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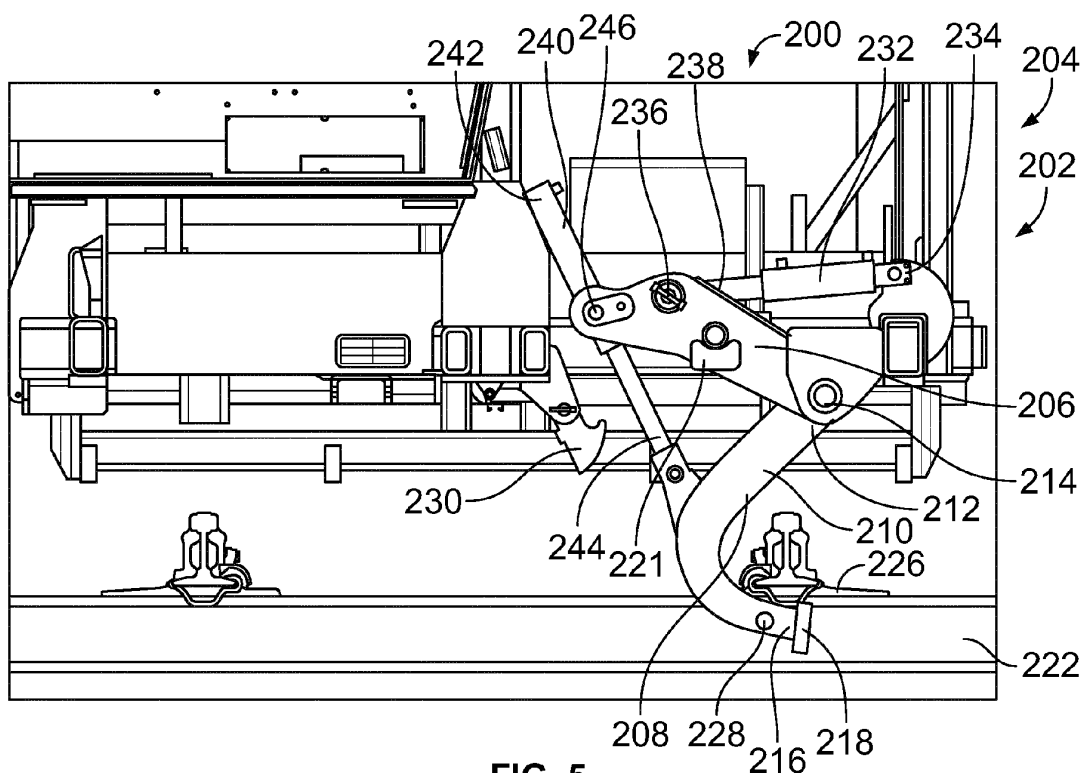
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London SE1 9RA (GB)**(54) **CRIBBING SYSTEM AND METHOD**

(57) A cribbing vehicle is provided that includes a vehicle frame and a primary cribbing device coupled to the vehicle frame and having a work head may move between rails of a track. The cribbing vehicle may include

an auxiliary cribbing system removably coupled to the vehicle frame in spaced relation to the primary cribbing device and having a push arm may move between a first tie and second tie of the track.

**FIG. 5****EP 4 382 670 A1**

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Application No. 63/386,315 (filed 6-December-2022), the entire disclosure of which is incorporated herein by reference.

BACKGROUND

Technical Field.

[0002] The subject matter described relates to a cribbing system and method for clearing a pathway.

Discussion of Art.

[0003] Rail vehicles travel along rails, or tracks, that are placed along a pathway from a first location to another location. When installing, or placing the tracks along the pathway, care may need to be taken to ensure the rail is securely fastened into the ground. Unsecure rails can cause undue wear, a bumpy ride, or a derailment. As a result, care may need to be taken when placing tracks along a pathway.

[0004] When placing the tracks on the pathway, the pathway is prepared for the tracks before the tracks are secured to into the ground. A cribbing vehicle may be utilized to smooth a pathway of debris, rocks, and other undesirable materials within the ground or mud so that the rails, or tracks, can be secured into the ground utilizing anchors. The smoothed-out area may be referred to as a crib that may be formed by the cribbing vehicle. The cribs are formed because the anchor machine needs space in between the ties of the track to get a work head and anchors into the correct position on a rail. If a cribber vehicle is unable to clear debris, mud, packed ballast, etc. from the position it may be difficult to properly secure the anchor. To address, the work head of the anchor machine must correctly operate even through rocks, mud, debris, and the like. Additional wear, and early replacement of the anchor machine, may occur. It may be desirable to have a cribbing system that has relatively decreased wear on the cribbing equipment and anchoring equipment and that may affect the securing of track.

BRIEF DESCRIPTION

[0005] In one or more embodiments, a cribbing vehicle is provided that includes a vehicle frame and a primary cribbing device coupled to the vehicle frame and having a work head may move between rails of a track. The cribbing vehicle may include an auxiliary cribbing system removably coupled to the vehicle frame in spaced relation to the primary cribbing device and having a push arm may move between a first tie and second tie of the track.

[0006] In one or more embodiments, an auxiliary crib-

bing system is provided that includes a kicker frame, a first actuating member coupled to a vehicle frame at a first actuating member first end, and coupled to the kicker frame at a first frame pivot at a first actuating member second end, and a second actuating member coupled to the kicker frame between a second actuating member first end and a second actuating member second end, and coupled to a push arm at the second actuating member second end. The push arm may move from a travel position where the push arm may be coupled to a vehicle frame at a push arm first end and at a push arm second end, to a ready position where the push arm may be coupled to the vehicle frame at only the push arm first end, and to a working position wherein the push arm may be at least partially under a rail of a track.

[0007] In one or more embodiments, a method of cribbing ground for securing rails of a track to the ground is provided that includes performing, with a primary cribbing device, an initial cribbing between a first tie of a track and a second tie of the track between rails of the track. The method may provide, after the initial cribbing, performing a supplemental cribbing between the first tie of the track and the second tie of the track with an auxiliary cribbing device, including cribbing under a rail of the rails of the track.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The inventive subject matter may be understood from reading the following description of non-limiting embodiments, with reference to the attached drawings, wherein below:

Figure 1 illustrates a side plan view of a cribbing vehicle;

Figure 2 illustrates a perspective view of a cribbing system;

Figure 3 illustrates a side plan view of a cribbing system;

Figure 4 illustrates a side plan view of a cribbing system;

Figure 5 illustrates a side plan view of a cribbing system;

Figure 6 illustrates a schematic diagram of a control system; and

Figure 7 illustrates a schematic flow block diagram for a process for securing a rail in a pathway.

DETAILED DESCRIPTION

[0009] Embodiments are disclosed herein that relate to a cribbing system that can be coupled to a vehicle

frame of an existing cribbing vehicle that clears cribs of leftover debris after the cribbing vehicle smooths the pathway. Leftover rock, ballast, packed mud, and the like, may be rooted out using a push arm and a clearing head may engage and capture rock, debris, and the like. Additional or auxiliary cribbing may prepare the ground for application of anchors. Overall, this may reduce or eliminate wear on the anchoring machining during use as well as provide other technical effects.

[0010] Figure 1 illustrates a side view of a cribbing vehicle 100 that moves along a pathway 102 to clear the pathway. The pathway may be cleared of snow, ice, rock, debris, mud, and the like. Once clear, a track, or rail, may be anchored. The cribbing vehicle 100 of Fig. 1 is illustrated as including wheels 104. Still in other example embodiments, the cribbing vehicle may move using tracks, rails, sliding, etc. to form a crib along the pathway. The cribbing vehicle includes a vehicle frame 106 on the wheels. In one example the wheels may engage and move along a previously laid track 108 and can engage the rails 110 of such track for movement.

