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(54) **RAILWAY ANCHOR APPLICATION TOOL**

(57) Provided herein is a railway anchor holder for a to machinery used for applying anchors to rail ties. The anchor holder can have a frame having a pivot bore formed therein. In one example, the railway anchor holder can have a hydraulic actuator arranged in the top of the frame. The railway anchor holder can include a first retaining forming a side of the frame, wherein the first retaining wall has a recessed seat aligned along the bottom. The railway anchor holder can have a second retaining wall located opposite to and aligned parallel with the first retaining wall on the frame. The recessed seat may have a first contact surface aligned with the hydraulic actuator, a second contact surface located at a distal end of the first retaining wall, and a clearance surface formed between the first and second contact surfaces.

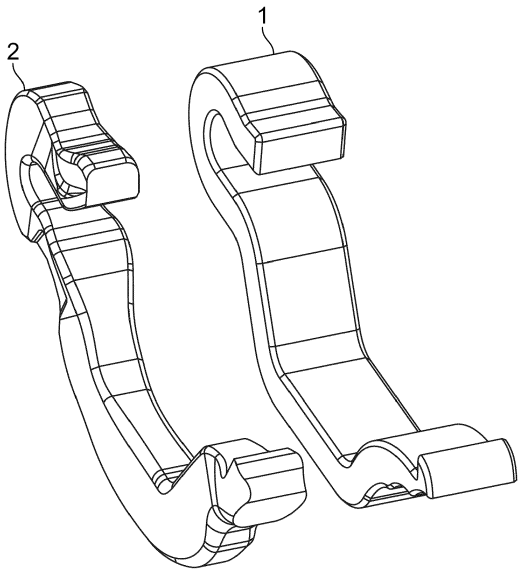

FIG. 1

EP 4 407 095 A1

Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a non-provisional conversion of, and claims priority to, U.S. Provisional Patent Application No. 63/440,751, which was filed on 24-January-2023 and U.S. Non-Provisional Application No. 18/540,265, which was filed on 14-December-2023, the entire disclosures of which is incorporated herein by reference.

BACKGROUND

Technical Field.

[0002] The subject matter described herein relates to right-of-way maintenance machinery, and specifically to machinery used for applying anchors to rail ties for securing rail tie plates and rails to the ties.

Discussion of Art.

[0003] A railway anchor clamps onto a rail and is positioned to abut the tie and the tie plate. This positioning helps to resist the movement of the rail relative to the tie. Railway anchors may include different configurations and models of anchors, such as spring-type or drive-on anchors made by different manufacturers, or any other rail fasteners positioned adjacent tie plates and used for retaining tie plates upon the ties.

[0004] During the course of railroad maintenance work, rail anchors are removed from the track before replacing rail ties, tie plates, and rails, and sometimes for other maintenance operations. Once the maintenance is complete, the anchors are reinstalled. Alternatively, the anchors themselves can fail, and new anchors may need to be installed in their place.

[0005] Rail anchors may be installed by railroad maintenance machines that may include a chassis structure which is either self-propelled or towable along the track, and a workhead to perform the maintenance task such as installation of the rail anchor to the rail. Improvements to rail anchors to increase the anchors effectiveness at holding to rail and distributing forces to the tie and tie plate have led to significant changes in the geometry of certain rail anchors. Although the new geometries of rail anchors have led to improved performance, the geometries have created challenges to installation using known railroad maintenance machines. Thus, it may be desirable to have a system and method that accommodate new geometries of rail anchors from those that are currently available.

BRIEF DESCRIPTION

[0006] In one or more embodiments, a railway anchor holder is provided that has a frame configured to be coupled to an anchor application machine. In one example, the frame may include first and second walls that define a pocket therebetween configured to receive an anchor. The first wall defines a recessed seat configured to contact the anchor. In one example, the anchor holder may have a hydraulic actuator coupled to the second wall, the hydraulic actuator including a gripper block configured to be advanced towards the anchor that is in the pocket and to exert a clamp force on the anchor to secure the anchor between the gripper block and the recessed seat. In one example, the anchor holder may have a backing pin coupled to the frame and biased to exert a return force on the anchor. The return force exerted by the backing pin on the anchor can be in a transverse direction relative to the clamp force exerted by the gripper block on the anchor.

[0007] In one or more embodiments, for an anchor holder may have a frame having a top, back, and bottom, and a pivot bore formed in the back. In one example, the frame is adapted to receive a railway anchor in a first position and pivot and lower to guide the anchor to a second position. In one example, a hydraulic actuator arranged in the top of the frame, the hydraulic actuator arranged perpendicular to the pivot bore. In one example, the anchor holder may have a backing pin located and supported in the back between the pivot bore and the bottom, the backing pin aligned perpendicular to the hydraulic actuator, wherein the backing pin can have a first end provided with a concave head, a second end at a distal location from the first end, and a middle portion having a shoulder. The anchor holder can have a spring coupled to the shoulder and the back, a first retaining wall extending from the bottom towards the top and the back to form a side of the frame, wherein the first retaining wall has a recessed seat aligned along the bottom, the recessed seat aligned parallel to the backing pin. The anchor holder can have a second retaining wall located opposite to and aligned parallel with the first retaining wall on the frame, wherein the second retaining wall extends from the back to enclose the concave head of the backing pin within a pocket formed between the first retaining wall, the second retaining wall, and the back. In one example of the anchor holder, the recessed seat can have a first contact surface aligned to the hydraulic actuator, a second contact surface located at a distal end of the first retaining wall, and a clearance surface formed between the first and second contact surfaces.

[0008] In one or more embodiments, is a method including the steps of providing an anchor holder comprising a frame having a top, back, and bottom, the frame having a pivot bore formed in the back; receiving a railway anchor in the anchor holder at first position of the anchor holder, wherein the receiving of the railway anchor includes the railway anchor striking a first location of the anchor holder located on the back; clamping the railway anchor in the anchor holder at a second contact surface located on the top; pivoting the anchor holder to guide the anchor to a second position corresponding to the bot-

tom of the frame aligned in proximity to the railway track; clipping the anchor onto a railway track; and applying a reaction force at the second contact surface, a third contact surface, and a fourth contact surface, wherein the third contact surface and the fourth contact surface are located on the bottom of the frame.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The subject matter may be understood from reading the following description of non-limiting embodiments, with reference to the attached drawings, wherein below:

Figure 1 is a perspective view of two rail anchors having different cross-sectional thicknesses;

Figure 2 is a side view of a rail anchor and an anchor holder that may install the anchors of Figure 1.

Figure 3 is a front view of the anchor holder depicted in Figure 2.

Figure 4 is a side view of the anchor holder depicted in Figure 2.

