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Intelligent drop table

Abstract

A drop table system can intelligently provide truck assembly movement with a controller connected to at least one lifting column and a single inclinometer with the inclinometer positioned at a geometric center of a drop table platform. The drop table platform can be suspended with the at least one lifting column prior to a detection of drop table platform tilt with the inclinometer. The tilt may be corrected by altering operation of the at least one lifting column to orient the drop table platform in a level configuration.

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Background/Summary

RELATED APPLICATIONS (1) The present application makes a claim of domestic priority to U.S. Provisional Patent Application No. 62/705,406 filed Jun. 2, 2020, the contents of which are hereby incorporated by reference.

SUMMARY
(1) An intelligent drop table, in accordance with various embodiments, has a drop table platform suspended by at least one lifting column connected to a controller. The controller is connected to a single inclinometer positioned at a geometric center of the drop table platform to identify tilt of the drop table platform.
(2) An intelligent drop table, in other embodiments, has a controller connected to at least one lifting column and a single inclinometer with the inclinometer positioned at a geometric center of a drop table platform. The drop table platform is suspended with the at least one lifting column prior to a detection of drop table platform tilt with the inclinometer. The tilt is then corrected by altering operation of the at least one lifting column to orient the drop table platform in a level configuration.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) FIG. **1** is a representation of an example environment in which assorted embodiments can be practiced.
(2) FIG. **2** depicts portions of an example drop table operated in accordance with assorted embodiments.
(3) FIGS. **3**A & **3**B respectively depict portions of an example drop table configured in accordance with various embodiments.
(4) FIG. **4** depicts portions of an example drop table arranged in accordance with some embodiments.
(5) FIG. **5** depicts a service top portion of an example drop table configured in accordance with assorted embodiments.
(6) FIG. **6** depicts portions of an example drop table utilized in accordance with some embodiments.
(7) FIG. **7** depicts portions of an example drop table constructed and operated in accordance with assorted embodiments.
(8) FIG. **8** depicts portions of an example sensor that can be employed in a drop table in accordance with various embodiments.
(9) FIG. **9** is a flowchart of an example drop table service routine carried out with the assorted embodiments of FIGS. **1-8**.
DETAILED DESCRIPTION
(10) The present disclosure is generally directed to a drop table that employs intelligent structure and function to optimize the servicing of rail car truck assemblies.
(11) Despite the modernization of railway equipment, the truck assemblies that house one or more traction motors and connect a rail car and/or locomotive to rails need service after an amount of use. Such service involves separating a truck assembly from a rail car prior to performing repair, maintenance, and replacement of assorted assembly components. The separation of a truck assembly can be wrought with safety, efficiency, and performance issues associated with moving the truck assembly to, and from, a service station. Hence, various embodiments are directed to increasing the safety, efficiency, and performance of a drop table system that physically moves a truck assembly.

