror images of each other, with clamping assemblies 100 on the first clamp stand 31 connecting a first half of the rails 3 to the tie-down car 1 and clamping assemblies 100 on the second clamp stand 32 connecting a second half of the rails 3 to the tie-down car 1. As discussed in more detail hereafter, the clamp assemblies 100 are preferably hydraulically and remotely operated for clamping the ribbon rails 3 to the clamp stands 31 and 32. As mentioned elsewhere, it is to be understood that the clamp assemblies 100 could be actuated pneumatically, electrically, or mechanically.

[0026] Each clamp stand 31 and 32 is formed from a framework 34 forming a plurality of clamp stand shelves 35, respectively, with the number of clamp stand shelves 35 corresponding to the number of layers or rows of rail to be supported. First and second end roller rack stands (not shown) may be positioned adjacent and outwardly from the clamp stands 31 and 32, respectively, on the ends of the tie-down car 1. Each clamp stand shelf 35 is provided with multiple clamp assembly frameworks 34, two of which are included in the embodiment shown. The clamp frameworks 34 support opposingly oriented clamping assemblies 100, with each opposingly oriented pair of such clamp assemblies configured to secure a rail 3.

[0027] Referring to FIGS. 2 and 3, each clamp assembly 100 of clamp stands 31 and 32 includes a clamp plate 102 to which the rest of the components are attached. Each clamp plate or base plate 102 has a pair of opposed clamping members 103 and 104 extending through slots 105 and 106 formed in the base plate 102. As shown in FIG. 1, the clamp plate 102 of each clamp assembly 100 includes means for connecting it to the framework 34 of the shelf 35 on which it is supported which, in the embodiment shown, comprise bolt holes 107 formed in each clamp plate 102. Bolts (not shown) are threaded through the bolt holes 107 and into the framework 34 to secure the base plate 102 of each clamp assembly 100 thereto.

[0028] The base plate 102 of each clamp assembly 100 includes a driving or actuating end 108 and an opposing second or spring end 109, with at least one longitudinal receiving section 110 positioned between the ends 108 and 109 on which the base flange 6 of a respective rail 3 rests. The actuating end 108 may also be referred to as a clamping end 108 and the spring end 109 may also be referred to as the release end 109 of the base plate 102. As best shown in FIG. 4, two elongate clamp slots 105 and 106 are formed through the base plate 102 adjacent to and on opposite sides of the receiving section 110. Each clamp slot 105 and 106 is defined by inner and outer edges 113 and 114 relative to a longitudinal axis extending through the receiving section 110, and by inner and outer end walls 115 and 116 extending transverse to the longitudinal axis extending through the receiving section 110. The inner end wall 115 may be referred to as a clamping end or clamping end wall 115 and the outer end wall 116 may be referred to as a release end or release end wall 116. As best seen in FIGS. 2, 3, 10 and 11, each clamping member 103 and 104 includes a clamp hook or holding hook 117 and 118 for grasping the base flange 6 of a rail 3. As best seen in FIGS. 4 and 9, the clamping members 103 and 104 are slidably mounted on guide rods or shafts 119 and 120, respectively, that are mounted to bosses or other structures formed on the underside of the base plate 102. The guide rods 119 and 120 extend below the base plate 102 with each hook 117 and 118 extending upward through a respective one of the clamp slots 105 and 106. Each clamping member 103 and 104 is supported within a clamping member carriage 121 and 122, each of which is slidably connected to and positioned below the clamp base 102 and slidable between the clamping end 108 and release end 109 thereof. Longitudinal movement of the clamping member carriages 121 and 122 moves the clamping members 103 and 104 longitudinally along the respective guide rods 119 and 120 to advance the clamping members 103 and 104 into and out of engagement with the base flange 6 of a rail 3 on the base plate 102.