[0011] The cribbing vehicle may include a primary cribbing device 112 coupled to the vehicle frame and that has a work head frame having a longitudinal extent and a lateral extent that may be mounted laterally on the vehicle frame and may be reciprocally movable vertically relative to the rails between a working position and a travel position. The primary cribbing device may be coupled to the vehicle frame by being of one-piece construction with the vehicle frame, secured to the vehicle frame via welding, or other techniques, removably securing the primary cribbing device to the vehicle frame with bolts or other fasteners, or the like. To this end, the primary cribbing device and the vehicle frame may be formed as a unitary structure formed from a single piece or body. For example, the primary cribbing device and the vehicle frame may be formed as a homogenous single component, rather than a non-homogenous component or a component formed by two or more separate bodies that are then combined with each other. The homogenous component may have the same consistency and/or chemical makeup throughout the entirety or substantially all of the component. The work head frame may be raised and lowered, including by use of hydraulic cylinders, a rack and gear arrangement, levers, cables, or the like. In other examples, the working head frame can operate in other manners than reciprocally, but in each instance, the working head frame functions to smooth or condition the pathway. The smoothing or conditioning may include removing debris, or other materials, within the pathway.

[0012] The cribbing vehicle may include an auxiliary cribbing system 114 to be described in greater detail in relations to Figs. 2-5. The auxiliary cribbing system in one example can be removably, or detachably, coupled to the vehicle frame of the cribbing vehicle. In one example the auxiliary cribbing system may be bolted to the vehicle frame. Alternatively, the auxiliary cribbing system can be screwed, clamped, adhered, etc. onto the vehicle

frame. In one example, the auxiliary cribbing system may be in spaced relation to the primary cribbing device. To this end, a single cribbing device with multiple actuating members cannot be considered both the primary cribbing device and the auxiliary cribbing system. In one example, the auxiliary cribbing system may be located behind, or after, the work head frame in relation to the forward direction of movement of the cribbing vehicle. In an alternative example, the auxiliary cribbing system may be in front of, or before, the work head frame in relation to the forward direction of movement of the cribbing vehicle. In one example, the auxiliary cribbing vehicle includes a push arm and clearing head 116 that have a different size and shape compared to the implement that clears debris, rocks, etc. of the work head frame.

[0013] In another example, the auxiliary cribbing system may generate relatively more force at the clearing head where the ground, rock, debris, mud, ballast, etc. is engaged as compared to the implement of the work head frame that engages the ground, rock, debris, mud, ballast, etc. The amount(s) of force may, in some embodiments, be selected by the controller and may be based on situation specific parameters. In another example, the clearing head of the auxiliary cribbing system engages the ground, rock, debris, mud, gravel, ballast, etc. may use a different motion than the motion used by the implement that engages the ground, rock, debris, mud, ballast, etc. of the implement of the work head frame. In each instance, the auxiliary cribbing system may provide supplemental movement, force, clearing, or action that may differ from that of the work head frame. The amount of rock, debris, mud, ballast, etc. removed from a pathway may differ compared to a situation where only the work head frame is utilized. This may condition the pathway for relatively improved insertion of anchors. The anchors may be inserted into a substrate, such as the ground of the pathway, by an anchor machine.

[0014] Other embodiments may further differentiate the cribber from the implement. Other suitable differentiations may include a vibratory device, a fluid dispenser, a compressed air blower, and the like, arranged on or in conjunction with the operation of the inventive cribber. A suitable vibratory device may include tines or brushes and may vibrate and/or rotate to aid in the cribbing effort. The vibrating and/or rotating may be selectively activated by the controller. A suitable fluid dispenser may be used to aid in the control of airborne dust generation, for example, and may be selectively operated by the controller. A compressed air nozzle may blow smaller particles in a determined direction to aid in the cribbing and may be selectively operated by the controller.

[0015] Figs. 2-5 illustrate an auxiliary cribbing system 200 (Fig. 2) and how the auxiliary cribbing system operates as the auxiliary cribbing system moves from a travel position (Fig. 3) to a ready position (Fig. 4), and finally to a working position (Fig. 5). In one example, the auxiliary cribbing system of Figs. 2-5 is the auxiliary cribbing system illustrated in Fig. 1.

[0016] As illustrated in Fig. 2, the auxiliary cribbing system 200 attaches to the vehicle frame 202 of a cribbing vehicle 204. In one example the cribbing system may be detachably, or removably, coupled to the vehicle frame allowing the attachment and removal of the auxiliary cribbing system. Alternatively, the auxiliary cribbing system has a kicker frame 206 that may be of one-piece constructions with the vehicle frame of the cribbing vehicle. In another example, the auxiliary cribbing system has a kicker frame that may be bolted onto the vehicle frame of the cribbing vehicle as illustrated in Figs. 2-5.

[0017] The auxiliary cribbing system includes the kicker frame that may be coupled to a push arm 208 such that the push arm moves in relation to the kicker frame of the cribbing system to engage the ground to provide cribbing functionality. In the example embodiment of Figs. 2-5, the push arm may be generally c-shaped, or has an arcuate body 210 that arcs from a push arm first end 212 at a main pivot 214 to a push arm second end 216 that terminates in a cribbing head 218. The arcuate body 210 can include a roughened surface, patterned surface, toothed surface, or the like to facilitate the movement of the push arm through the ground 220. The arcuate body may include one or more frame stop members 221 that may engage either the kicker frame of the auxiliary cribbing system, or the vehicle frame of the cribbing vehicle. The frame stop members provide additional support and structure for an area of the arcuate body that may engage a frame.

[0018] The push arm may be of size and shape to be displaced between a first tie 222 and a second tie 224 of a rail 226 to provide cribbing of the ground between the first and second tie. In one embodiment, a locking pin 228 can extend from the push arm and engage the vehicle frame of the cribbing vehicle to hold the push arm such that the push arm does not engage the ground. In this position, when the push arm may be secured to or within the vehicle frame of the cribbing vehicle, is a traveling position (e.g., Fig. 3). In one example, the locking pin may be a bolt that may be received by a cradle 230, or bracket, of the vehicle frame of the cribbing vehicle such that the bolt needs to be lifted out of the cradle for use. Suitable locking pins may include a latch, adhesive, magnets, and the like. The locking pin may hold the push arm in place above the ground in the traveling position.

[0019] The main pivot in one example can be a cylindrical body, bolt, or the like that couples to the kicker frame of the cribbing assembly to allow the push arm to rotate about the main pivot. In one example, the main pivot can be secured to the vehicle frame of the cribbing vehicle while the kicker frame and push arm are both rotatably coupled to the main pivot for rotation around the main pivot.

[0020] The cribbing head may facilitate cribbing of the ground between a first tie and a second tie. The cribbing head in one example has a cross-section that may be different than the cross-section of the arcuate body. For

example, the cribbing head can be relatively flat and rectangular in shape. In another example, cribbing head may have a triangular cross-section, or be formed as a wedge. In some examples, the cribbing head may have a smooth surface, a roughened surface, have teeth, grooves, or the like. In one embodiment, the cribbing head may be a detachable implement where different cribbing heads are made for different ground types. So, in one environment the ground may be particularly rocky, whereas in another environment may include compact mud, or excess clay. In this manner, a cribbing head designed to best provide cribbing can be selected and secured to the push arm for use.