(12) FIG. **1** displays a line representation of an example locomotive system **100** in which various embodiments of the present disclosure can be practiced. The locomotive system **100** can consist of any number of locomotive engines or rail cars **102** positioned atop a pair of rails **104**. Each rail car **102** can employ at least one truck assembly **106** that provide suspension of at least one traction motor as well as rolling engagement between the rails **104** and the respective rail cars and locomotive engines **102**. It is noted that each truck assembly **106** has a multiple wheels **108** that physically engage the rails **104**, but such configuration is not required or limiting as any number of wheels can be utilized to allow a rail car to move along the rails **104**.
(13) The use of truck assemblies **106** with suspensions and multiple wheels **108** allow relatively heavy loads to be efficiently transported via locomotive power. However, heavy loads and relatively long transportation distances result in wear on the truck assemblies **106** that require service, such as inspection, maintenance, component repair, and component replacement, in order to provide consistent and safe transportation performance over time. Such service can be daunting and riddled with challenges due, at least in part, to the size, weight, and position of the truck assemblies relative to the other portions of the respective rail cars **102**.
(14) FIG. **2** depicts portions of an example drop table system **120** operated in accordance with assorted embodiments to service portions of a rail car **102**. The drop table system **120** separates a truck assembly **106** from a non-rotating portion of the rail car **102** by lowering a section of rail **122** via one or more jacks **124**. In some embodiments, independent lifting jacks **124** provide selective operation to raise or lower a truck assembly **106** with respect to a recessed drop table pit **126** along a vertical axis (Z axis). The drop table pit **126** can be configured for horizontal movement (X axis) to align the truck assembly **106** with a service shaft **128**. The position of the service shaft **128** away from the rail car **102** allows for unimpeded access to the truck assembly **106**, which results in efficient inspection, access, and replacement of various portions of the truck assembly **106**.
(15) While use of the service shaft **128** provides efficient servicing of a truck assembly **106**, the two-dimensional movement of the lifting jacks **124** along the Z and X axes, respectively, corresponds with increased mechanical complexity that can be prone to reliability, safety, and performance issues compared to one-dimensional lifting columns that simply perform vertical motion. For instance, a two-dimensional jack **124** can be plagued with failures while in the pit **126**, which can be difficult and time consuming to repair and overcome. A two-dimensional jack **124** may also be plagued with stabilizing a truck assembly **106** for both vertical (Z axis) and horizontal (X axis) movement, which can jeopardize the integrity of the truck assembly **106** as well as the function of the jacks **124** in the event of inadvertent truck assembly **106** motion.
(16) In addition to the difficulties inherent in moving heavy truck assemblies **106** in two-dimensions, the use of truck assemblies **106** is inherently dirty. Thus, the drop table lifting jacks **124** routinely experience unbalanced and heavy loads that expel dirt, debris, and contaminated liquids onto the jacks **124**. The presence of such contaminants may further exacerbate the difficulties of a two-dimensional jack **124** by contaminating moving portions of a jack **124**, creating slippery surfaces, and exposing electrical components to liquid. Accordingly, two-dimensional jacks **124** can be constructed to be robust against contamination and wear due to dirty and heavy truck assemblies **106**. However, such robust construction corresponds with slow operation and parts that are difficult to access and repair.
(17) Hence, drop table systems **120** have been configured with a balance of robustness for contamination and wear versus speed and performance of operation. Assorted embodiments of an intelligent drop table alleviate this compromising balance by providing a more efficient two-dimensional jack that maintains robust resistance to contamination and wear over time. FIGS. **3**A & **3**B respectively depict portions of an example drop table **150** arranged in accordance with some embodiments. The top view line representation of the drop table **150** in FIG. **3**A illustrates how a base **152** can support a plurality of lifting columns **154** and lifting motors **156**.
(18) While not required or limiting, a pair of lifting columns **154** can each be powered by a motor

156 disposed therebetween on the base **152**, as directed by an electronic controller **158**. By constructing the base **152** as a rigid member, the respective lifting columns **154** can more reliably be supported to lift, and lower, heavy loads compared to if the columns **154** were physically independent of the base **152**. The base **152** may further support one or more gear boxes between the respective motors **156** and a connected column **154**, which allows for increased mechanical efficiency compared to a direct drive (gearless) motor-column connection.

(19) The respective lifting columns **154** can each be physically attached to a lifting platform **160**, as shown in FIG. **3**B, that contacts a truck assembly to be moved by the drop table **150**. It is contemplated that the lifting platform **160** is mounted directly to each lifting column **154**, but such configuration can result in an unstable movement mechanism along with a relatively long travel distance, as shown by arrow **162** that corresponds with a pit depth and a length of lifting/lowering for the columns **154**. Accordingly, various embodiments link lifting columns **154** on the same longitudinal side of the base **152** with a crossbeam **164** that joins the operation of the respectively connected lifting columns **154**.