Figure 5 is a perspective view of a backing pin used in the anchor holder of Figure 2.

Figure 6 is a side view of the backing pin of Figure 5.

Figure 7 is a flow chart depicting a method used to apply an anchor.

DETAILED DESCRIPTION

[0010] The subject matter described herein relates to right-of-way maintenance machinery, and specifically to machinery used for applying anchors to rail ties for securing rail tie plates and rails to the ties. Embodiments of the subject matter described herein relate to an anchor holder, which can be used for securing anchors to railway tracks. The anchor holder may be a component of a pivoting workhead assembly, which may pivot from a gauge position between the rails to a position beneath the rails towards the field side or outside of the track. The anchor holder may help to provide consistent and repeatable application of new and/or reused rail anchors.

[0011] Figure 1 illustrates a side-by-side comparison of a known rail anchor 1 and an improved rail anchor 2. The improved rail anchor may have greater load bearing surface area geometry. The known rail anchor has a substantially uniform thickness and cross-section. The improved rail anchor has a non-uniform thickness and a non-uniform cross-section. The variation in shape and size amongst rail anchors presents challenges for installation in the field. For example, tools that may be used for installation of the known rail anchor can fail to consistently hold and install the improved rail anchor because the improved rail anchor may have significantly different geometry than the known rail anchor and a non-uniform thickness.

[0012] Referring to Figure 2, an anchor holder 10 can be used in conjunction with anchor application machines. The anchor holder can be attached to a workhead (not shown) of an anchor application machine at a pivot location, such as a pivot bore 12. The workhead may move the anchor holder relative to a railway track. In an example, the workhead may pivot the anchor holder about the pivot bore 12. The workhead may move the anchor holder between a first or receiving position and a second or applying position. At the first or receiving position, the anchor holder sequentially receives an anchor 14 from a magazine or other delivery structure. The anchor holder may be in a location above the track in the first position. At the second or applying position, the anchor holder is proximate to the railway track and oriented for securing the anchor to the track.

[0013] The anchor holder may include a hydraulic actuator 16 designed to be coupled to a hydraulic control system of the anchor application machine. The hydraulic actuator may be an assembly having a hydraulically actuated piston coupled to a gripper block 52 that selectively clamps a railway anchor. In one example, the gripper block may be a generally rectangular body that can attach through a pin or bolt to the piston. The gripper block can have a smooth or flat surface that can contact the top of the anchor. In some examples, the gripper block may have a textured surface that can contact the top of the anchor. In some embodiments, the anchor holder includes a backing pin 18 designed to contact the anchor. The backing pin 18 may be biased to exert a resilient return force on the anchor. In an example, the backing pin 18 exerts the resilient return force on the anchor in a first direction that is transverse to a second direction at which the gripper block exerts a clamp force on the anchor. Optionally, the first direction may be approximately (e.g., within 5 or 10 degrees) perpendicular to the second direction. The backing pin may be oriented perpendicular to the hydraulic actuator. For example, the backing pin may longitudinally extend along a pin axis, and the pin axis may be perpendicular to a reciprocal movement axis of the gripper block of the hydraulic actuator.

[0014] Figures 3 and 4 are views of the anchor holder with the backing pin. The anchor holder may have a frame with a top portion 20, a back portion 22, and a bottom portion 24. The pivot bore may be formed in the back portion. The hydraulic actuator may be arranged at the top portion. The hydraulic actuator may be spaced apart (e.g., offset) from the pivot bore along the frame. The backing pin may be located and supported by the back portion. The backing pin may be disposed between the pivot bore and the bottom portion of the frame. In some embodiments, a first retaining wall 26 forms a side of the frame. A second retaining wall 28 may form a second side of the frame. The frame may define a pocket 32 for

receiving an anchor to be secured within the anchor holder. The pocket may be defined between the first retaining wall, the second retaining wall, and the back portion of the frame. The pocket may be open along a front of the frame to permit the anchor entering and leaving the pocket. The first retaining wall may form a recessed seat 30 to accommodate an anchor. The recessed seat may be along an opposite end of the pocket from the gripper block of the hydraulic actuator. An anchor received in the pocket may sit on the recessed seat of the first retaining wall. The recessed seat may be generally parallel to the backing pin. The second retaining wall 28 may be located opposite to and aligned parallel with the first retaining wall. The first retaining wall may be longer than the second retaining wall in the direction aligned with the backing pin. The second retaining wall may be located above the first retaining wall (and the recessed seat thereof). The pocket may be defined below the second retaining wall and above the recessed seat of the first retaining wall. The anchor holder may have a shoulder 33 flanking the pocket. The shoulder may provide a hard stop surface for the hydraulic actuator to regulate the compression force applied to the anchor. The shoulder may be chamfered. The chamfered surface may provide guidance to the anchor as it enters the anchor holder from the magazine or delivery structure.

[0015] In some embodiments, the recessed seat may have a first contact surface 34 arranged below the hydraulic actuator. The recessed seat may have a second contact surface 36 located at a distal end of the first retaining wall. For example, the first contact surface may be located between the second contact surface and the back portion of the frame. The recessed seat may have a clearance surface 38 between the first and second contact surfaces. The clearance surface may have a curved shape.

[0016] Figures 5 and 6 are views of the backing pin. The backing pin can have a first end provided with a concave head 40. The concave head can be formed with a profile having conformity with the anchor. The backing pin can be coupled to a spring 42 that biases the backing pin. When the anchor in the pocket presses against the backing pin, the spring may exert a resilient return force on the anchor. A first end of the spring may contact and exert the return force on a shoulder 44 of the spring. The second end of the spring may be contact and press against a surface along the back portion of the frame. The shoulder can be formed on a middle portion of the backing pin. In one example, the spring may provide a dampening force to the anchor during receiving. The spring can provide a return force to the backing pin once the anchor holder is removed from the applied anchor. In some embodiments, the backing pin can include a threaded portion 46 adapted to receive a fastener for retaining the backing pin in the anchor holder. The threaded portion can be formed on a second end of the backing pin.