[0021] The auxiliary cribbing assembly additionally may include a first actuating member 232 secured to the vehicle frame of the cribbing vehicle at a first actuating member first end 234 and coupled to the kicker frame of the auxiliary cribbing assembly at a first frame pivot 236 at the first actuating member second end 238. In one example, the first actuating member may be a pneumatic cylinder that includes a locking member. A suitable locking member can be a stop, lock, vacuum created seal, and the like. In other examples embodiments, the first actuating member may provide an in-line force at the first frame pivot by extending or contracting. The first actuating member moves from a first position (e.g., Fig. 3) when in a traveling position of the cribbing vehicle to a second locked position (e.g., Fig. 4) when the auxiliary cribbing system may be in a ready position and locked in place by the locking member. As the first actuating member moves from the first position to the second locked position, the force caused by the first actuating member pushes the kicker frame around the main pivot, resulting in the coupled push arm to rotate in an opposite direction of the kicker frame. This rotation results in the locking pin moving upwardly and away from the cradle until in the ready position (e.g., Fig. 4). Once the ready position is reached, the first actuating member may be in a locked second position where the first actuating member can no longer move, locking the first frame pivot in place relative to the main pivot. As a result, forces experienced by the push arm can be dissipated, or provided through the first actuating member, to reduce load and accompanying wear on the push arm during actuation.

[0022] The auxiliary cribbing assembly may include a second actuating member 240. This second member may operate, or control the operation of, the push arm. In one example, the second actuating member may be a pneumatic cylinder. In other embodiments, the second actuating member may be an actuating member that can provide an in-line force at the first frame pivot by extending or contracting. Suitable actuators may include air actuated and electric motor actuated devices.

[0023] The second actuating member extends from a second actuating member first end 242 to a second actuating member second end 244, where when actuated, the second actuating member second end moves linearly away from the second actuating member first end as the

second actuating member moves from a first position, that can be the ready position, to a second position, that can be a work position. The second actuating member is rotatably coupled to the kicker frame of the cribbing system at a second frame pivot 246 between the second actuating member first end and the second actuating member second end. In one example, the second frame pivot may be a cylinder, bolt, or the like such that the second actuating member can rotate above the second actuating member pivot point. In one embodiment, the second frame pivot may be located to align with the first actuating member. In this manner, when the first actuating member may be in a locked position, the force vector in a horizontal plane of the second actuating member caused by engaging and moving the push arm aligns directly with the first actuating member reducing moment forces on the second actuating member as a result of moving the push arm.

[0024] The second actuating member may include a second actuating member coupling member that engages the push arm at the second actuating member second end of the second actuating member. In one example, the second actuating member coupling member has an arcuate surface that matingly engages an arcuate surface of the push arm. As the second actuating member second end moves downward, or away from the second actuating member first end, the second actuating member second end rotates the push arm counterclockwise around the main pivot to move the push arm from the ready position (e.g., Fig. 4) to the working position (e.g., Fig. 5). In this manner, the clearing head of the push arm engages the ground, pushing and moving debris, rock, etc. from between the first and second ties underneath the rail, and to the other side of a rail when moving from the ready position to the working position. As a result, material may be removed from a determined location relative to the track. For example, material may be removed between the rails of the track. Because the first actuating member is locked, and aligned with the second actuating member pivot point, forces on the second actuating member may be reduced. Reduced force may translate into less wear and/or stress on the second actuating member.

[0025] Fig. 6 illustrates a schematic diagram of a control system 600 for an auxiliary cribbing assembly. In one example, the control system may include a controller that can operate the auxiliary cribbing assembly of any of the Figs. 1-5 to move the push arm of the auxiliary cribbing assembly from a traveling position to a ready position, to a working position.

[0026] The controller may include one or more processors 602, a memory 604 or storage device, and a transceiver 606. The control system may include an interface 608 with an input device 610 and an output device 612. A suitable input device can be a lever, button, toggle, touchscreen, mouse, or the like. A suitable output device can be a display screen, speaker, etc.

[0027] The controller may initiate a first actuating member 614 and a second actuating member 616. The mem-

bers may be electrically and/or communicatively coupled to the controller. The controller may control the movement of each of the first and second actuating members. In some embodiments the control may be autonomous, while in other embodiments the control may be manually initiated. In one example, in response to a user moving a lever, pressing a button, moving a toggle, using a touchscreen or mouse, or the like the first actuating member can be operated to move from a first position to a second position, and/or to a position between the first and second position. In one embodiment the second position is a locked position where the control system can lock the first actuating member. The first actuating member may include a locking member that secures the first actuating member in place in the second, locked position. In addition, by moving a lever, pressing a button, moving a toggle, using a touchscreen or mouse, or the like, the second actuating member may be moved accordingly. In one example, the second actuating member moves from a first position that can be a ready position, to a second position that is a working position. The control system may initiate the movement of the second actuating member to a position between the first position and the second position. In example embodiments, the lever, button, toggle, touchscreen, mouse, etc. utilized to operate and move the first actuating member may be the same lever, button, toggle, touchscreen, mouse, or the like used to operate and move the second actuating member. In other embodiments, a separate different lever, button, toggle, touchscreen, mouse, or the like may be utilized to move the first and second actuating members. To this end, the first actuating member can be operated by a first lever, while the second actuating member may be operated or moved by a second lever. In another example the first actuating member can be operated or moved by a toggle, while the second actuating member may be operated or moved by a button.

[0028] The control system may include one or more sensors 618 that can be coupled to or be part of the auxiliary cribbing assembly, coupled to or be part of the cribbing vehicle, positioned adjacent the auxiliary cribbing assembly, or the like. In one example a sensor determines the position of one of or both of the first and second actuating members. A suitable sensor may be a camera, or video feed. Image data may be communicated to an operator, and thereby to allow the operator in a cab of the cribbing vehicle to see the operation of the auxiliary cribbing assembly. In another example, the sensor may detect the consistency or make up of the ground below, or adjacent the auxiliary cribbing assembly. To this end, the controller may identify rocks, debris, certain objects, or the like. In one example, upon detection of the rocks, debris, certain objects, etc. the control system can control the first and second actuating members in response to the detection without interaction by an operator. In this manner, the auxiliary cribbing assembly can provide automatic auxiliary and supplemental cribbing without the need for an operator to make determinations regarding

use of the auxiliary cribbing assembly. In yet another example, the sensor may detect rail ties, sleepers, rails, switches, and/or ground, and the like. Upon detection, the control system may determine when the auxiliary cribbing assembly is over the ground and automatically (e.g., without human interaction) actuate the auxiliary cribbing assembly to crib each ground section between the rail ties as the cribbing vehicle moves along the rails of the track. In this manner, the auxiliary cribbing assembly may provide supplementary cribbing in between plural sets of track ties.

[0029] Figure 7 illustrates a schematic flow block diagram for a process 700 for providing supplemental cribbing during a track installation process. In at least one embodiment, the cribbing vehicle of Fig. 1 and the auxiliary cribbing assemblies of Figs. 2-5 under the control of the control system of Fig. 6 are utilized to perform the operations detailed in Fig. 7.

[0030] At step 702, a cribbing vehicle traverses a track to a location where cribbing is to be provided. The cribbing may be to clear debris, rock, compacted mud, or the like so that anchors can be utilized to secure the track to the ground. At this time, a primary cribbing device is not in use and the auxiliary cribbing device may be in a traveling position. In one example, the auxiliary cribbing system includes a push arm that has a locking pin that may be received by a cradle on the vehicle frame of the cribbing vehicle to hold the push arm in place, and to protect the push arm, or prevent it from contacting the ground during travel.

[0031] At step 704, the cribbing vehicle reaches a portion of the track where cribbing is to occur, and the primary cribbing device begins cribbing the ground in between ties of the track. At step 706, when the primary cribbing device begins cribbing, the first actuating member may be moved from a first position to a locked second position to move a push arm of the auxiliary cribbing system from the traveling position to a ready position. In the ready position, the first actuating member locks, and may be positioned such that a pivot point of a second actuating member aligns with the first actuating member. In this manner, when the second actuating member moves the push arm, horizontal force may be input directly into the first actuating member.