(20) The configuration of a crossbeam **164** to connect two lifting columns **154**, instead of three or more columns **154**, allows the motors **156** to be linked without overpowering the respective motors **156**. That is, joining lifting columns **154** connected to different motors **156** allows for efficient, precise, and safe lifting and lowering operation compared to columns powered independently or a single motor powering all columns **154**. For instance, bilateral lifting control afforded by the crossbeams **164** allow different motors **156** to balance lifting, and lowering, motion along the longitudinal axis (X axis), which can accommodate shifting loads, equipment wear, and component failures.

(21) In some embodiments, the crossbeams **164** can extend parallel to the Y axis to connect a pair of lifting columns **154** powered by the same motor **156** instead of the crossbeam **164** configuration shown in FIGS. **3**A & **3**B. The connection of columns **154** powered by a common motor **156** can increase stability of the drop table system **150**, but can be plagued by shifting loads, particularly when the drop table system **150** moves along the X axis to a service pit. The use of crossbeams **164**, regardless of orientation, in combination with the platform **160** oriented with beams extending perpendicular to the longitudinal axis of the crossbeams **164** increases the overall strength and stability of the drop table system **150** while reducing the depth of the service pit and the length of the respective lifting columns **154**.

(22) FIG. **4** depicts portions of an example drop table **180** configured in accordance with various embodiments. The drop table **180** can be positioned below rails in a pit that allows for vertical (Z axis) and horizontal (X axis) movement to separate a truck assembly from a rail car, service the truck assembly, and return the truck assembly to the rail car. Such activity can be facilitated by a pair of rail sections that each consist of a length of rail **182** supported by a stanchion **184**. Each stanchion **184** is supported by a rail crossbeam **186** that ensures the stanchions **184** remain a predetermined distance apart, as measured along the X axis, during movement of a truck assembly.

(23) The stanchions **184** are each configured with manual locks **188** that engages the platform **160** to support the truck assembly, and attached rail car, which prevents rollovers and inadvertent weight transfer when detaching and installing the truck assembly. The manual locks **188** can be complemented by adjustable wheel chocks **190** that secure the position of the truck assembly by contacting at least one truck wheel. While not required, the wheel chocks **190** can be adjusted to place more, or less, force on the truck assembly, which can restrict, or allow, truck assembly motion during drop table **180** movement and operation.

(24) The height **192** of the stanchions **184** can be customized, in accordance with various embodiments, to reduce the depth of the service pit and the length of travel for the respective lifting columns **154**. That is, the combination of the crossbeams **164** supporting the platform **160** that supports the stanchions **184** adds height above the lifting limit of the columns **154**, as established by the X-Y plane at the top of the respective crossbeams **164**, that reduces the distance needed to

bring a truck assembly into the service pit to be translated horizontally. Hence, the height, parallel to the Z axis, of the platform **160** and stanchions **184** can be tuned to provide enough distance to effectively reduce the depth of the service pit and operating length of the lifting columns **154** without compromising truck assembly stability or drop table operating safety due to the crossbeams **164** minimizing side loading by transferring weight directly to the top of a lifting nut that travels within each lifting column **154**.

(25) The configuration of the platform **160** atop the crossbeams **164** allows for the efficient removal of a truck assembly and/or traction motor from a locomotive engine or rail car. For instance, the additional height of the platform **160** allows the suspension holding a truck assembly/traction motor to an engine/rail car to be easily compressed along the Z axis without the crossbeams **164** being at the very top of the range of the lifting columns **154**, which increases safety and efficiency. That is, a truck assembly and/or traction motor can be reliably moved upward by the platform **160** to allow the truck assembly/motor to be disconnected from the engine/car prior to being lowered by the lifting columns.