[0029] Referring to FIG. 7, the base plate 102 has a depending box-shaped flange assembly 124 positioned near the periphery thereof. This flange assembly 124 includes a first end or actuator end 125, an opposed second end 126, and opposing sides 127, 128, with the ends and the sides having inner surfaces 130 and outer surfaces 132. The flange assembly 124 substantially houses the clamping member carriages 121 and 122 as described herein. Outer guide rails or tracks 135 and 136 are provided along the inner surfaces 130 of the opposing flange assembly sides 127, 128 with the guide rails 135 and 136 spanning substantially between the flange assembly opposing ends 125 and 126. A central guide rail 138 similarly extends between the flange assembly opposing ends 125 and 126 medially between the flange assembly sides 127 and 128. Clamping member carriage 121 is slidably mounted on and between outer guide rail 135 and central guide rail 138, and clamping member carriage 122 is slidably mounted on and between outer guide rail 136 and central guide rail 138.

[0030] Hydraulic actuators 141 and 142 are mounted below the plane in which the base plate 102 extends, near the driving end 125 and in-line with a respective carriage 121 and 122. Each actuator 141, 142 includes a respective piston 143, 144 which is fastened to a respective clamping member carriage 121, 122 and extends through openings provided through the actuator end 125 of flange assembly 124. The actuators 141 and 142 are operable to act on the respective clamping member carriages 121 and 122 which carry the clamping members 103 and 104, with operation of the actuators 141 and 142 drawing the hooks 117 and 118 against the biasing force of springs 145 and 146 from a clamping position wherein the hooks 117 and 118 are oriented proximate the clamping end walls 115 of the respective slots 105 and 106 to an unclamped or open position wherein the hooks 117 and 118 are oriented proximate to the release end walls 116 of the respective slots 105 and 106. The actuators 141 and 142 are also operable to advance or drive the clamp hooks 117 and 118 from the open position back to the clamping position.

[0031] Referring to FIGS. 8 and 9, each clamping member carriage 121 and 122 includes a push end 148 and an opposite compression end 149 and is provided with connection means, such as a mounting tab 151 on the push end 148 for attachment to a fork or clevis 152 extending from an end of the respective piston 143, 144 of each respective hydraulic actuator 141, 142. The push end 148 of each carriage 121, 122 may be referred to as the clamping end 148 and the compression end 149 of each carriage 121, 122 may be referred to as the compression end 149. Each clamping member carriage 121 and 122 has carriage rails 155 projecting from sides thereof (see FIG. 10) which are aligned with and moveable upon the guide tracks 135 and 136 and the central guide rail 138 of the base plate flange assembly 124, allowing the clamping member carriages 121 and 122 to move linearly. As best shown in FIG. 7, two spring bores 161 and 162 are provided in each clamping member carriage 121 and 122 for housing the compression springs 145 and 146. The compression springs 145 and 146 extend between inner ends of the bores 161 and 162 and the inner surface 130 of the compression end 126 of the flange assembly 124, with the spring bores 161 and 162 surrounding the springs 145 and 146 during compression to limit spring deflection.

[0032] The compression springs 145 and 146 are sized to normally urge the carriages 121 and 122 toward the clamp-

ing end 108 of the base plate 102, which advances the associated clamp members 103 and 104 toward an inner end or clamping end 169 of each guide rod 119 and 120 such that the clamp members 103 and 104 slide downward on the respective guide rods 119 and 120 and toward the clamping end 108 of the base plate 102. As the carriages 121 and 122 advance toward the clamping end 108, the clamp hooks 117 and 118 are drawn downward into the clamping position and the pistons 143 and 144 of the actuators 141 and 142 are urged outward.

[0033] Each guide rod 119 and 120 extends from its clamping end 169 to an outer end or release end 171 and is connected to the underside of the base plate 102, such that the guide rods 119 and 120 slope downward from the release ends 171 to the clamping ends 169. The clamping end 169 of each guide rod 119, 120 is connected to the underside of the base plate 102 proximate to the actuator end 125 thereof, and the release end 171 of each guide rod 119, 120 is connected to the underside of the base plate 102 closer to the opposing end 126 of the flange assembly 124 and proximate to the release end 116 of each guide slot 105, 106. The guide rods 119 and 120 may also be described as sloping downward from the release end 116 to the clamping end 115 of each clamp slot 105, 106. The guide rods 119 and 120 generally extend along the full length of the respective clamp slots 105 and 106 and are positioned parallel to and below the inner edges 113 thereof.