[0032] At step 708, after an initial cribbing by the primary cribbing device the second actuating member may be actuated to provide a supplemental cribbing of the ground between the ties of the tracks. By actuating the second actuating member, the push arm moves from the ready position to a working position. As the push arm moves from the ready position to the working position, the clearing head at the end of the push arm engages the ground and debris, rock, mud, or the like the primary cribbing device was unable to remove during the initial cribbing. In one example, the clearing head had a different shape, size, texture, makeup, or the like compared to the working head of the primary cribbing device. In another example, the auxiliary cribbing system may pro-

vide more force to remove the debris, rock, mud or the like than the primary cribbing device. In yet another example, the motion and movement of the auxiliary cribbing system may be different than the movement of the primary cribbing device. In each instance, the auxiliary cribbing system provides a supplemental cribbing that improves the ground in preparation of receiving anchors for securing the track to the ground.

[0033] At step 710, a determination may be made whether the cribbing is finished. If not, then steps 706 and 708 are repeated until the cribbing is complete. If the cribbing is complete, then at step 712 the first and second actuating members are actuated to return the push arm to the traveling position.

[0034] In an example embodiment a cribbing vehicle may include a vehicle frame and a primary cribbing device coupled to the vehicle frame and having a work head may move between rails of a track. The cribbing vehicle may include an auxiliary cribbing system removably coupled to the vehicle frame in spaced relation to the primary cribbing device and having a push arm may move between a first tie and second tie of the track.

[0035] Optionally, the primary cribbing device may be of one-piece construction with the vehicle frame. In one aspect, the auxiliary cribbing system may move from a travel position where the push arm may be coupled to the vehicle frame at a push arm first end and at a push arm second end, to a ready position where the push arm may couple to the vehicle frame at only the push arm first end, and to a working position wherein the push arm may be at least partially under a rail of the rails. In another aspect, the auxiliary cribbing system includes a kicker frame, a first actuating member may couple to the vehicle frame at a first actuating member first end and couple to the kicker frame at a first frame pivot at a first actuating member second end. In addition, a second actuating member may be coupled to the kicker frame between a second actuating member first end and a second actuating member second end and coupled to the push arm at the second actuating member second end. The first frame pivot may align with a second frame pivot such that horizontal forces on the second actuating member are directed into the first actuating member. In one example, the first actuating member may extend from a first position to a second position to lift and move the push arm from a travel position to a ready position. Optionally, the first actuating member may include a locking member may lock the first actuating member in the second position. In another example, the second actuating member may extend from a first position to a second position to move the push arm from a ready position above ground to the working position wherein the push arm may be at least partially under a rail of the pair of rails.

[0036] Optionally, the first actuating member may be a first pneumatic cylinder, and the second actuating member may be a second pneumatic cylinder. In one aspect, the second actuating member may engage the push arm to engage the push arm at the second actuating

member second end. In another aspect, the push arm may include a cribbing head secured to an arcuate body and having a different cross section than the push arm body.

[0037] In one or more embodiments, an auxiliary cribbing system may include a kicker frame, a first actuating member coupled to a vehicle frame at a first actuating member first end, and coupled to the kicker frame at a first frame pivot at a first actuating member second end, and a second actuating member coupled to the kicker frame between a second actuating member first end and a second actuating member second end, and coupled to a push arm at the second actuating member second end. The push arm may move from a travel position where the push arm may be coupled to a vehicle frame at a push arm first end and at a push arm second end, to a ready position where the push arm may be coupled to the vehicle frame at only the push arm first end, and to a working position wherein the push arm may be at least partially under a rail of a track.

[0038] Optionally, the first frame pivot may align with a second frame pivot such that horizontal forces on the second actuating member are directed into the first actuating member. In one aspect, the first actuating member may extend from a first position to a second position to lift and move the push arm from the travel position to the ready position. In another aspect, the first actuating member may include a locking member may lock the first actuating member in the second position. In another aspect, the second actuating member may extend from a first position to a second position to move the push arm from the ready position above ground to the working position wherein the push arm may be at least partially under a rail of the rails. In one example, the second actuating member may engage the push arm. In another example, the push arm may include a cribbing head secured to an arcuate body and having a different cross section than the push arm body.

[0039] In one or more embodiments, a method of cribbing ground for securing rails of a track to the ground may include performing, with a primary cribbing device, an initial cribbing between a first tie of a track and a second tie of the track between rails of the track. The method may provide, after the initial cribbing, performing a supplemental cribbing between the first tie of the track and the second tie of the track with an auxiliary cribbing device, including cribbing under a rail of the rails of the track.

[0040] Optionally, the supplemental cribbing may include moving a push arm of the auxiliary cribbing device from a travel position to a ready position with a first actuating member of the auxiliary cribbing device and moving the push arm from the ready position to a working position with a second actuating member. In one aspect, the supplemental cribbing further may include locking the first actuating member upon reaching the ready position.

[0041] In one embodiment, the controllers or systems described herein may have a local data collection system deployed and may use machine learning to enable der-

ivation-based learning outcomes. The controllers may learn from and make decisions on a set of data (including data provided by the various sensors), by making data-driven predictions and adapting according to the set of data. In embodiments, machine learning may involve performing a plurality of machine learning tasks by machine learning systems, such as supervised learning, unsupervised learning, and reinforcement learning. Supervised learning may include presenting a set of example inputs and desired outputs to the machine learning systems. Unsupervised learning may include the learning algorithm structuring its input by methods such as pattern detection and/or feature learning. Reinforcement learning may include the machine learning systems performing in a dynamic environment and then providing feedback about correct and incorrect decisions. In examples, machine learning may include a plurality of other tasks based on an output of the machine learning system. In examples, the tasks may be machine learning problems such as classification, regression, clustering, density estimation, dimensionality reduction, anomaly detection, and the like. In examples, machine learning may include a plurality of mathematical and statistical techniques. In examples, the many types of machine learning algorithms may include decision tree based learning, association rule learning, deep learning, artificial neural networks, genetic learning algorithms, inductive logic programming, support vector machines (SVMs), Bayesian network, reinforcement learning, representation learning, rule-based machine learning, sparse dictionary learning, similarity and metric learning, learning classifier systems (LCS), logistic regression, random forest, K-Means, gradient boost, K-nearest neighbors (KNN), a priori algorithms, and the like. In embodiments, certain machine learning algorithms may be used (e.g., for solving both constrained and unconstrained optimization problems that may be based on natural selection). In an example, the algorithm may be used to address problems of mixed integer programming, where some components restricted to being integer valued. Algorithms and machine learning techniques and systems may be used in computational intelligence systems, computer vision, Natural Language Processing (NLP), recommender systems, reinforcement learning, building graphical models, and the like. In an example, machine learning may be used making determinations, calculations, comparisons and behavior analytics, and the like.

[0042] In one embodiment, the controllers may include a policy engine that may apply to one or more policies. These policies may be based at least in part on characteristics of a given item of equipment or environment. With respect to control policies, a neural network can receive input of a number of environmental and task-related parameters. These parameters may include, for example, operational input regarding operating equipment, data from various sensors, location and/or position data, and the like. The neural network can be trained to generate an output based on these inputs, with the output

representing an action or sequence of actions that the equipment or system should take to accomplish the goal of the operation. During operation of one embodiment, a determination can occur by processing the inputs through the parameters of the neural network to generate a value at the output node designating that action as the desired action. This action may translate into a signal that causes the vehicle to operate. This may be accomplished via backpropagation, feed forward processes, closed loop feedback, or open loop feedback. Alternatively, rather than using backpropagation, the machine learning system of the controller may use evolution strategies techniques to tune various parameters of the artificial neural network. The controller may use neural network architectures with functions that may not always be solvable using backpropagation, for example functions that are non-convex. In one embodiment, the neural network has a set of parameters representing weights of its node connections. A number of copies of this network are generated and then different adjustments to the parameters are made, and simulations are done. Once the output from the various models is obtained, they may be evaluated on their performance using a determined success metric. The best model is selected, and the vehicle controller executes that plan to achieve the desired input data to mirror the predicted best outcome scenario. Additionally, the success metric may be a combination of the optimized outcomes, which may be weighed relative to each other.