(26) It is noted that the base **152** is covered with a solid plate **194** that protects the electrical components, such as the motors, controller, and moving components, housed in the base **152**. In addition, the solid plate **194** provides a safe walking surface when servicing the drop table **180**. With the presence of dirt, liquids, and other contaminants that can degrade and fail electrical and mechanical components of the lifting columns **154** and base **152**, the combination of the continuously solid platform **160** and base along the X-Y plane presents barriers for such contaminants from entering, interfering, degrading, and failing portions of the drop table **180**.

(27) FIG. **5** depicts a service top **200** portion of an example drop table arranged in accordance with assorted embodiments. The service top **200** has a welded structural beam **202** and utilizes a rail **204** having a standardize size and shape to provide continuity with rails utilized in service shops. The manual lock **188** extends through pockets in the platform **160** to stabilize the truck assembly and prevent occurrences of rollover. The adjustable wheel chocks **190** secure a truck wheel at any location on the rail **204**, which allows greater customization of truck assembly stabilization than non-adjustable, single location wheel chocks, by optimizing the center-of-gravity of the platform.

(28) FIG. **6** depicts portions of an example drop table system **210** positioned within a service pit **212** to carry out various embodiments of servicing a truck assembly **106**. The drop table system **210** utilizes stabilizing blocks **214** connected to each non-moving rail **216** to ensure no rail movement is experienced when the truck assembly **106** is lowered onto the base **152** of the system **210** to allow horizontal motion along the pit rails **218**. It is noted that the drop table base **152** may have one or more motors that power motion along the X axis via the pit rails **218**.

(29) The additional height provided by the crossbeams **164** and platform **160** allow the platform top surface **220** to be even with, aligned with, and parallel to a shop floor surface **222**, which increases safety of workers while reducing contaminants from dropping onto the lifting columns **154** and base **152**. It is contemplated that the space vacated by the platform when lowered onto the base **152** is filled by a safety panel that prevents people, tools, and contaminants from falling into to the service pit **212**.

(30) FIG. **7** depicts a platform **230** of an example drop table configured in accordance with some embodiments. The platform **230** employs a single inclinometer sensor **232** positioned in the geometric center **234** of the platform **230** and connected to a drop table controller, such as controller **158**. The geometric center **234** of the rectangular platform **230** is disposed at the intersection of respective X and Y extending centerlines **234**A, **234**B. Such single inclinometer **232** replaces separate sensors located in the lifting columns, as represented by segmented boxes **232**A. The use of a single sensor **232** to measure three-dimensional tilt of the platform **230** allows for efficient and precise detection of operating conditions along the periphery of the platform **230**, such as at the lifting columns and along crossbeam edges, as represented by arrows **236**.

(31) It is noted that the sensor **232** can be positioned above or below the platform top surface **222**

to sense platform status relative to the drop table base as well as the ground floor of the service pit. The construction of the platform **230** with numerous beams **238** provides increased stiffness throughout the top surface **222**, which allows the sensor **232** to precisely sense non-level platform status, as one inch of deviation from level at any location on the periphery of the platform **230**. The ability to quickly and accurately detect non-level position for any part of the platform **230** allows corrective actions to be efficiently generated and carried out to prevent undue wear on the drop table components as well as inadvertent movement of the truck assembly being transported by the platform **230**.

(32) In contrast to the use of optical or acoustic sensors that can suffer performance and/or accuracy degradation by the presence of dirt, liquid, and other contaminants, the single inclinometer sensor **232** can be a sealed unit that is protected from contaminants while being less susceptible to measurement inaccuracies due to the presence of contaminants proximal to the sensor **232**. The use of a single sensor **232** in the place of multiple sensors on, and/or around, the platform **230** allows for quicker detection of non-level platform status, less controller processing, faster derivation of corrective actions to reach a level status, and simpler overall configuration that reduces risk of a sensor failure over time.

