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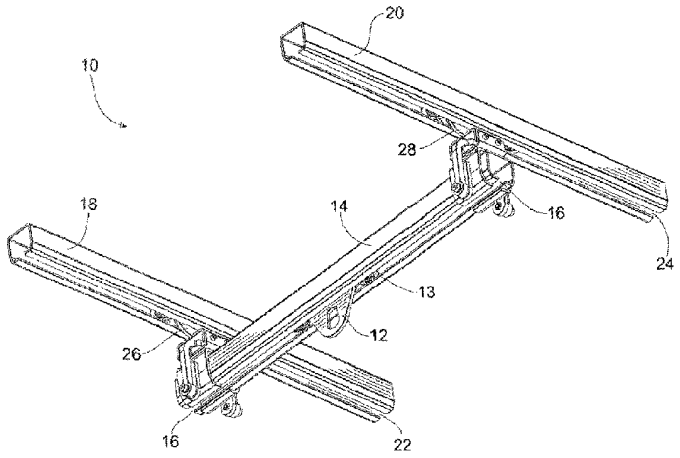
(54) Title: A CRANE ASSEMBLY



(57) Abstract: A lifting assembly comprising parallel guides (18, 20), a carriage (26, 28) associated with each parallel guide (18, 20) and movable along the length of the parallel guides, a displacement arm (40) pivotally connected to each carriage (26, 28) and pivotally supporting a bridge (14), preferably a trolley (13) located on the bridge (14) including attachment means (12) for supporting a lifting device.

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TITLE:

"A CRANE ASSEMBLY"

FIELD OF THE INVENTION

The present invention relates generally to an improved crane assembly. The invention has particular application to a manually operated suspended (or overhead) crane assembly, which is configured to provide easier operation for the assembly operator. The invention will therefore be described in this context. However, it will be appreciated that the invention has broader application and is not limited to that particular use.

BACKGROUND OF THE INVENTION

Manually operated suspended crane assemblies such as a gantry crane or bridge crane are used in a great variety of industrial and other applications for lifting and moving objects. Suspended crane assemblies can be designed to lift and move any practical weight.

Existing suspended crane assemblies generally include a crane, which is suspended from a trolley that is, in turn, suspended from at least one bridge. The trolley is capable of longitudinal movement along the at least one bridge. The at least one bridge is movably supported (generally in a suspended manner) at either end from a pair of parallel tracks or guides. The tracks or guides are generally mounted to a building ceiling or roof structure. Alternatively, the tracks or guides (hereinafter referred to simply as "guides") could be supported from a steel superstructure. This is a particularly attractive option in situations where the building ceiling or roof structure concerned is not designed to bear loads.

One problem with existing assemblies occurs when an operator attempts to initiate movement of the bridge in either direction relative to the guides. The effort required to initiate such movement is often considerable, at least in part owing to the fact that movement of the other end of the bridge is initiated. This can cause the bridge to twist relative to the stationary guides, and thereby jam and prevent further movement.

Another problem with existing assemblies is the fact that the guides must be aligned parallel or very close to parallel during installation. If

not, the bridge tends to jam in the guides preventing further movement.

OBJECT OF THE INVENTION

It is an object of the invention to overcome or alleviate one or more of the above problems of lifting assemblies or to provide the consumer with a useful commercial choice.

SUMMARY OF THE INVENTION

According to one aspect, the present invention provides a lifting assembly comprising:

a pair of parallel guides;

a carriage associated with each parallel guide and movable along the length of said guide;

a connection means pivotally connecting each said carriage to one end of a bridge; and

an attachment means associated with the bridge;

wherein said connection means includes a universal connection to absorb rotational and lateral motions of the bridge when a force is applied to the attachment means.

The attachment means is suitably connected to a trolley located on the bridge and that is movable along the bridge.

The lifting device could be rigidly connected to the bridge. However, more preferably, the lifting device is movable along the bridge on the trolley. This desirably enables greater manoeuvrability of the lifting device. The lifting device could be movable by any suitable means. Most preferably, the lifting device is manually movable relative to the bridge. However, the lifting device could instead be movable, for example, electrically relative to the bridge.

In a preferred form, the lifting device is a crane. The crane could be raised and lowered to lift an object by any suitable means. In particularly envisaged forms, a manually and/or electrically operable crane could be adopted to raise and lower an object.