[0017] Referring now to Figure 7, a method 60 can be implemented using the anchor holder according to the embodiments described herein in an anchor application machine. The method begins at a step 62 where the anchor holder can be aligned to a magazine or delivery structure that sequentially delivers anchors in series to the anchor holder. The method may proceed to a step 64 where an anchor from the magazine or delivery structure is guided to the anchor holder. The method may proceed to a step 66 where the anchor holder receives the anchor. For example, the anchor may be received within the pocket, such that a first portion of the anchor rests on the recessed seat of the frame and a second portion of the anchor is contacted by the backing pin. The method may proceed to a step 68 where the anchor holder clamps the anchor in place via the hydraulic actuator. For example, while the anchor is positioned on the recessed seat, the hydraulic actuator may be controlled for the piston to advance the gripper block downward towards the anchor until the gripper block is in contact with the anchor. The hydraulic actuator may sandwich the anchor between the gripper block and the recessed seat. The method may proceed to a step 70 where the anchor holder is pivoted and lowered to a second position for presenting the anchor, that is held by the anchor holder, to the railway track for installation on the track. The method may proceed to a step 72 where the anchor is secured (e.g., clipped or otherwise applied) to the railway track. In some embodiments, the method can return to the first step of the method.

[0018] During operation of a rail anchor application machine, an anchor can be received in the anchor holder from a magazine or delivery structure (not shown). The anchor may be received in the anchor holder while the anchor holder is at first position in which a bottom surface of the bottom portion is aligned parallel to the magazine. The anchor may contact a concave head of the backing pin upon delivery into the pocket and achieving a fully loaded position within the pocket. The concave head of the backing pin may provide a conformal surface to provide accurate positioning and retention of the anchor. The hydraulic actuator may clamp the anchor in the anchor holder via the gripping block. The first retaining wall can provide position constraint to the anchor in the anchor holder. The anchor holder may be pivoted about the pivot bore and lowered towards the rail to guide the anchor holder to a second position. At the second position, the bottom portion of the frame may align with the railway track. The rail anchor application machine may then apply a force for transferring the anchor from the anchor holder to the railway track. The anchor application machine may secure (e.g., clip) the anchor onto the railway track. The anchor holder can hold the anchor by applying a reaction force at the concave head and at the first contact surface and the second contact surface formed on the recessed seat. Once clamped, the anchor can be accurately and consistently positioned by the arrangement of the concave head, the gripping block, the first contact surface, and the second contact surface. The

clearance surface can provide an unobstructed space for the anchor as the anchor is compressed during application to the railway track.

[0019] A control unit or controller (not shown) may be provided in some embodiments to implement the method and to control the various articulatable components and actuators such as the hydraulic actuator. A plurality of sensors may communicate operational data involving aspects of the operation to the controller. For example, a sensor may note that a workhead is ready to receive an anchor and the controller can move the workhead into position to receive the anchor, can initiate the deposition of the anchor into an anchor holder of the workhead of the anchor application machine, and the anchor holder can guide the anchor into position for installation. Another sensor may determine the placement of the anchor, and the controller can determine related operational aspects (and initiate action if such are correctly positioned) such as the presence of the anchor, the proper orientation and spacing of the anchor, the proper state of the ballast and rail, and the orientation of the anchor relative to the placement location. If an aspect is amiss, the controller can provide a signal that something needs to be fixed or changed, or may effectuate the needed change itself. Upon completion, the controller can receive signal sensors to ensure that the operation was completed successfully and properly. Otherwise, the controller can signal that there was an installation issue, or can try to fix the issue directly.

[0020] In one embodiment, the controller or systems described herein may have a local data collection system deployed and may use machine learning to enable derivation-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.

[0021] In one embodiment, the controller may include a policy engine that may apply 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 are 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. Ad-

ditionally, the success metric may be a combination of the optimized outcomes, which may be weighed relative to each other.

[0022] In one or more embodiments, a railway anchor holder is provided that has a frame configured to be coupled to an anchor application machine. In one example, the frame may include first and second walls that define a pocket therebetween configured to receive an anchor. The first wall defines a recessed seat configured to contact the anchor. In one example, the anchor holder may have a hydraulic actuator coupled to the second wall, the hydraulic actuator including a gripper block configured to be advanced towards the anchor that is in the pocket and to exert a clamp force on the anchor to secure the anchor between the gripper block and the recessed seat. In one example, the anchor holder may have a backing pin coupled to the frame and biased to exert a return force on the anchor. The return force exerted by the backing pin on the anchor can be in a transverse direction relative to the clamp force exerted by the gripper block on the anchor.

[0023] In one example, the anchor holder can include a chamfer surface formed on the second wall.

[0024] In one example of the anchor holder, the first wall is longer than the second retaining wall.

[0025] In one example, the anchor holder can include first and second shoulders flanking the pocket and configured to stop the hydraulic actuator.

[0026] In one example of the anchor holder, the hydraulic actuator can be an assembly having a hydraulically actuated piston coupled to a gripper block, wherein the gripper block can be configured to selectively clamp a railway anchor.

[0027] In one or more embodiments, for an anchor holder may have a frame having a top, back, and bottom, and a pivot bore formed in the back. In one example, the frame is adapted to receive a railway anchor in a first position and pivot and lower to guide the anchor to a second position. In one example, a hydraulic actuator arranged in the top of the frame, the hydraulic actuator arranged perpendicular to the pivot bore. In one example, the anchor holder may have a backing pin located and supported in the back between the pivot bore and the bottom, the backing pin aligned perpendicular to the hydraulic actuator, wherein the backing pin can have a first end provided with a concave head, a second end at a distal location from the first end, and a middle portion having a shoulder. The anchor holder can have a spring coupled to the shoulder and the back, a first retaining wall extending from the bottom towards the top and the back to form a side of the frame, wherein the first retaining wall has a recessed seat aligned along the bottom, the recessed seat aligned parallel to the backing pin. The anchor holder can have a second retaining wall located opposite to and aligned parallel with the first retaining wall on the frame, wherein the second retaining wall extends from the back to enclose the concave head of the backing pin within a pocket formed between the first retaining wall, the second retaining wall, and the back. In one example of the anchor holder, the recessed seat can have a first contact surface aligned to the hydraulic actuator, a second contact surface located at a distal end of the first retaining wall, and a clearance surface formed between the first and second contact surfaces.

[0028] In one example of the anchor holder, the first position of the anchor holder can correspond to the first retaining wall positioned above a railway tie.

[0029] In one example of the anchor holder, the second position of the anchor holder may correspond to the first retaining wall aligned to a railway tie.

[0030] In one example of the anchor holder, the first retaining wall is longer than the second retaining wall.

[0031] In one example, the anchor holder can include first and second shoulders flanking the pocket and configured to stop the hydraulic actuator.

[0032] In one example of the anchor holder, the hydraulic actuator can be an assembly comprising a hydraulically actuated piston coupled to a gripper block, wherein the gripper block is configured to selectively clamp.