[0043] As used herein, an element or step recited in the singular and proceeded with the word "a" or "an" do not exclude the plural of said elements or operations, unless such exclusion is explicitly stated. Furthermore, references to "one embodiment" of the invention do not exclude the existence of additional embodiments that incorporate the recited features. Moreover, unless explicitly stated to the contrary, embodiments "comprising," "comprises," "including," "includes," "having," or "has" an element or a plurality of elements having a particular property may include additional such elements not having that property. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein." Moreover, in the following claims, the terms "first," "second," and "third," etc. are used merely as labels, and do not impose numerical requirements on their objects. Further, the limitations of the following claims are not written in means-plus-function format and are not intended to be interpreted based on 35 U.S.C. § 112(f), unless and until such claim limitations expressly use the phrase "means for" followed by a statement of function devoid of further structure.

[0044] The above description is illustrative, and not restrictive. For example, the above-described embodiments (and/or aspects thereof) may be used in combination with each other. In addition, many modifications may be made to adapt a particular situation or material to the teachings of the inventive subject matter without

departing from its scope. While the dimensions and types of materials described herein define the parameters of the inventive subject matter, they are exemplary embodiments. Other embodiments will be apparent to one of ordinary skill in the art upon reviewing the above description. The scope of the inventive subject matter should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled.

[0045] This written description uses examples to disclose several embodiments of the inventive subject matter, including the best mode, and to enable one of ordinary skill in the art to practice the embodiments of inventive subject matter, including making and using the devices or systems and performing the incorporated methods. The patentable scope of the inventive subject matter is defined by the claims, and may include other examples that occur to one of ordinary skill in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

[0046] While one or more embodiments are described in connection with a rail vehicle system, not all embodiments are limited to rail vehicle systems. Unless expressly disclaimed or stated otherwise, the inventive subject matter described herein extends to multiple types of vehicle systems. These vehicle types may include automobiles, trucks (with or without trailers), buses, marine vessels, aircraft, mining vehicles, agricultural vehicles, or other off-highway vehicles. The vehicle systems described herein (rail vehicle systems or other vehicle systems that do not travel on rails or tracks) can be formed from a single vehicle or multiple vehicles. With respect to multi-vehicle systems, the vehicles can be mechanically coupled with each other (e.g., by couplers) or logically coupled but not mechanically coupled. For example, vehicles may be logically but not mechanically coupled when the separate vehicles communicate with each other to coordinate movements of the vehicles with each other so that the vehicles travel together as a group. Vehicle groups may be referred to as a convoy, consist, swarm, fleet, platoon, and train.

Claims

1. A cribbing vehicle comprising:

- a vehicle frame;
- a primary cribbing device coupled to the vehicle frame and having a work head configured to move between rails of a track; and
- an auxiliary cribbing system removably coupled to the vehicle frame in spaced relation to the primary cribbing device and having a push arm configured to move between a first tie and sec-

and tie of the track.

2. The cribbing vehicle of claim 1, wherein the auxiliary cribbing system is configured to move from a travel position where the push arm is coupled to the vehicle frame at a push arm first end and at a push arm second end, to a ready position where the push arm is coupled to the vehicle frame at only the push arm first end, and to a working position wherein the push arm is configured to be at least partially under a rail of the rails.

3. The cribbing vehicle of claim 1 or claim 2, wherein the auxiliary cribbing system comprises:

a kicker frame;
a first actuating member coupled to the vehicle frame at a first actuating member first end, and coupled to the kicker frame at a first frame pivot at a first actuating member second end; and
a second actuating member coupled to the kicker frame between a second actuating member first end and a second actuating member second end, and coupled to the push arm at the second actuating member second end; and
wherein the first frame pivot is aligned with a second frame pivot such that horizontal forces on the second actuating member are directed into the first actuating member;
optionally wherein the first actuating member extends from a first position to a second position to lift and move the push arm from a travel position to a ready position;
optionally wherein the first actuating member includes a locking member configured to lock the first actuating member in the second position.

4. The cribbing vehicle of claim 3, wherein the second actuating member extends from a first position to a second position to move the push arm from a ready position above ground to a working position wherein the push arm is configured to be at least partially under a rail of the rails.

5. The cribbing vehicle of claim 3 or claim 4, wherein the first actuating member is a first pneumatic cylinder, and the second actuating member is a second pneumatic cylinder; and/or

wherein the second actuating member engages the push arm to engage the push arm at the second actuating member second end; and/or
wherein the push arm includes a cribbing head secured to an arcuate body and having a different cross section than a push arm body.

6. The cribbing vehicle of any preceding claim, wherein the primary cribbing device is a one-piece construc-

tion with the vehicle frame.

7. A system comprising:

a kicker frame;
a first actuating member coupled to a vehicle frame at a first actuating member first end, and coupled to the kicker frame at a first frame pivot at a first actuating member second end; and
a second actuating member coupled to the kicker frame between a second actuating member first end and a second actuating member second end, and coupled to a push arm at the second actuating member second end; and
wherein the push arm is configured to move from a travel position where the push arm is coupled to the vehicle frame at a push arm first end and at a push arm second end, to a ready position where the push arm is coupled to the vehicle frame at only the push arm first end, and to a working position wherein the push arm is configured to be at least partially under a rail of a track.

8. The system of claim 7, wherein the first frame pivot is aligned with a second frame pivot such that horizontal forces on the second actuating member are directed into the first actuating member.

9. The system of claim 7 or claim 8, wherein the first actuating member extends from a first position to a second position to lift and move the push arm from the travel position to the ready position;
optionally wherein the first actuating member includes a locking member configured to lock the first actuating member in the second position.

10. The system of any of claims 7 to 9, wherein the second actuating member extends from a first position to a second position to move the push arm from the ready position above ground to the working position wherein the push arm is configured to be at least partially under a rail of the rails.

11. The system of any of claims 7 to 10, wherein the second actuating member engages the push arm.

12. The system of any of claims 7 to 11, wherein the push arm includes a cribbing head secured to an arcuate body and having a different cross section than a push arm body.

13. A method comprising:

performing, with a primary cribbing device, an initial cribbing between a first tie of a track and a second tie of the track between rails of the track; and

after the initial cribbing, performing a supplemental cribbing between the first tie of the track and the second tie of the track with an auxiliary cribbing device, including cribbing under a rail of the rails of the track.

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14. The method of claim 13, wherein the supplemental cribbing includes moving a push arm of the auxiliary cribbing device from a travel position to a ready position with a first actuating member of the auxiliary cribbing device and moving the push arm from the ready position to a working position with a second actuating member.

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15. The method of claim 13 or claim 14, wherein the supplemental cribbing further includes locking the first actuating member upon reaching the ready position.