[0034] As shown in FIGS. 4, 8, and 9, the pistons 143 and 144 of the actuators 141 and 142 are axially connected to the clamping member carriages 121 and 122, respectively. The clamp members 103 and 104 are slidably and rotatably mounted on respective guide rods 119 and 120 and lie within openings or recesses 175 (see FIGS. 12 and 13) extending into the respective carriages 121 and 122 from upper surfaces thereof. The clamping member carriages 121 and 122 are configured to slide longitudinally relative to the clamp base 102 and the guide rods 119 and 120, thereby advancing the respective clamp members 103 and 104 longitudinally relative to the guide rods 119 and 120 while allowing the clamp members 103 and 104 to rotate relative to the guide rods 119 and 120. By positioning the actuators 141 and 142 and the springs 145 and 146 to extend along the longitudinal axis of or in line with the respective carriages 121 and 122, the overall height of the clamp assembly 100 is reduced. The springs 145 and 146 function to normally bias and advance the clamping carriages 121 and 122 and the clamping members 103 and 104 carried thereby toward the clamping end 108 of the base plate 102, drawing the clamping members 103 and 104 downward on guide rods 119 and 120 until the holding hooks 117 and 118 extend in the clamping position. The springs 145 and 146 thereby force the holding hooks 117 and 118 to the clamping position when the supply of pressurized hydraulic fluid to actuators 141 and 142 is withdrawn, as may occur during transport of the rails 3 on the rail train, which may take days or weeks, or if a hydraulic line supplying pressurized fluid to either actuator 141 or 142 is severed. It is to be understood that different types of actuators other than hydraulic actuators might be utilized, including pneumatic actuators or solenoids. The actuators shown are linear actuators, but it is foreseen that other types of actuators, mechanisms or linkages may be used for remotely acting on and moving the hooks 117 and 118.

[0035] Referring to FIGS. 10 and 11, each clamping member 103 and 104 includes a generally tubular guide

sleeve or hook hub 176, a shank 177 projecting outward from and generally tangential to the hook hub 176 and a clamping flange 178 which is positioned at an upper end of the shank 177. The clamping flange 178 extends perpendicularly inward from the shank 177 and over the hook hub 176 in spaced relation thereto, such that the shank 177 and clamping flange 178 form the hook 117 and 118 of each clamping member 103 and 104. The guide rods 119 and 120 extend along axes which pass through guide bores formed in each hook hub 176 at acute angles relative to the clamping flanges 178, with the angles between the hook hubs 176 and clamping flanges 178 corresponding to the angled or downward slope of the guide rods 119 and 120 toward their respective clamping ends 169. As best seen in FIGS. 8 and 9, a first end or clamping end face 179 of the hook hub 176 is lower or spaced further away from the clamping flange 178 than a second end or release end face 180 of the hook hub 176. The clamping end faces 179 are formed on the ends of the hook hubs 176 opposite the respective compression springs 145, 146, and the release end faces 180 are formed on the ends of the hook hubs 176 closer to the respective compression springs 145, 146.

[0036] As best seen in FIG. 4, a sloping gap 181 which is formed between the hook hub 176 and the clamping flange 178 of each clamping member 103 and 104 opens inward toward the longitudinal receiving section 110 of the base plate 102 and is wider at the first end 179 than the second end 180 of the hook hub 176. The gap 181 between the hook hub 176 and clamping flange 178 allows the hooks 117 and 118 to move downward and rotate inward as the springs 145 and 146 urge the respective hooks 117 or 118 toward the clamping end 115 of each slot 105 and 106 and into the clamping position, with the clamping flange 178 of each hook 117, 118 down downwardly against the rail flange foot 8 or 9.