[0033] In one or more embodiments, is a method including the steps of providing an anchor holder comprising a frame having a top, back, and bottom, the frame having a pivot bore formed in the back; receiving a railway anchor in the anchor holder at first position of the anchor holder, wherein the receiving of the railway anchor includes the railway anchor striking a first location of the anchor holder located on the back; clamping the railway anchor in the anchor holder at a second contact surface located on the top; pivoting the anchor holder to guide the anchor to a second position corresponding to the bottom of the frame aligned in proximity to the railway track; clipping the anchor onto a railway track; and applying a reaction force at the second contact surface, a third contact surface, and a fourth contact surface, wherein the third contact surface and the fourth contact surface are located on the bottom of the frame.

[0034] In one example of the method, the third contact surface can be on a first end of the bottom and the fourth contact surface is on an opposite end of the bottom.

[0035] In one example of the method, the anchor holder can include a hydraulic actuator arranged to perpendicular to the pivot bore, wherein the hydraulic actuator provides the second contact surface.

[0036] In one example of the method, the anchor holder can include a backing pin located and supported in the back between the pivot bore and the bottom, the backing pin aligned perpendicular to the hydraulic actuator, wherein the backing pin has a first end provided with a concave head, and wherein the backing pin provides the first contact surface.

[0037] In one example of the method, the anchor holder further comprises a spring coupled to the backing pin and the back, wherein the spring provides a dampening force to the anchor and a return force to the backing pin.

[0038] In one example of the method, the anchor hold-

er can include a first retaining wall extending from the bottom towards the top and the back to form a side of the frame, wherein the first retaining wall has a recessed seat aligned along the bottom, the recessed seat aligned parallel to the backing pin, wherein the first retaining wall aligns the railway anchor when receiving.

[0039] In one example of the method, the anchor holder can include a second retaining wall located opposite to and aligned parallel with the first retaining wall on the frame, wherein the second retaining wall extends from the back to enclose a concave head of the backing pin within a pocket formed between the first retaining wall, the second retaining wall, and the back.

[0040] In one example of the method, the third contact surface may be located on the recessed seat aligned to the hydraulic actuator, the fourth contact surface can be located at a distal end of the first retaining wall, and a clearance surface can be formed between the third and fourth contact surfaces.

[0041] In one example, the method can include clamping the railway anchor further comprises applying a hydraulic force to the hydraulic actuator.

[0042] Use of phrases such as "one or more of ... and," "one or more of ... or," "at least one of ... and," and "at least one of ... or" are meant to encompass including only a single one of the items used in connection with the phrase, at least one of each one of the items used in connection with the phrase, or multiple ones of any or each of the items used in connection with the phrase. For example, "one or more of A, B, and C," "one or more of A, B, or C," "at least one of A, B, and C," and "at least one of A, B, or C" each can mean (1) at least one A, (2) at least one B, (3) at least one C, (4) at least one A and at least one B, (5) at least one A, at least one B, and at least one C, (6) at least one B and at least one C, or (7) at least one A and at least one C.

[0043] As used herein, an element or step recited in the singular and preceded 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 subject matter without departing from its scope. While the dimensions and types of materials described herein define the parameters of the subject matter, they are exemplary embodiments. The scope of the 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 subject matter, including the best mode, and to enable one of ordinary skill in the art to practice the embodiments of subject matter, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the 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 and clauses if they have structural elements that do not differ from the literal language of the claims and clauses, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims and clauses.

[0046] The following numbered clauses set forth features and aspects of the invention:

1. A railway anchor holder comprising:

a block having a top, back, and bottom, the back having a pivot bore formed in the back;

a hydraulic actuator arranged in the top of the block, the hydraulic actuator arranged offset from the pivot bore;

a backing pin located and supported in the back between the pivot bore and the bottom, the backing pin aligned perpendicular to the hydraulic actuator, wherein the backing pin has a first end provided with a concave head, a second end at a distal location, and a middle portion having a shoulder;

a spring coupled to the shoulder and the back;

a first retaining wall extending from the bottom towards the top and the back to form a side of the block, wherein the first retaining wall has a recessed seat aligned along the bottom, the recessed seat aligned parallel to the backing pin; and

a second retaining wall located opposite to and aligned parallel with the first retaining wall on

the block, wherein the second retaining wall extends from the back to enclose the concave head of the backing pin within a pocket formed between the first retaining wall, the second retaining wall, and the back,

wherein the recessed seat has a first contact surface aligned with the hydraulic actuator, a second contact surface located at a distal end of the first retaining wall, and a clearance surface formed between the first and second contact surfaces.

2. The railway anchor holder of clause 1, further comprising a chamfer surface formed on the second retaining wall, the chamfer surface in proximity to the top.

3. The railway anchor holder of clause 2, wherein the first retaining wall extends past the second retaining wall.

4. The railway anchor holder of clause 1, further comprising first and second shoulders flanking the pocket and configured to stop the hydraulic actuator.

5. The railway anchor holder of clause 1, wherein the hydraulic actuator is an assembly comprising a hydraulically actuated piston coupled to a gripper block, wherein the gripper block is configured to selectively clamp a railway anchor.

6. A workhead assembly for a railway anchor applicator machine, the workhead assembly comprising:

an anchor magazine configured to guide an anchor from a first location to a second location in proximity to a railway track;

an anchor clipping mechanism configured to install the anchor onto the railway track;

an anchor holder adapted to receive the anchor from the magazine in a first position and pivot and lower to guide the anchor to the anchor clipping mechanism at a second position, the anchor holder comprising: a block having a top, back, and bottom, the block having a pivot bore formed in the back;

a hydraulic actuator arranged in the top of the block, the hydraulic actuator arranged perpendicular to the pivot bore;

a backing pin located and supported in the back between the pivot bore and the bottom, the backing pin aligned perpendicular to the hydraulic actuator, wherein the backing pin has a first end provided with a concave head, a second end at a distal location from the first end, and a middle portion having a shoulder;

a spring coupled to the shoulder and the back;

a first retaining wall extending from the bottom towards the top and the back to form a side of the block, wherein the first retaining wall has a recessed seat aligned along the bottom, the recessed seat aligned parallel to the backing pin;

a second retaining wall located opposite to and aligned parallel with the first retaining wall on the block, wherein the second retaining wall extends from the back to enclose the concave head of the backing pin within a pocket formed between the first retaining wall, the second retaining wall, and the back; and

wherein the recessed seat has a first contact surface aligned to the hydraulic actuator, a second contact surface located at a distal end of the first retaining wall, and a clearance surface formed between the first and second contact surfaces.

7. The workhead assembly of clause 6, wherein the first position of the anchor holder corresponds to the first retaining wall aligned parallel with the anchor magazine.

8. The workhead assembly of clause 7, wherein the second position of the anchor holder corresponds to the first retaining wall aligned parallel with the anchor clipping mechanism.