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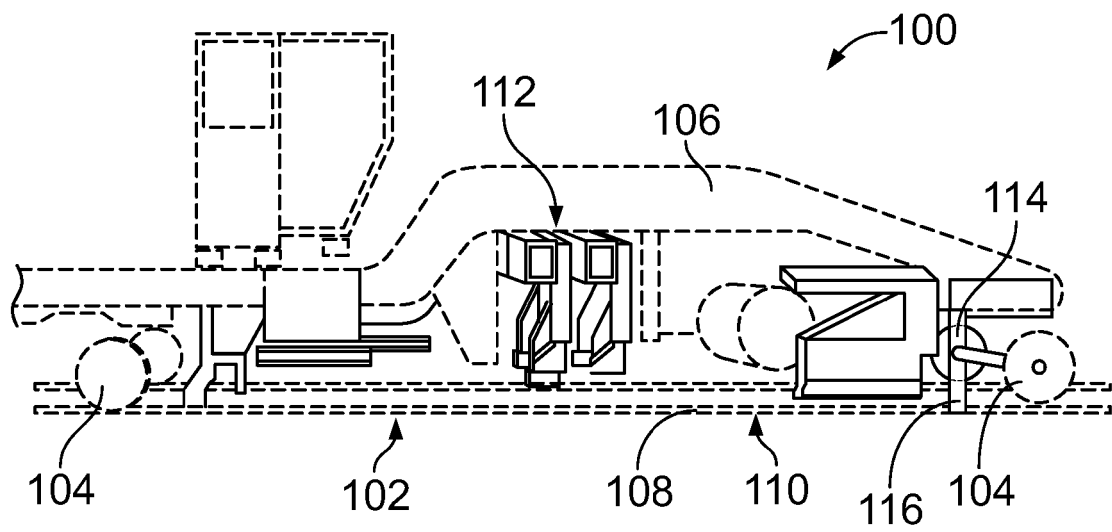