[0037] The inner edges 113 of the clamp slots 105 and 106 generally define the outer edges of the receiving section 110, and the outer edges 114 of each clamp slot 105 and 106 are contoured inward from the release ends 116 to the clamping ends 115, such that the clamp slots 105 and 106 are narrower proximate to their respective clamping ends 115 than proximate to their respective release ends 116. The edges of the base plate 102 form the outer edge 114 of each slot 105 and 106, with the narrower spacing of the clamp slots 105, 106 near the clamping ends 115 thereof allowing the edges of the base plate 102 to function as guides which engage the hooks 117 and 118, forcing the hooks 117 and 118 to pivot inward about the respective guide rods 119 and 120 as the springs 145 and 146 urge the hooks 117 and 118 to the clamped position. Similarly, the wider spacing of the clamp slots 105, 106 near the release ends 116 thereof allows the hooks 117 and 118 and clamping flanges 178 thereof to pivot outward to the open position, spaced away from a rail 3 supported on the receiving section 110 of the clamp base plate 102, with the inner edges 113 of the clamp slots 105 and 106 guiding the hooks 117 and 118 sufficiently outward such that when the hooks 117 and 118 are in the open position, the hooks 117 and 118 are spaced apart from and do not overlie the feet 8 and 9 of the rail base flange 6.

[0038] Referring to FIG. 4, each clamp slot 105 and 106 includes a relatively wide distal portion or release portion 182 proximate to the respective release end 116, a tapering intermediate portion 183, and a relatively narrow clamping portion 184 proximate to the respective clamping end 115.

First and second inwardly sloping transition sections 185 and 186 extend between the distal portion 182 and the intermediate portion 183 and between the narrow portion 184 and the intermediate portion 183, respectively, of each clamp slot 105 and 106. The narrow clamping portions 184 of the clamp slots 105 and 106 are sized slightly wider than the width of the hook shanks 177 extending therethrough, such that when the clamping members 103 and 104 are drawn to the clamping position, the hook shanks 177 are maintained in a perpendicular or vertical alignment relative to the base plate 102 and the clamping flanges 178 project over the receiving section 110 and over the feet 8 and 9 of the rail base flange 6. A clamping wall 190 is formed along the outer edge 114 of each slot 105 and 106 along the narrow portion 184 thereof, with the clamping walls 190 and the second transition sections 186 cooperating to urge or hold the clamp hooks 117 and 118 in the clamping position. As the hooks 117 and 118 advance from the clamping position to the open position, the hooks 117 and 118 are drawn outward toward respective release ends 171 of the slots 105 and 106. As the hooks 117 and 118 move from the intermediate portions 183 to the distal portions 182 of the slots 105 and 106, the second ends of the hooks 117 and 118 engage the associated first transition sections 185 of the slots 105 and 106 such that the hooks 117 and 118 pivot outward and their associated clamping flanges 178 pivot away from the receiving section 110 and into an open alignment.

[0039] As best shown in FIG. 5, when the hooks 117 and 118 are in the open position discussed above, a first end of each hook 117 and 118 which is oriented closer to the respective slot clamping end 115 is positioned in the intermediate portion 183 of the respective slots 105 and 106, and an opposing second end of each hook 117 and 118 which is oriented closer to the respective slot release end 116 is positioned in the distal portion 182 of the respective slots 105 and 106. As the hooks 117 and 118 are driven toward the respective clamping ends 115 of the slots 105 and 106, the first ends of the hooks 117 and 118 engage the associated inner or second transition sections 186 of the slots 105 and 106 such that the hooks 117 and 118 pivot inward, with the hook shanks 177 pivoting upward into alignment with the intermediate portions 183 of the clamp slots 105 and 106 as the hooks 117 and 118 are driven toward the respective clamping ends 115 of each slot 105 and 106. As the first ends of the hooks 117 and 118 advance into the narrow portions 184 of the respective slots 105 and 106, the second ends of the hooks 117 and 118 extend adjacent to the portions of the base plate 102 which form the intermediate portions 183 of the slots 105 and 106, such that the second ends of the hooks 117 and 118 are urged toward the inner edges 113 of the respective slots 105 and 106 until the entire length of each hook clamping flange 178 engages with and clamps against the respective foot 8 or 9 of the rail base flange 6.