9. The workhead assembly of clause 8, wherein the first retaining wall extends past the second retaining wall.

10. The workhead assembly of clause 6, further comprising first and second shoulders flanking the pocket and configured to stop the hydraulic actuator.

11. The workhead assembly of clause 6, wherein the hydraulic actuator is an assembly comprising a hydraulically actuated piston coupled to a gripper block, wherein the gripper block is configured to selectively clamp.

12. A method comprising:

providing an anchor magazine configured to guide an anchor from a first location to a second location in proximity to a railway track;

providing an anchor holder comprising a block

having a top, back, and bottom, the block having a pivot bore formed in the back;

receiving a railway anchor in the anchor holder from the magazine at first position of the anchor holder corresponding to the bottom of the block aligned parallel to the magazine, wherein the receiving of the railway anchor includes the railway anchor striking a first location of the anchor holder located on the back;

clamping the railway anchor in the anchor holder at a second contact surface located on the top;

pivoting the anchor holder to guide the anchor to a second position corresponding to the bottom of the block aligned in proximity to the railway track;

clipping the anchor onto the railway track; and

applying a reaction force at the second contact surface, a third contact surface, and a fourth contact surface, wherein the third contact surface and the fourth contact surface are located on the bottom of the block.

13. The method of clause 12, wherein the third contact surface is on a first end of the bottom and the fourth contact surface is on an opposite end of the bottom.

14. The method of clause 13, wherein the anchor holder further comprises a hydraulic actuator arranged to perpendicular to the pivot bore, wherein the hydraulic actuator provides the second contact surface.

15. The method of clause 14, wherein the anchor holder further comprises a backing pin located and supported in the back between the pivot bore and the bottom, the backing pin aligned perpendicular to the hydraulic actuator, wherein the backing pin has a first end provided with a concave head, and wherein the backing pin provides the first contact surface.

16. The method of clause 15, wherein the anchor holder further comprises a spring coupled to the backing pin and the back, wherein the spring provides a dampening force to the anchor and a return force to the backing pin.

17. The method of clause 16, wherein the anchor holder further comprises a first retaining wall extending from the bottom towards the top and the back to form a side of the block, wherein the first retaining wall has a recessed seat aligned along the bottom, the recessed seat alignedparallel to the backing pin, wherein the first retaining wall aligns the railway anchor when receiving.

18. The method of clause 17, wherein the anchor holder further comprises a second retaining wall located opposite to and aligned parallel with the first retaining wall on the block, wherein the second retaining wall extends from the back to enclose the concave head of the backing pin within a pocket formed between the first retaining wall, the second retaining wall, and the back.

19. The method of clause 17, wherein the third contact surface is located on the recessed seat aligned to the hydraulic actuator, the fourth contact surface is located at a distal end of the first retaining wall, and a clearance surface is formed between the third and fourth contact surfaces.

20. The method of clause 14, wherein clamping the railway anchor further comprises applying a hydraulic force to the hydraulic actuator.

21. The method of clause 18, wherein the second retaining wall couples to the railway anchor when receiving.

22. An anchor holder comprising: a frame having a top, back, and bottom, and a pivot bore formed in the back, the frame adapted to receive a railway anchor in a first position and pivot and lower to guide the anchor to a second position;

a hydraulic actuator arranged in the top of the frame, the hydraulic actuator arranged perpendicular to the pivot bore;

a backing pin located and supported in the back between the pivot bore and the bottom, the backing pin aligned perpendicular to the hydraulic actuator, wherein the backing pin has a first end provided with a concave head, a second end at a distal location from the first end, and a middle portion having a shoulder;

a spring coupled to the shoulder and the back;

a first retaining wall extending from the bottom towards the top and the back to form a side of the frame, wherein the first retaining wall has a recessed seat aligned along the bottom, the recessed seat aligned parallel to the backing pin;

a second retaining wall located opposite to and aligned parallel with the first retaining wall on the frame, wherein the second retaining wall extends from the back to enclose the concave head of the backing pin within a pocket formed

between the first retaining wall, the second retaining wall, and the back; and

wherein the recessed seat has a first contact surface aligned to the hydraulic actuator, a second contact surface located at a distal end of the first retaining wall, and a clearance surface formed between the first and second contact surfaces.

23. The anchor holder of clause 22, wherein the first position of the anchor holder corresponds to the first retaining wall positioned above a railway tie.

24. The anchor holder of clause 23, wherein the second position of the anchor holder corresponds to the first retaining wall aligned to a railway tie.

25. The anchor holder of clause 23, wherein the first retaining wall is longer than the second retaining wall.

26. The anchor holder of clause 22, further comprising first and second shoulders flanking the pocket and configured to stop the hydraulic actuator.

27. The anchor holder of clause 22, wherein the hydraulic actuator is an assembly comprising a hydraulically actuated piston coupled to a gripper block, wherein the gripper block is configured to selectively clamp.

28. A method comprising:

providing an anchor holder comprising a frame having a top, back, and bottom, the frame having a pivot bore formed in the back;

receiving a railway anchor in the anchor holder at first position, wherein the receiving of the railway anchor includes the railway anchor striking a first contact surface of the anchor holder located on the back;

clamping the railway anchor in the anchor holder at a second contact surface located on the top;

pivoting the anchor holder to guide the anchor to a second position corresponding to the bottom of the frame aligned in proximity to a railway track;

clipping the anchor onto the railway track; and

applying a reaction force at the second contact surface, a third contact surface, and a fourth contact surface, wherein the third contact surface and the fourth contact surface are located on the bottom of the frame.

29. The method of clause 28, wherein the third contact surface is on a first end of the bottom and the fourth contact surface is on an opposite end of the bottom.

30. The method of clause 29, wherein the anchor holder further comprises a hydraulic actuator arranged to perpendicular to the pivot bore, wherein the hydraulic actuator provides the second contact surface.

31. The method of clause 30, wherein the anchor holder further comprises a backing pin located and supported in the back between the pivot bore and the bottom, the backing pin aligned perpendicular to the hydraulic actuator, wherein the backing pin has a first end provided with a concave head, and wherein the backing pin provides the first contact surface.

32. The method of clause 31, wherein the anchor holder further comprises a spring coupled to the backing pin and the back, wherein the spring provides a dampening force to the anchor and a return force to the backing pin.

33. The method of clause 32, wherein the anchor holder further comprises a first retaining wall extending from the bottom towards the top and the back to form a side of the frame, wherein the first retaining wall has a recessed seat aligned along the bottom, the recessed seat aligned parallel to the backing pin, wherein the first retaining wall aligns the railway anchor when receiving.