FIG. 1

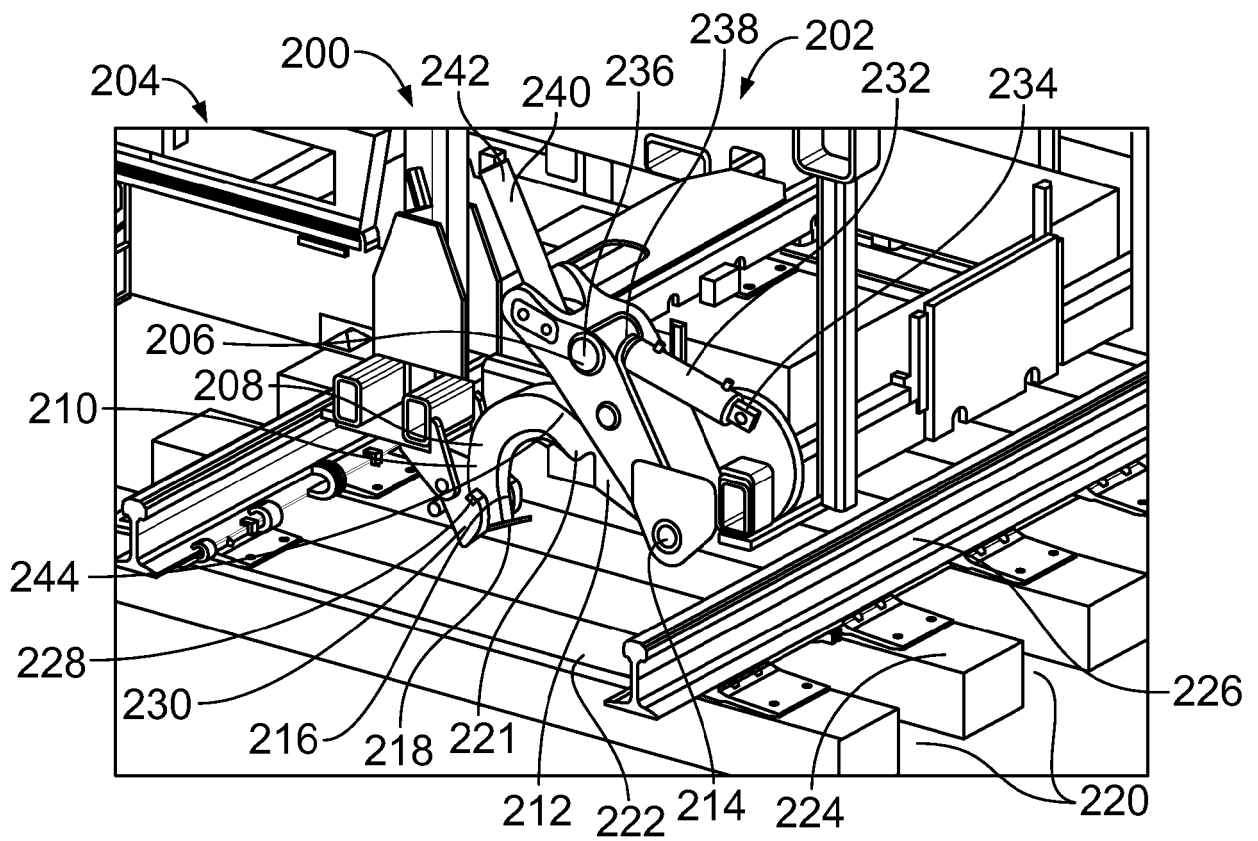


FIG. 2

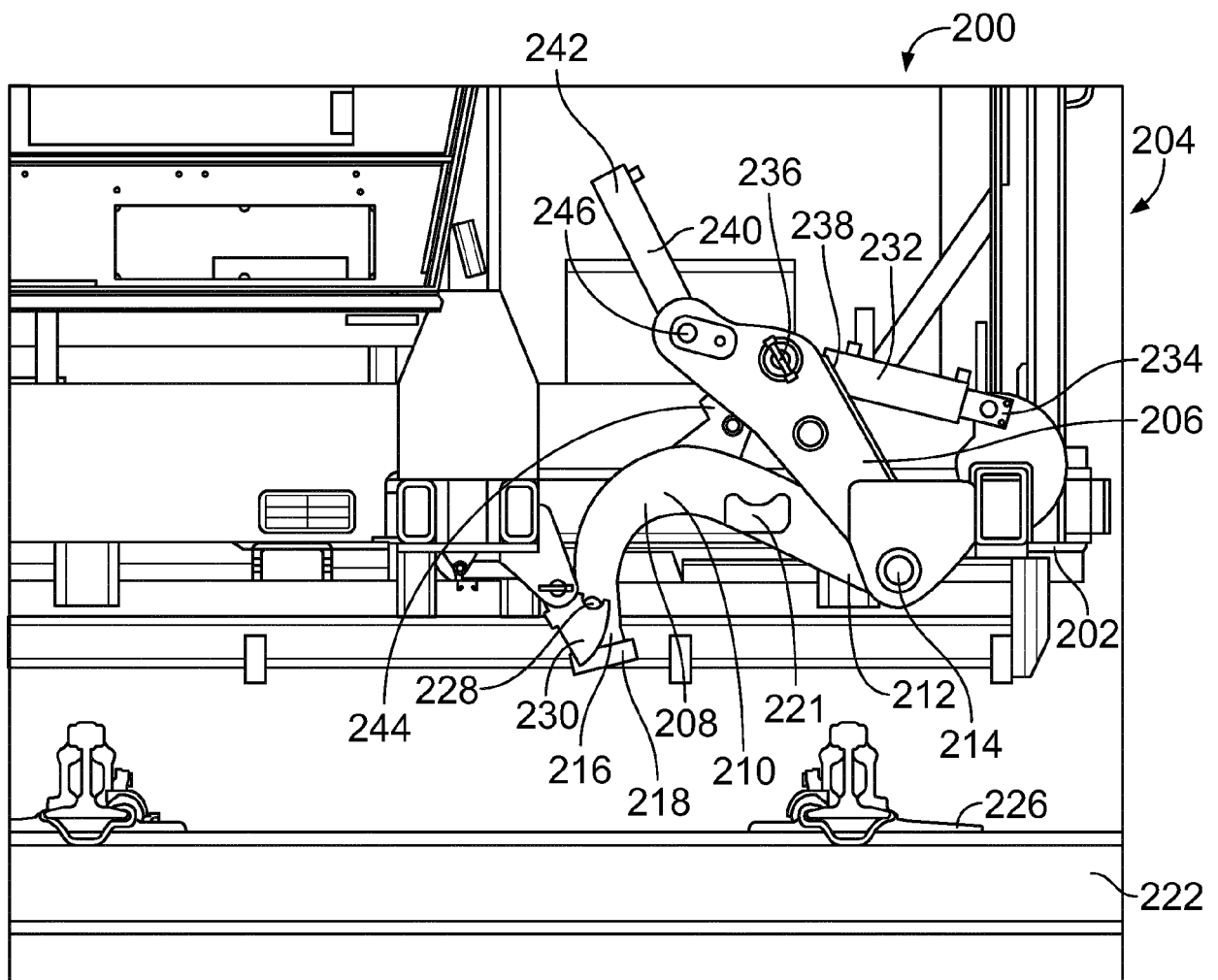
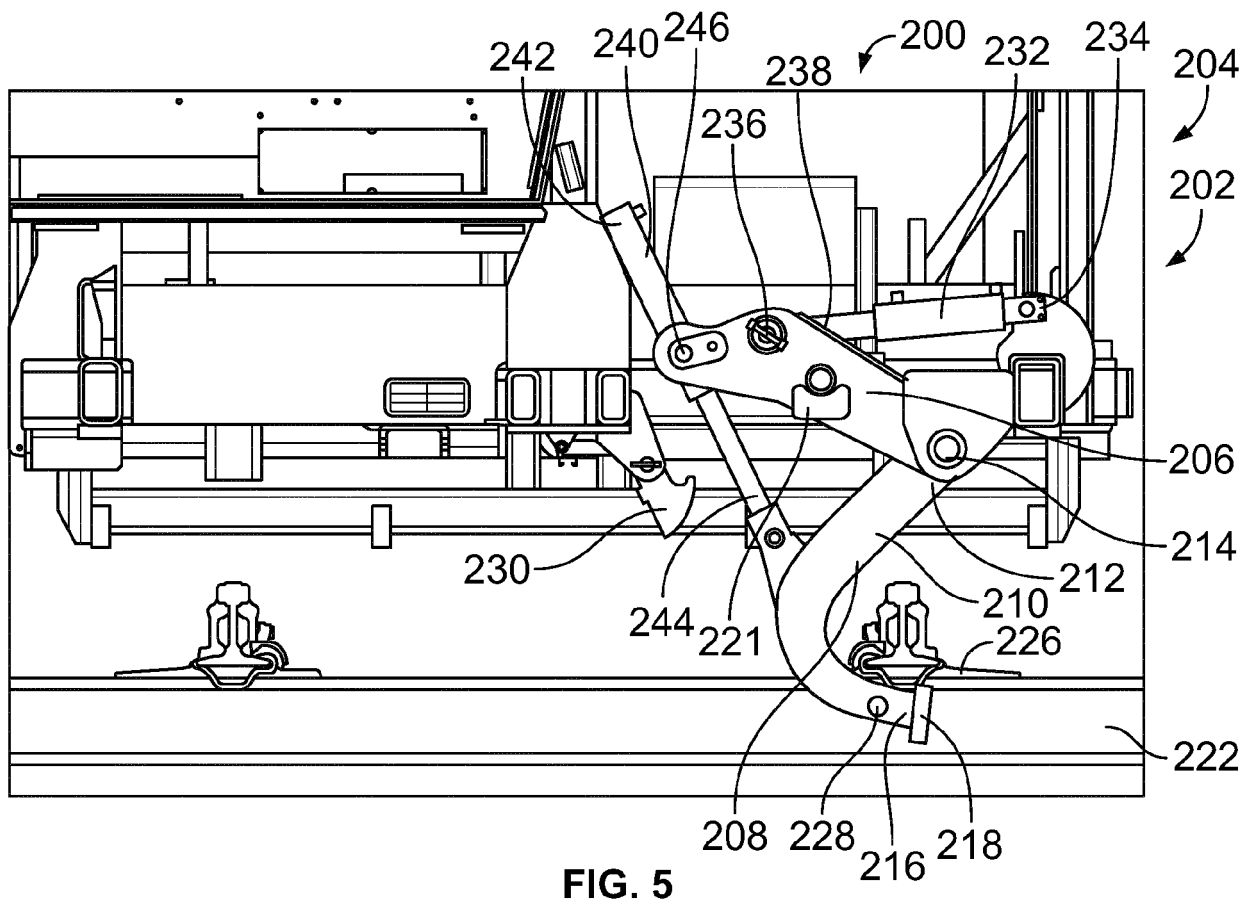
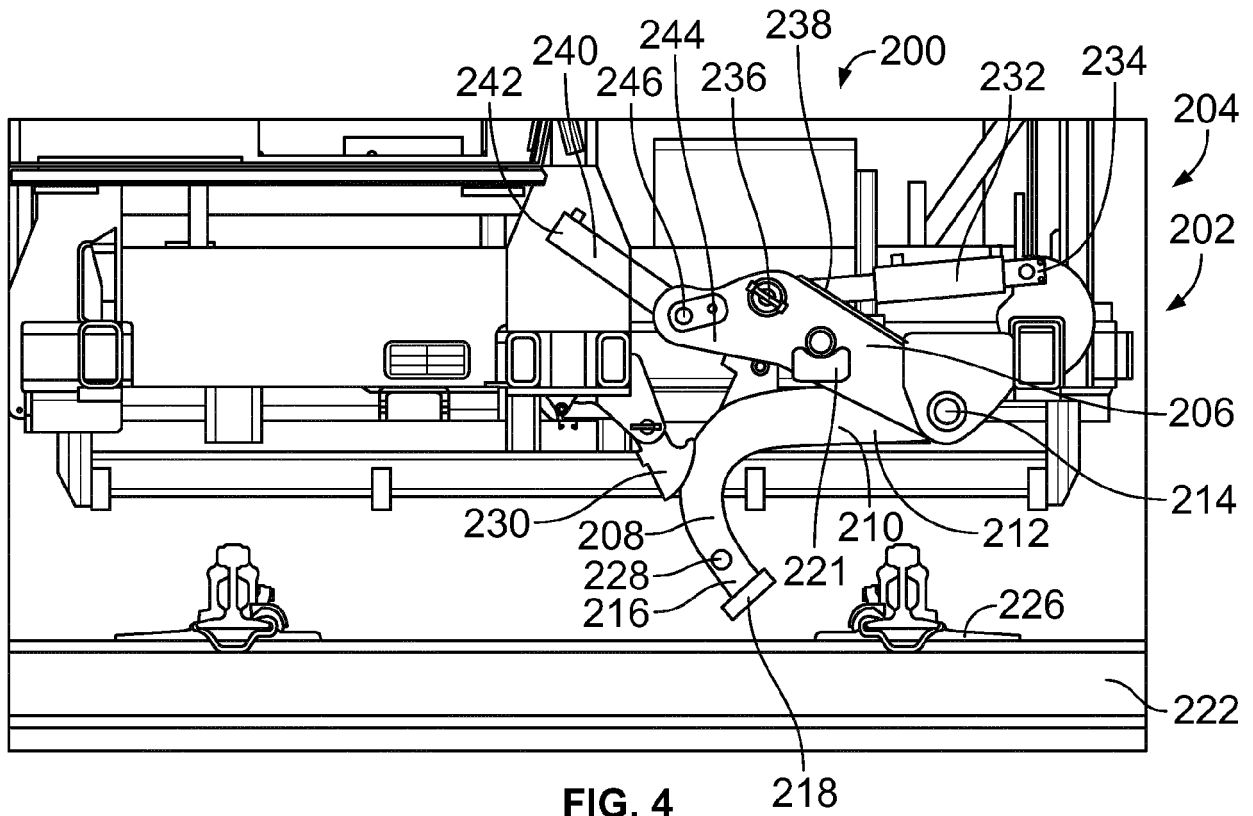