[0040] Referring to FIGS. 10 and 11, it is seen that as the hooks 117 and 118 are drawn inward and downward from the distal portions 182 of the respective clamp slots 105 and 106 toward the clamping ends 115 thereof for engagement of inner surfaces of the clamping flanges 178 with upper surfaces of the respective rail feet 8 and 9 of a rail 3 positioned on the rail receiving section 110 of the base plate 102, the hook hubs 176 advance downward on their respective downwardly sloping guide rods 119 and 120 such that the hooks 117, 118 and the associated clamping flanges 178 are forced downward.

[0041] As best seen in FIG. 7, the clamping member carriages 121 and 122 are configured to engage and move the clamping members 103 and 104 longitudinally along the shafts 119 and 120 in response to the biasing force of the springs 145, 146 and the extension of the pistons 143, 144 of actuators 141, 142. The carriages 121 and 122 are slidably mounted below the base plate 102, such that the clamping end 148 of each carriage 121 and 122 extends toward or faces the clamping end 108 of the base plate 102 and the release end 149 of each carriage 121 and 122 extends toward or faces the release end 109 of the base plate 102. As best seen in FIGS. 12 and 13, the recesses or cavities 175 of the carriages 121 and 122, which may be referred to as clamping member recesses 175, are formed between first and second abutments 205 and 206 mounted on each carriage 121 and 122. The first abutments 205 are mounted on the respective carriages 121 and 122 closer to the clamping ends 148 thereof and extend in closely spaced relation to the clamping end faces 179 of the respective hook hubs 176, and the second abutments 206 are mounted on the respective carriages 121 and 122 closer to the release ends 149 thereof and extend in closely spaced relation to the release end faces 180 of the respective hook hubs 176. As the carriages 121 and 122 advance toward the clamping end 108 of the base plate 102, the second abutments 206 mounted thereon extend in engaging or abutting relationship with the release end faces 180 of the hook hubs 176 of the clamping members 103 and 104, pushing each clamping member 103 and 104 toward the clamping end 108 of the base 102 such that each hook hub 176 slides downward on the respective guide rod or shaft 119 and 120 and into the clamping position as discussed previously. Similarly, as the carriages 121 and 122 advance toward the release end 109 of the base plate 102, the first abutments 205 mounted thereon extend in engaging or abutting relationship with the clamping end faces 179 of the hook hubs 176 of the clamping members 103 and 104, pushing each clamping member 103 and 104 toward the release end 109 of the base 102 such that each hook hub 176 slides upward on the respective guide rod or shaft 119 and 120 and into the open or released position as discussed previously.

[0042] In the embodiment shown in FIGS. 12 and 13, the release end 149 of each carriage 121 and 122 is formed as a spring housing generally in the form of a rectangular block or spring support block 211, with the spring receiving bores 161 and 162 extending into the spring support blocks 211 from the release ends 149 of the carriages 121 and 122. An outer side wall 213 extends along an outer side of each carriage 121 and 122 from the spring support block 211 toward the clamping end 148, with an end wall 215 projecting laterally inward from the outer side wall 213 of each carriage 121 and 122 at the clamping end 148 thereof and toward the respective guide rod 119 or 120. The first abutment 205 of each carriage 121, 122 is mounted on the respective end wall 215 outward of the respective guide rod 119 or 120, and the first abutments 205 extend back toward the respective release ends 149 of the carriages 121 and 122. The first abutments 205 may be described as oriented generally vertically and may be formed from a comparatively soft metal, relative to the carriages 121 and 122, such as brass or bronze to reduce wear on clamping end face 179 of the hook hub 176 as the clamping members 103 and 104 are repeatedly advanced between the clamping position and the open position. The mounting tabs 151, which connect the

pistons 143 and 144 of the actuators 141 and 142 to respective carriages 121 and 122, are formed on the end wall 215 of each carriage 121 and 122.