It is to be appreciated that the assembly does not include the lifting device, or part thereof. The inclusion of the lifting device in the

discussion of the present invention is merely provided to define the context of the invention.

Most preferably, each bridge is longitudinally displaceable relative to the carriages. This further prevents the carriages from jamming on/in the guides. In one preferred form, the longitudinal displacement is provided by way of a displacement arm, which is pivotally connected at either end, respectively, to the bridge and the carriages. However, longitudinal displacement could occur via any other suitable arrangement.

The pivotal connection of the carriages to the bridge could adopt any suitable form. The pivotal connection acts as a universal joint with the displacement arm. The pivotal connection enables the carriages to commence movement along one guide prior to the carriages commencing movement along the other guide(s). This pivotal connection effectively absorbs lateral and axial movement of the bridge and translates applied force into longitudinal movement of the bridge along the guides. This has been found to reduce the exertion necessary to initiate movement of the carriages. It has also been found to reduce the incidence of the carriages becoming jammed on/in the guides. The displacement arm is also pivotally connected to a bridge sleeve which is rigidly fixed to the bridge.

Preferably, the bridge includes an at least one substantially horizontally extending beam or girder. The beam or girder could be any suitable profile, including an I-beam or a thin walled open section such as a C-section. A single bridge could be used to support the lifting device. However, the use of two or more bridges could also be adopted, thereby enabling the bridges to be longer, for comparable loads, and so may be preferred in some applications. The use of two or more bridges also enables larger loads to be lifted, and enables a lower overall lifting device height to be achieved.

In one particularly preferred form, the carriages include guide rollers, which are provided to enable longitudinal movement of the carriages along the guide. However, it is to be appreciated that the carriage could adopt and/or include any other suitable form.

The carriages could be moved relative to the guides by any practical means. While, it is particularly preferred that the carriages be manually movable relative to the guides, it is to be appreciated that the carriages could be moved relative to the guides by, for example, electrical means.

Any practical number of guides could be incorporated into the crane assembly. Most preferably, however, two guides are provided, with the bridge spanning across the two guides.

The guides could adopt any suitable length and any suitable profile or cross-section. Possible guide designs include hollow C-sections (thin walled open channel sections) with inside-running surfaces, and I-beam sections with outside-running surfaces.

Furthermore, the guides could be supported at any suitable height by any suitable means. In one form, the guides could be supported from a building roof and/or ceiling, or from a specially erected superstructure.

It will be convenient to hereinafter describe an embodiment of the invention in greater detail with reference to the accompanying drawings. The particularity of these drawings in the related description is to be understood as not superseding the generality of the preceding broad description of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described with reference to the accompanying drawings in which:

FIG. 1 is a perspective view of an overhead lifting assembly according to an embodiment of this invention;

FIG. 2 is a front view of a carriage illustrated in FIG 1;

FIG. 3 is a partial cross-sectional view of the carriage illustrated in FIG 2;

FIG. 4 is perspective view of an overhead lifting assembly according to another embodiment of this invention;

FIG. 5 is a front view of a carriage illustrated in FIG. 4; and

FIG. 6 is a partial cross-sectional view of the carriage illustrated

in FIG.5.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a lifting assembly 10. A lifting device in the form of a manually operated crane (not illustrated) may be suspended from the lifting assembly by attachment means 12. The attachment means 12 could be a hook, chain or other suitable device. It is to be appreciated, that the lifting device could adopt any suitable form. For example, the lifting device could be a manually or an electrically operated crane.

The attachment means 12 is connected to a trolley 13. The trolley 13 is movably suspended from a bridge 14. The bridge 14 could be in the form of an open channel section, an I-beam, or any other suitable form. The trolley 13 includes trolley rollers being wheels, ball bearings or other suitable propulsion means. The rollers are capable of rolling longitudinally along the bridge 14. The trolley rollers could adopt any suitable form. In this respect, the trolley rollers could include plastic coated rolling surfaces for silent running. Alternatively, the rollers, including the roller surfaces, could be constructed from steel. Alternatively other mechanisms could be used in place of rollers, such that the trolley 13 is movable along the length of the bridge 14.