(33) FIG. **8** depicts portions of an example sensor **250** constructed and operated in accordance with some embodiments as part of a drop table system. The sensor **250** has a mass **252** that consists of protrusions **254**. Movement of the mass and protrusions **252**/**254** relative to stationary leads **256** via one or more suspensions **258** provide at least tilt measurements for the surface to which the leads **256** are attached. That is, at least one suspension **258** allows the mass **252** and protrusions **254** to move in response to gravity to electrically and/or magnetically interact with the stationary leads **256** to indicate where, and to what degree, the surface on which the sensor **250** is mounted is tilted. In other words, the moving mass **252** and protrusions **254** can be mechanically free of the underlying surface while each lead is fixed onto the underlying surface that is being measured for orientation relative to level.

(34) While the sensor **250** may be constructed as illustrated in FIG. **8**, such components and configuration is not required or limiting. As such, any inclinometer sensor can be utilized by a drop table system to detect non-level orientation of a drop table platform. For instance, any mass that reacts to gravity can interact with any number and arrangement of stationary leads to indicate three-dimensional tilt direction and degree. Thus, a drop table can utilize a single inclinometer with at least one mass influenced by gravity to detect where, and how much, platform tilt is occurring.

(35) FIG. **9** is a flowchart of an example drop table service routine **260** that can be carried out with the various embodiments of FIGS. **1**-**8**. A drop table system is initially installed in step **262** in a service pit with lifting columns extending from a base to a platform that presents a service top, as generally shown in FIGS. **3**A-**6**. A rail car, or locomotive engine, is positioned over the service pit in step **264** so that a truck assembly of the rail car, which may consist of the entire truck assembly or simply a traction motor of the truck assembly, contacts the service top of the drop table. The truck assembly wheels are locked in place in step **266** before the truck assembly is separated from the rail car/engine in step **268** by lowering the service top and platform via cross beams and lifting column activation from a pair of electric motors located in the base of the drop table.

(36) At any time after the truck assembly/motor is separated from the rail car/engine and wholly supported by the drop table, a single inclinometer sensor measures the physical orientation of the drop table platform, which allows decision **270** to determine if the platform, and connected service top, are not level with a ground level and base of the drop table. For example, decision **270** can continuously, cyclically, or sporadically monitor platform orientation to determine if the platform is currently not level, or parallel to the ground level with a 0 degree position along the X-Y plane. A determination that the platform is level advances routine **260** to step **272** where the drop table proceeds to horizontally move the truck assembly/motor to a service area that is then accessed by lifting the truck assembly/motor via the lifting columns to allow step **274** to perform maintenance,

repair, and other service on the truck assembly/motor.

(37) In the event decision **270** detects a current, or imminent, tilting of the platform from level, a determination can be made as to the location and severity of the tilt. If the tilt is within a correctable range at a correctable position, then step **276** generates a correction strategy with a drop table controller that is carried out in step **278** by altering at least one operational parameter before returning to decision **270** to verify the tilt has been corrected. For instance, the drop table controller can utilize one or more generated algorithms indicative of the drop table lifting configuration to identify from the single sensor where the platform is too high and/or too low. It is noted that the use of a single three-dimensional sensor requires such algorithmic computation of where a tilt is present due to the presence of multiple connected lifting columns.

(38) The determination of whether a tilt is correctable can be conducted spontaneously by the drop table controller based on a variety of predetermined parameters, such as weight of the truck assembly, position of the platform relative to the drop table base, speed of lifting/lowering, and detected center of gravity of the truck assembly relative to the geometric center of the platform. The generated correction strategy can comprise any number of reactive and/or proactive actions that are collectively designed to return the platform to a level orientation. As an example, a correction strategy may be to reduce power to one motor, increase power to one motor, change gear ratios, reduce lifting/lowering speed, and temporarily lock a lifting column.

(39) A determination that a tilt is not correctable, or is not safe to attempt to correct, triggers step **280** to sound an audible warning so that any personnel in and around the service pit is altered of a dangerous situation. The audible warning prompts the drop table controller to bring the platform to a stop as safely as possible in step **282** to minimize the risk of drop table failure or truck assembly movement from the service top. Step **282** may involve continued platform motion and/or locking of one or more lifting columns, as determined by the drop table controller, to reduce the risk of losing control of the truck assembly or components of the drop table itself.