[0043] In the embodiment shown, a carriage floor 217 extends forward from the spring support block 211 of each carriage 121 and 122 and toward the clamping member recess 175 thereof. The second abutments 206 are secured to or formed on an end of the respective carriage floors 217 adjacent to the clamping member recess 175, with each second abutment 206 extending laterally in a plane oriented below the release ends 171 of the respective guide rods 119 and 120. The second abutments 206 may be described as oriented generally horizontally and may be formed from a comparatively soft metal, relative to the carriages 121 and 122, such as brass or bronze to reduce wear on the release end face 180 of the hook hub 176 as the clamping members 103 and 104 are repeatedly advanced between the clamping position and the open position.

[0044] In the embodiment shown, each clamping member recess 175 extends from an upper surface of the respective carriage 121, 122 through a lower surface thereof, such that the clamping member recesses 175 extend completely through the respective carriages 121 and 122 and the respective carriage floors 217 do not extend below the hook hubs 176 of the clamping members 103 and 104. A shaft accommodating recess 225 is formed above the carriage floor 217 of each carriage 121 and 122 and opens upward, extending through the upper surface thereof to allow each carriage floor 217 and second abutment 206 formed thereon to slide below the release end 171 of each guide rod 119, 120 and a portion of the respective guide rod 119, 120 positioned proximate thereto as the carriages 121 and 122 are advanced toward the clamping end 108 of the base plate 102. In an embodiment, the carriage floor 217 may include a sidewall portion 227 which extends along the outer side wall 213 of each carriage 121 and 122 from a position proximate to the second abutment 206 thereof to the end wall 215 thereof. The sidewall portion 227 may extend inward from the outer side wall 213 of each carriage 121, 122 into the respective recesses 175 such that an inner edge of the sidewall portion 227 may define an outer edge of the recess 175 of each clamping member 103, 104.

[0045] With reference to FIGS. 1-3, a mounting plate 231 is secured to each actuator 141 and 142 and is configured to allow mounting the actuators 141 and 142 to the framework 34 of the respective clamp stands 31 and 32 on which the clamp assembly 100 is secured. In the embodiment shown, the mounting plates 231 are secured to the actuators 141 and 142 such that the pistons 143 and 144 thereof extend through openings formed in the respective mounting plates 231, before extending through openings formed in the actuator end 125 of the base plate flange assembly 124 to allow extension and retraction of each piston 143 and 144 there-through in association with longitudinal movement of the carriages 121 and 122. The actuators 141, 142 and pistons 143, 144 may be described as being connected in-line with the respective carriages 121, 122, such that application of pressurized hydraulic fluid to the actuators 141 and 142 drives movement of the carriages 121 and 122 along only their longitudinal axes. Similarly, the compression springs 145 and 146 may be described as extending in-line with the respective carriages 121 and 122, such that the biasing force of the springs 145 and 146 drives movement of the carriages 121 and 122 along only their longitudinal axes. The pistons

143 and 144 are connected to the carriages 121 and 122, respectively, rather than to the clamping members 103 and 104, allowing the pistons 143 and 144 to remain in a fixed rotational position as the clamping members 103 and 104 are advanced between the clamping position and the release position. Similarly, the springs 145 and 146 act on the carriages 121 and 122, respectively, rather than acting directly on the clamping members 103 and 104, thereby preventing impartment of rotational torque on the springs 145 and 146 as the clamping members 103 and 104 rotate relative to the shafts 119 and 120, respectively, while advancing between the clamping position and the release position. In addition, because the actuators 141 and 142 and springs 145 and 146 can be mounted in-line with the carriages 121 and 122, respectively, the overall height of the clamping assembly 100 is reduced.

[0046] It is to be understood that compression or tension springs could foreseeably be used to bias the clamp hooks into or out of clamping engagement with a rail supported on the rail base, such that springs could function as either clamping means or release means acting on the clamp hooks. It should be further understood that actuators of the type disclosed herein can be used as either clamping or release means, or both, which act on the clamp hooks to advance the clamp hooks into and out of clamping engagement with a rail supported on the rail base. Actuators other than hydraulic actuators, including pneumatic actuators, solenoids or mechanical linkages could be used to move the clamp hooks into and/or out of clamping engagement with a rail supported on the rail base to permit remote engagement and disengagement of the clamp hooks with a rail supported on the clamp base.