34. The method of clause 33, wherein the third contact surface is located on the recessed seat aligned to the hydraulic actuator, the fourth contact surface is located at a distal end of the first retaining wall, and a clearance surface is formed between the third and fourth contact surfaces.

35. The method of clause 30, wherein clamping the railway anchor further comprises applying a hydraulic force to the hydraulic actuator.

Claims

1. An anchor holder comprising:

a frame configured to be coupled to an anchor application machine, the frame including first and second walls that define a pocket therebetween configured to receive an anchor, the first wall defining a recessed seat configured to contact the anchor;

a hydraulic actuator coupled to the second wall, the hydraulic actuator including a gripper block configured to be advanced towards the anchor that is in the pocket and to exert a clamp force on the anchor to secure the anchor between the gripper block and the recessed seat; and
a backing pin coupled to the frame and biased to exert a return force on the anchor, wherein the return force exerted by the backing pin on the anchor is in a transverse direction relative to the clamp force exerted by the gripper block on the anchor.

2. The anchor holder of claim 1, further comprising a chamfer surface formed on the second wall.

3. The anchor holder of claim 1, wherein the first wall is longer than the second wall.

4. The anchor holder of claim 1, further comprising first and second shoulders flanking the pocket and configured to stop the hydraulic actuator.

5. The anchor holder of claim 1, wherein the hydraulic actuator is an assembly comprising a hydraulically actuated piston coupled to a gripper block, wherein the gripper block is configured to selectively clamp a railway anchor.

6. The anchor holder of Claim 1, wherein the frame is adapted to receive a railway anchor in a first position and pivot and lower to guide the anchor to a second position.

7. The anchor holder of claim 6, wherein the first position of the anchor holder corresponds to the first retaining wall positioned above a railway tie.

8. The anchor holder of claim 6, wherein the second position of the anchor holder corresponds to the first retaining wall aligned to a railway tie.

9. A method comprising:

providing an anchor holder comprising a frame having a top, back, and bottom, the frame having a pivot bore formed in the back;
receiving a railway anchor in the anchor holder at first position, wherein the receiving of the railway anchor includes the railway anchor striking a first contact surface of the anchor holder located on the back;
clamping the railway anchor in the anchor holder at a second contact surface located on the top;
pivoting the anchor holder to guide the anchor to a second position corresponding to the bottom of the frame aligned in proximity to a railway track;
clipping the anchor onto the railway track; and
applying a reaction force at the second contact surface, a third contact surface, and a fourth contact surface, wherein the third contact surface and the fourth contact surface are located on the bottom of the frame.

10. The method of claim 9, wherein the third contact surface is on a first end of the bottom and the fourth contact surface is on an opposite end of the bottom.

11. The method of claim 10, wherein the anchor holder further comprises a hydraulic actuator arranged to perpendicular to the pivot bore, wherein the hydraulic actuator provides the second contact surface.

12. The method of claim 11, wherein the anchor holder further comprises a backing pin located and supported in the back between the pivot bore and the bottom, the backing pin aligned perpendicular to the hydraulic actuator, wherein the backing pin has a first end provided with a concave head, and wherein the backing pin provides the first contact surface.

13. The method of claim 12, wherein the anchor holder further comprises a spring coupled to the backing pin and the back, wherein the spring provides a dampening force to the anchor and a return force to the backing pin.

14. The method of claim 13, wherein the anchor holder further comprises a first retaining wall extending from the bottom towards the top and the back to form a side of the frame, wherein the first retaining wall has a recessed seat aligned along the bottom, the recessed seat aligned parallel to the backing pin, wherein the first retaining wall aligns the railway anchor when receiving.

15. The method of claim 14, wherein the anchor holder further comprises a second retaining wall located opposite to and aligned parallel with the first retaining wall on the frame, wherein the second retaining wall extends from the back to enclose a concave head of the backing pin within a pocket formed between the first retaining wall, the second retaining wall, and the back.