FIG. 3



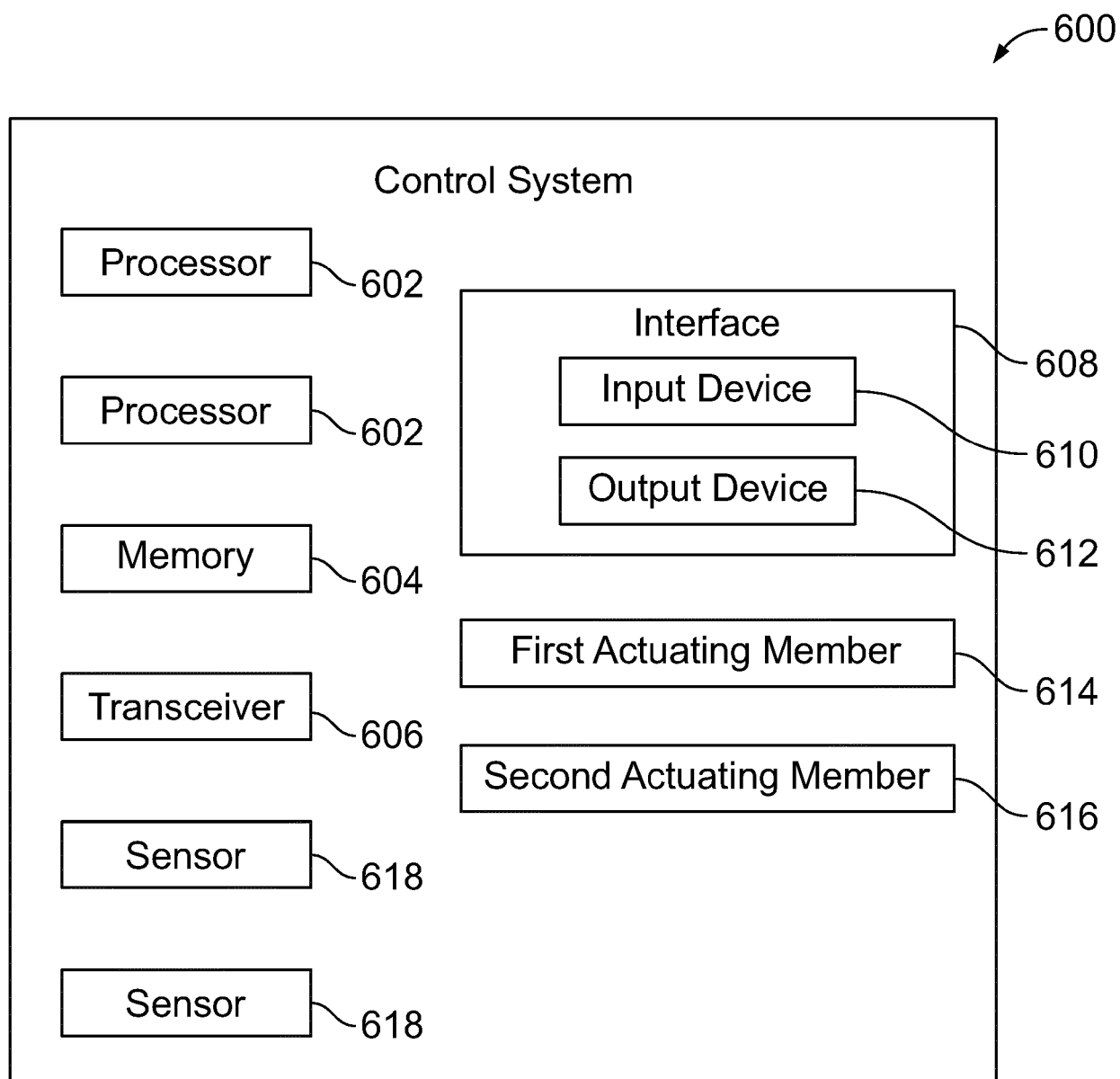


FIG. 6

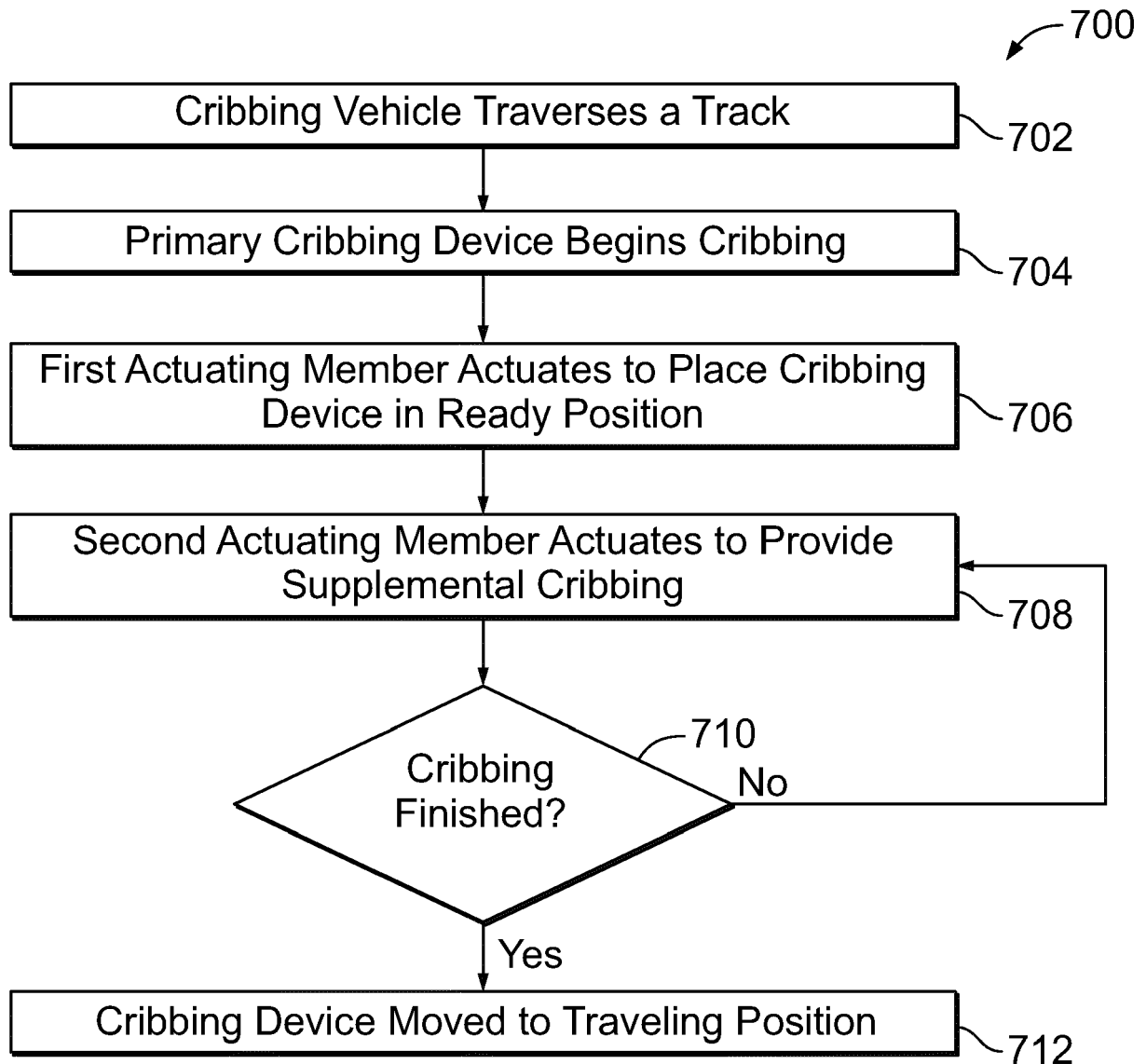


FIG. 7



EUROPEAN SEARCH REPORT

Application Number

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			E01B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 28 February 2024	Examiner Movadat, Robin
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