[0047] It is to be understood that while certain forms of the present invention have been illustrated and described herein, it is not to be limited to the specific forms or arrangement of parts described and shown. As used in the claims, identification of an element with an indefinite article “a” or “an” or the phrase “at least one” is intended to cover any device assembly including one or more of the elements at issue. Similarly, references to first and second elements, or to a pair of elements, is not intended to limit the claims to such assemblies including only two of the elements, but rather is intended to cover two or more of the elements at issue. Only where limiting language such as “a single” or “only one” with reference to an element, is the language intended to be limited to one of the elements specified, or any other similarly limited number of elements.

What is claimed is:

1. A clamp assembly for securing an elongate member thereto, comprising:

- a clamp base having an elongate member support section extending from a clamping end to a release end of said clamp base;
- a clamping member carriage slidably connected to the clamp base and slidable between the clamping end and the release end of the clamp base; the clamping member carriage having first and second ends, the first end extending toward the clamping end of the clamp base and the second end extending toward the release end of the clamp base;
- an actuator connected to the clamping member carriage and operable to selectively move the clamping member carriage between the clamping end and the release end of the clamp base;

- a spring acting on and normally urging the clamping member carriage toward the clamping end of the clamp base; and
 - a clamping member engaged by the clamping member carriage, the clamping member advanceable into clamping engagement with an elongate member supported on the elongate member support section of the clamp base upon movement of the clamping member carriage toward the clamping end of the clamp base by the actuator, and the clamping member advanceable out of clamping engagement with the elongate member supported on the elongate member support section of the clamp base upon movement of the clamping member carriage toward the release end of the clamp base.
2. The clamp assembly as in claim 1, wherein the spring comprises at least one compression spring.
3. The clamp assembly as in claim 1, wherein the actuator comprises a linear actuator.
4. The clamp assembly as in claim 1, wherein the clamping member carriage is slidably connected to the clamp base therebelow and the spring comprises at least one compression spring extending between the release end of the clamping member carriage and an abutment depending from the clamp base.
5. The clamp assembly as in claim 4, wherein the actuator comprises a linear actuator connected at a first end to the clamp base and at a second end to a clamping end of the clamp member carriage.
6. The clamp assembly as in claim 1, further comprising a shaft on which the clamping member is pivotally mounted, the shaft mounted below the clamp base and having an upper end and a lower end, the upper end of the shaft extending closer to the release end of the clamp base than the lower end of the shaft.
7. The clamp assembly as in claim 1, wherein the clamping member includes a hook configured to move downward and pivot inward upon advancement of the clamping member into clamping engagement with the elongate member supported on the elongate member support section of the clamp base.
8. A clamp assembly for securing an elongate member thereto, comprising:
- a) a clamp base having an elongate member support section extending from a clamping end to a release end of said clamp base;
 - b) a shaft having an upper end and a lower end mounted below said clamp base; said lower end of said shaft supported below said upper end of said shaft and said lower end of said shaft extending closer to the clamping end of said clamp base than said upper end of said shaft;
 - c) a clamping member having a hub pivotally mounted on said shaft; a shank projecting outward from said hub and a clamping flange projecting inward from a distal end of said shank over and in spaced relation to said hub; and
 - d) a clamping member carriage slidably connected to and below said clamp base and slidable between the clamping end and the release end of the clamp base; the clamping member carriage having first and second ends, the first end extending toward the clamping end of the clamp base and the second end extending toward the release end of the clamp base; the clamping member carriage having a clamping member cavity extend-

ing into the clamping member carriage from an upper surface thereof, the clamping member carriage having a first abutment extending adjacent the clamping member cavity from the first end of the clamping member carriage and having a second abutment extending adjacent the clamping member cavity from the second end of the clamping member carriage, the clamping member positioned within the clamping member cavity with the first abutment extending in closely spaced relation to a clamping end face of the clamping member and the second abutment extending in closely spaced relation to a release end face of the clamping member such that sliding advancement of the clamping member carriage toward the clamping end of the clamp base advances the clamping member on the shaft toward the lower end thereof and sliding advancement of the clamping member carriage toward the release end of the clamp base advances the clamping member on the shaft toward the upper end thereof.