(40) It is contemplated a correction strategy can conduct a variety of risk mitigation actions in an effort to return the platform to a level orientation. For instance, the drop table controller can maintain a certain amount of platform tilt while changing lifting/lowering speed until the lifting columns reach a limit stop (top or bottom) of the respective lifting columns. Another non-limiting example of a correction strategy involves utilizing the cross beam connection of different motors to conduct a pattern of movements among connected lifting columns to induce a reduction in platform tilt, such as pulsating one motor at a greater frequency than the other motor. The diverse capabilities of a correction strategy allows a drop table controller to mitigate risks to component and personnel.

(41) Through the assorted embodiments of a drop table system, efficiency, performance, and safety can be improved. By connecting lifting columns powered by different motors with a cross beam, motor feedback can more accurately depict the condition of the drop table, particularly the respective longitudinal sides. The cross beams support a rigid platform that provides increased stiffness that allows for increased tilt detection precision while decreasing the lifting distance and service pit depth required to service a truck assembly. Employing a single inclinometer at the geometric center of a platform can provide fast and accurate tilt measurements without concern for contamination degradation from dirt, liquids, and other contaminants. The use of a single inclinometer to generate a correction strategy allows a drop table controller to adapt to real-time conditions to provide intelligent corrective actions that have component wear and personnel safety in focus.

(42) It is to be understood that even though numerous characteristics of various embodiments of the present disclosure have been set forth in the foregoing description, together with details of the structure and function of various embodiments, this detailed description is illustrative only, and changes may be made in detail, especially in matters of structure and arrangements of parts within the principles of the present technology to the full extent indicated by the broad general meaning of

the terms in which the appended claims are expressed. For example, the particular elements may vary depending on the particular application without departing from the spirit and scope of the present disclosure.

Claims

1. An apparatus comprising a drop table platform suspended by at least one lifting column connected to a controller, the controller connected to a single inclinometer positioned at a geometric center of the drop table platform to continuously detect tilt of the drop table platform as the drop table platform is respectively raised and lowered between a lowest elevational position and a highest elevational position.
2. The apparatus of claim 1, wherein the inclinometer comprises a mass suspended relative to stationary leads.
3. The apparatus of claim 2, wherein a protrusion of the mass extends between a pair of stationary leads.
4. The apparatus of claim 2, wherein the mass is suspended above the drop table platform while the stationary leads are fixed onto the drop table platform.
5. The apparatus of claim 2, wherein four separate protrusions each extend from the mass and respectively interact with different pairs of stationary leads.
6. The apparatus of claim 2, wherein the mass reacts relative to gravity to identify a location of drop table platform tilt and a degree of drop table platform tilt.
7. The apparatus of claim 1, wherein the inclinometer is positioned atop the drop table platform.
8. The apparatus of claim 1, wherein the inclinometer is positioned on an underside of the drop table platform.
9. The apparatus of claim 1, wherein the drop table comprises a pair of spaced apart railroad track sections configured to raise and lower a railroad truck assembly through a service pit opening.
10. The apparatus of claim 1, wherein the inclinometer is packaged in a sealed container.
11. The apparatus of claim 1, wherein the tilt identified by the controller using the single inclinometer comprises an amount and location of deviation of a periphery of the drop table platform from a horizontally level plane defined by first and second orthogonal axes, and wherein the controller is further configured to adjust an elevational position of at least one of the at least one lifting column responsive to the amount and location of deviation of the periphery of the drop table platform from the horizontally level plane.
12. The apparatus of claim 1, wherein the controller determines the tilt of the drop table platform as three-dimensional tilt thereof solely from the single inclinometer and independently of any sensors coupled to the at least one lifting column.
13. The apparatus of claim 1, wherein the controller detects the tilt of the drop table platform along multiple orthogonal dimensions using only the single inclinometer.
14. The apparatus of claim 1, wherein the drop table platform comprises a rectangularly shaped top surface and a plurality of stiffening beams to impart stiffness to the rectangularly shaped top surface, wherein the geometric center is disposed at an intersection of first and second orthogonal centerlines of the drop table platform, and wherein the single inclinometer is aligned with the intersection and attached at a position above or below the rectangularly shaped top surface.
15. A method comprising: connecting a controller to at least one lifting column and a single inclinometer, the inclinometer positioned at a geometric center of a drop table platform; suspending the drop table platform with the at least one lifting column; supporting a railroad truck assembly on rails of the drop table platform at an uppermost extent of the at least one lifting column; lowering the drop table platform and the railroad truck assembly to a lowermost extent of the at least one lifting column; and during the lowering step, detecting tilt of the drop table platform with the inclinometer at an intermediate location between the uppermost extent and the lowermost extent,