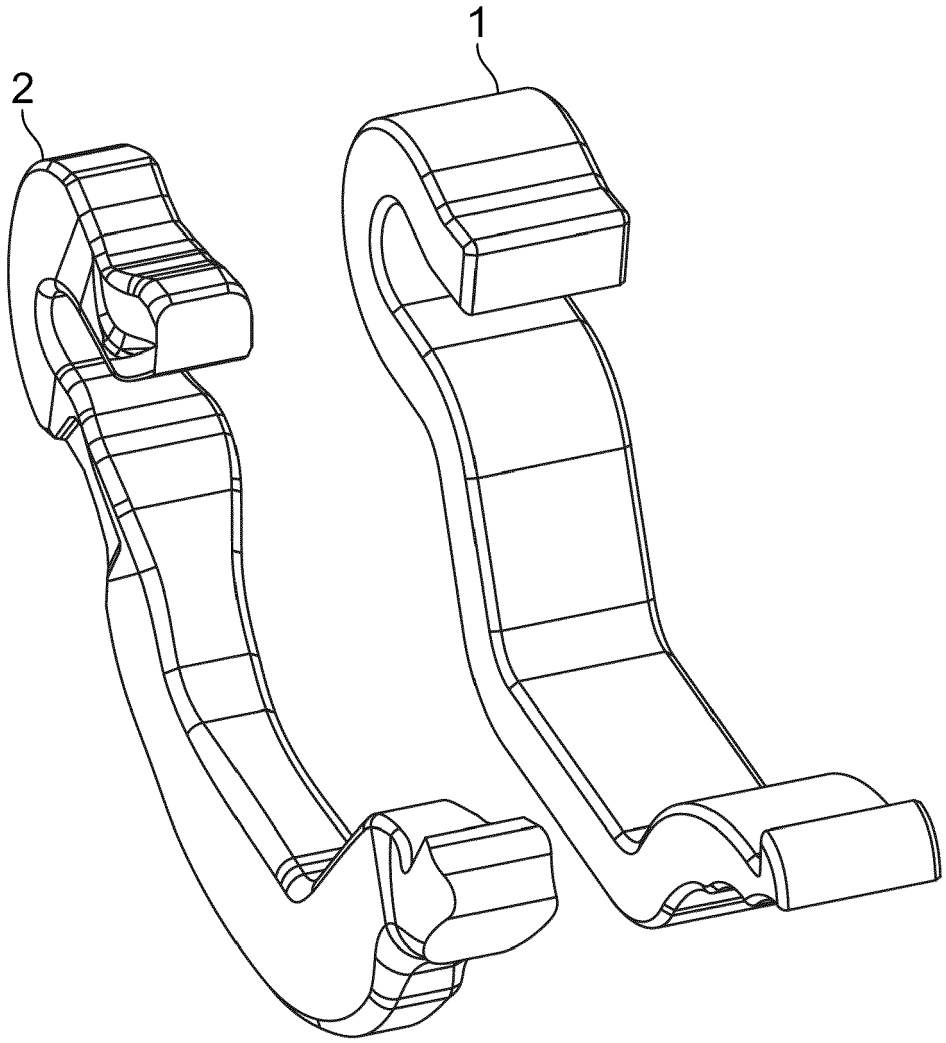

FIG. 1

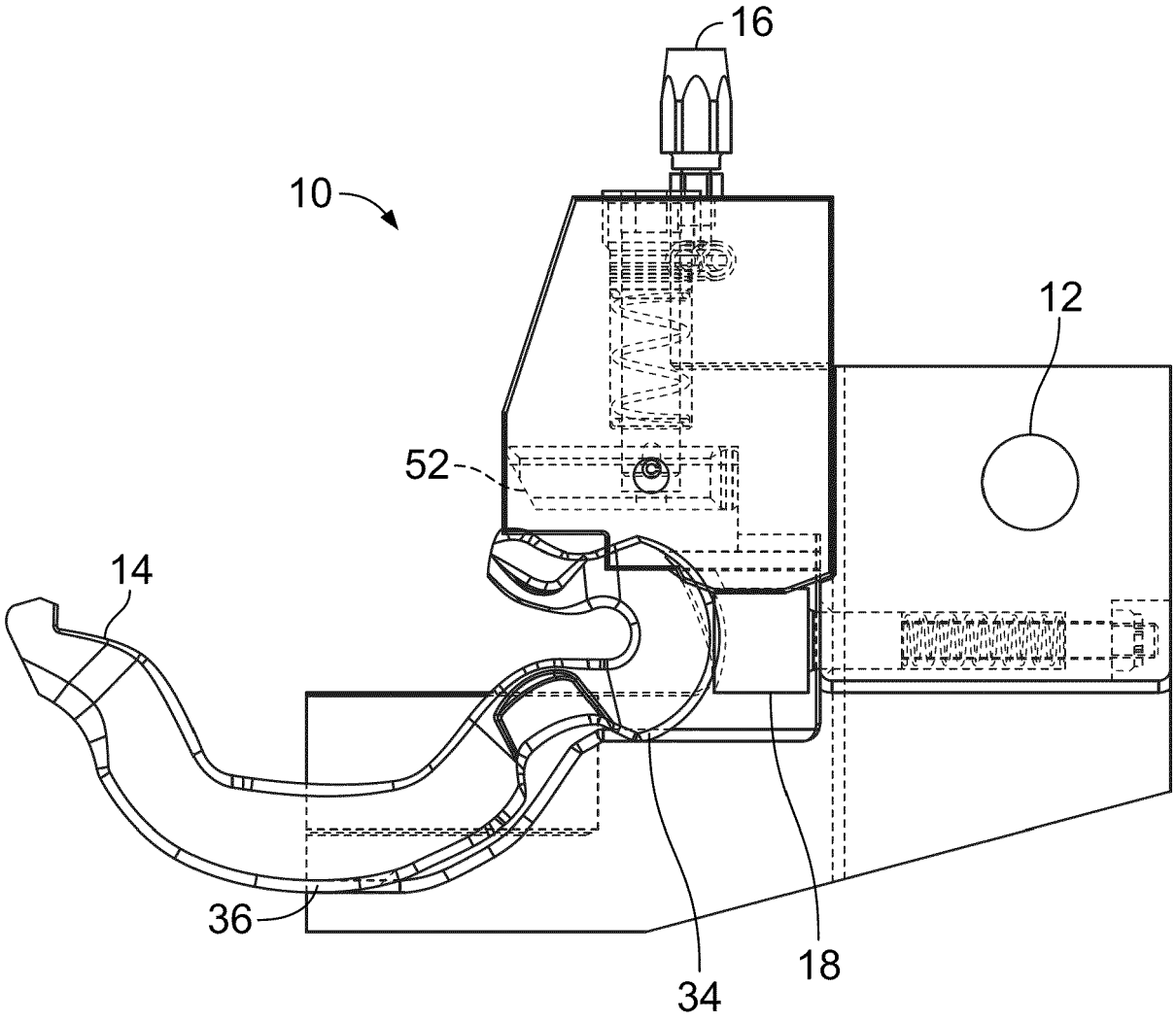

FIG. 2

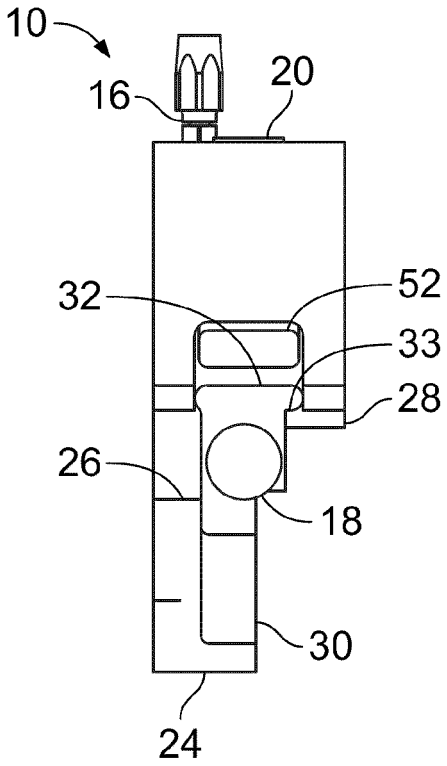

FIG. 3

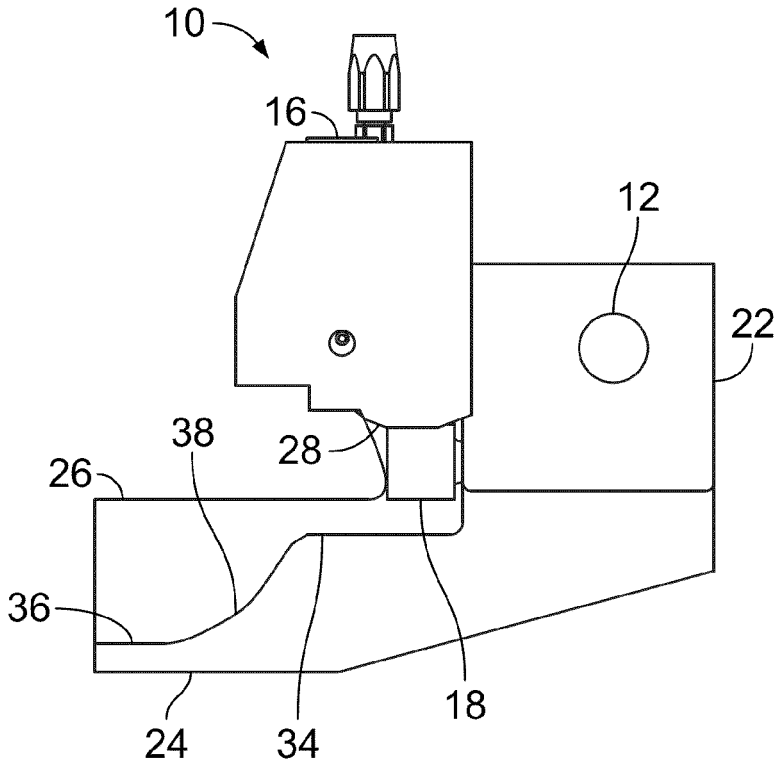

FIG. 4

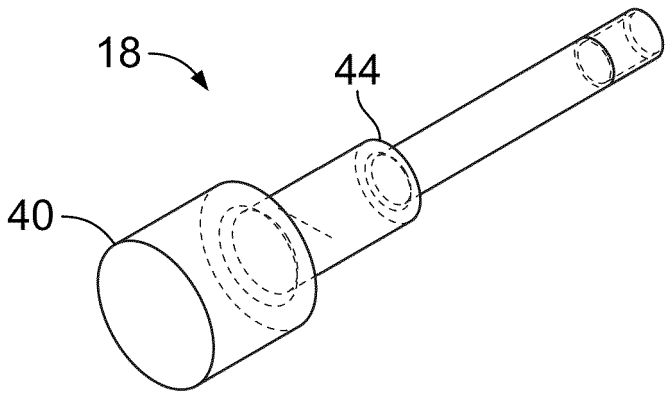

FIG. 5

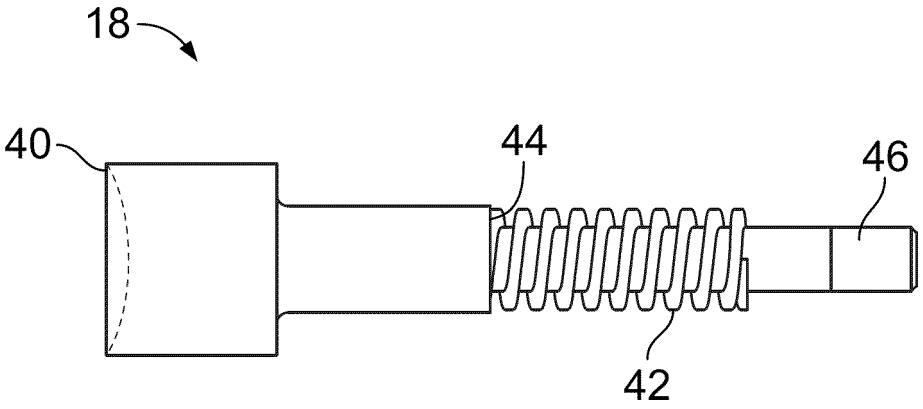

FIG. 6

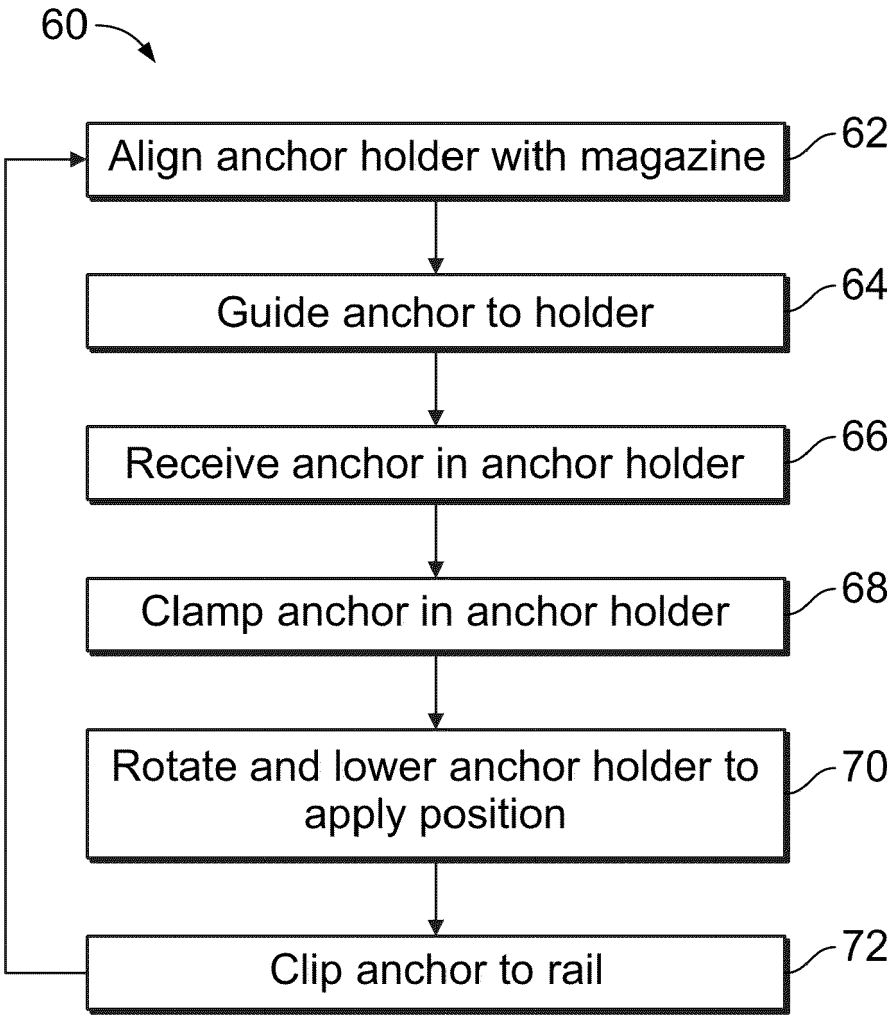
60
Align anchor holder with magazine
62
Guide anchor to holder
64
Receive anchor in anchor holder
66
Clamp anchor in anchor holder
68
Rotate and lower anchor holder to apply position
70
Clip anchor to rail
72

FIG. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 24 15 1161

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2010/101446 A1 (CLAAS ROBERT C [US] ET AL) 29 April 2010 (2010-04-29) * paragraphs [0054] - [0068]; figures *	1-14	INV. E01B29/32
A	CA 3 057 519 A1 (NORDCO INC [US]) 4 April 2020 (2020-04-04) * the whole document *	1-15	

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E01B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 May 2024	Movadat, Robin

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16-05-2024

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