9. The clamp assembly as in claim 8, further comprising at least one compression spring acting on a second end of the clamping member carriage and normally biasing the clamping member carriage toward the clamping end of the clamp base.

10. The clamp assembly as in claim 9, further comprising a linear actuator acting on a first end of the clamping member carriage for selectively advancing the clamping member carriage toward the release end of the clamp base against the biasing force of the at least one compression spring.

11. The clamp assembly as in claim 8, wherein the shank of the clamping member extends through a clamp slot formed in the clamp base, the clamp slot defined by a clamping end wall, a release end wall, and inner and outer edge walls extending therebetween; the clamping end of the clamp base extending closer to the clamping end wall than the release end wall.

12. The clamp assembly as in claim 11, further comprising a first sloped transition section extending between the release end wall and the inner edge wall and a second sloped transition section extending between the clamping end wall and the outer edge wall.

13. The clamping assembly as in claim 12, wherein the clamping member pivots inward upon engaging the first sloped transition section as the clamping member advances toward the lower end of the shaft; and the clamping member pivots outward upon engaging the second sloped transition section as the clamping member advances toward the upper end of the shaft.

14. A clamp assembly for securing an elongate member thereto, comprising:

a clamp base having an elongate member support section extending from a clamping end to a release end of said clamp base, an elongate clamp slot formed in said clamp base, said elongate clamp slot including a clamping portion proximate to an inner end wall of said elongate clamp slot and a release portion proximate to an outer end wall of said elongate clamp slot;

a clamp member carriage slidably connected to said clamp base and slidably advanceable between the clamping end and the release end of said clamp base; said clamp member carriage having first and second ends, the first end extending toward the clamping end of said clamp base and the second end extending toward the release end of the clamp base a guide rod mounted to an underside of said clamp base, said guide rod extending between a first end mounted proximate to the outer end wall of said elongate clamp slot and a second end mounted proximate to the inner end wall of said elongate clamp slot, said guide rod sloping downward from said first end thereof to said second end thereof; and

a clamp member comprising a hub pivotally mounted to said guide rod and a hook extending outward therefrom, the hook extending through said elongate clamp slot, said clamp member advanceable between a clamping position and an open position upon sliding advancement of the clamp member carriage between the clamping end and the release end of said clamp base.

15. The clamp assembly as in claim 14, further comprising a linear actuator attached to the first end of the clamp member carriage, the linear actuator operable to slidably advance the clamp member carriage between the clamping end and the release end of said clamp base.

16. The clamp assembly as in claim 15, further comprising at least one compression spring acting on the second end of the clamp member carriage, the at least one compression spring normally biasing the clamp member carriage toward the clamping end of the clamp base.

17. The clamp assembly as in claim 14, wherein the hook comprises a shank projecting outward from said hub and a clamping flange projecting inward from a distal end of said shank, said clamping flange projecting over and in spaced relation to said hub to form a gap extending between said clamping flange and said hub.

18. The clamp assembly as in claim 14, wherein said hook moves downward and rotates inward upon advancement of said clamp member to the clamping position, and said hook moves upward and rotates outward upon advancement of said clamp member to the open position.

19. The clamp assembly as in claim 14, wherein said clamp member carriage has a clamp member cavity extending therein from an upper surface thereof, said clamp member positioned within the clamp member cavity.

20. The clamp assembly as in claim 14, wherein said clamp member carriage is a pair of clamp member carriages, said guide rod is a pair of guide rods, and said clamp member is a pair of clamp members; each one of the pair of clamp member carriages positioned on an opposite longitudinal side of the elongate member support section of said clamp base, each one of the pair of guide rods positioned on an opposite longitudinal side of the elongate member support section of said clamp base, and each one of the pair of clamp members positioned on an opposite longitudinal side of the elongate member support section of said clamp base.

* * * * *