and correcting the tilt of the drop table platform by altering operation of the at least one lifting column to orient the drop table platform in a level configuration.
16. The method of claim 15, wherein the level configuration is perpendicular to gravity, and the railroad truck assembly has a center of gravity that is offset from the geographic center of the drop table platform.
17. The method of claim 15, wherein the inclinometer detects drop table platform tilt alone.
18. The method of claim 15, wherein the controller generates a correction strategy in response to the detection of drop table platform tilt.
19. The method of claim 15, wherein the correction strategy reduces power to less than all the lifting columns connected to the drop table platform to correct the tilt and return the drop table platform to the level configuration.
20. The method of claim 15, wherein the correction strategy maintains a predetermined amount of drop table platform tilt while the at least one lifting column moves the drop table platform from a first vertical position to a second vertical position prior to correcting the tilt.
21. The method of claim 15, wherein the correction strategy pulsates a first motor connected to a first lifting column of the at least one lifting columns at a greater frequency than a second motor connected to a second lifting column of the at least one lifting columns.
22. The method of claim 15, wherein the controller detects a location and severity of drop table platform tilt in three dimensions.
23. The method of claim 15, wherein the controller determines if the detected tilt can be corrected based on a center of gravity of the drop table platform determined by the controller.
24. The method of claim 15, wherein the controller predicts drop table platform tilt will occur in the future.
25. The method of claim 15, wherein the tilt identified by the controller using the single inclinometer comprises an amount and location of deviation of a periphery of the drop table platform from a horizontally level plane defined by first and second orthogonal axes, and wherein the controller is further configured to adjust an elevational position of at least one of the at least one lifting column responsive to the amount and location of deviation of the periphery of the drop table platform from the horizontally level plane.
26. The method of claim 15, wherein the drop table platform comprises a rectangularly shaped top surface and a plurality of stiffening beams to impart stiffness to the rectangularly shaped top surface, wherein the geometric center is disposed at an intersection of first and second orthogonal centerlines of the drop table platform, and wherein the single inclinometer is aligned with the intersection and attached at a position above or below the rectangularly shaped top surface.
27. A drop table system, comprising: a drop table platform configured to support a railroad truck assembly; a plurality of lifting columns configured to concurrently lower the drop table platform while maintaining the drop table platform in a nominally horizontal table orientation; a single inclinometer positioned at a geometric center of the drop table platform to detect tilt of the drop table platform as deviation from the nominal horizontal table orientation as the drop table platform is lowered; and a controller configured to interrupt further lowering of the drop table platform by the plurality of columns responsive to the detected tilt.
28. The system of claim 27, wherein the drop table platform comprises a pair of spaced apart rails that extend upwardly from a platform surface to contactingly engage wheels of the railroad truck assembly, wherein the platform surface is configured to be nominally flush with a shop floor surface to cover an opening into a service pit into which the drop table platform is lowered, and wherein the inclinometer is affixed to the platform surface.