The attachment means 12 extends through an opening 16 provided in the underside of the bridge 14. In this way the attachment means 12 (and crane) is movable along the length of bridge 14. Where the bridge does not have a slot, the attachment means 12 is connected to the trolley 13 or bridge 14.

It is to be appreciated that the attachment means 12 could be movably connected to two or more bridges 14.

Two substantially parallel guides 18,20 are provided. The bridge 14 is movable longitudinally relative to the parallel guides 18,20. In the illustrated embodiment of the invention, the bridge 14 is manually movable relative to the parallel guides 18,20. Again, however, it is to be appreciated that the bridge 14 could be electrically movable relative to the parallel guides 18,20.

The parallel guides 18,20 as shown formed from an open channel C-section are respectively provided with openings 22,24.

In the illustrated embodiment the parallel guides 18,20 are rigidly secured to a building ceiling, roof or separate superstructure (not illustrated). However, it is to be appreciated that the parallel guides 18,20 could be provided with some movement relative to their mountings, if desired.

The bridge 14 includes carriage 26,28. The carriages 26,28 are provided for travelling along the parallel guides 18,20 respectively. The relationship and configuration of the carriage 26 and the guide 18 is substantially identical to that of the carriage 28 and the guide 20. Therefore, the following description, with reference to FIGS. 3 and 4, in part, refers only to the carriage 26 and the guide 18.

The parallel guides 18,20 are illustrated in FIG. 1 as being open channels in profile, and therefore include an internal track system. It is to be appreciated, however, that the guides 18,20 could adopt other suitable profiles, including I-beam (or external track) profiles, as shown in FIGS. 4, 5 and 6.

The carriage 26, or similar device, is movable along the parallel guides 18,20, and includes at least one mounting plate 30. The mounting plate 30 is configured to travel longitudinally along the parallel guide 18 by way of rollers 32,34,36,38, which are rotatably mounted to the mounting plate 30. The carriages 26,28 bear the weight of the bridge 14 and the crane (not illustrated), which is, in turn, borne by the parallel guides 18,20. An additional mounting plate 30 may be used external of the profile (I-beam).

Preferably, the rollers 32,34,36,38 include tapered surfaces thereby enabling the rollers 32,34,36,38 to roll efficiently along the guides 18,20. The rollers 32,34,36,38 include plastic (or rubber) coated rolling surfaces. The plastic coated rolling surfaces are provided to reduce rolling noise of the rollers 32,34,36,38. It is to be appreciated, however, that the rollers 32,34,36,38 need not include plastic coated rolling surfaces. The rollers 32,34,36,38 could instead include, for example, steel rolling surfaces.

Furthermore, it is to be appreciated that the rollers 32,34,36,38 could be replaced by another suitable arrangement such as, for example, a bearing arrangement.

Existing crane assemblies tend to jam when an operator initiates movement of the bridge (comparable to the bridge 14) along the assembly guides (similar to guides 18,20). This is, in part, a result of the rigid connection in existing crane assemblies of the bridge to the carriage.

To address this problem, the present invention includes a displacement arm 40. The displacement arm 40 is constructed from mild steel, or higher-grade steel, generally from steel plate or steel strip. Alternatively, the displacement arm 40 could be constructed from any other suitable material. The displacement arm 40 is pivotally connected to a sleeve 42. The sleeve 42 is rigidly fastened (by any suitable means) to the mounting plate 30. The figures show the mounting plate 30 welded to the sleeve 42, but other means of rigid attachment such as bolting could be used. The pivotal connection between the displacement arm 40 and the sleeve 42 is by way of a ball bearing 44. The ball bearing 44 is retained in place by a ball bearing seat 46 provided in the displacement arm 40 and the sleeve 42, respectively. The ball bearing 44 could be manufactured from any suitable grade of steel, or any other suitable material. The bearing seat is formed from a plastic, such as nylon, to minimise friction, but could be formed from other suitable materials.

The displacement arm 40 is pivotally connected to a bridge sleeve 50 (see FIGS. 2 and 3) which, in turn, is securely connected to one end of the bridge 14. The bridge sleeve 50 is constructed from steel. Any suitable grade steel (or any other material) could be used in the construction of the bridge sleeve 50. The displacement arm 40 is pivotally connected to the bridge sleeve 50 by two fasteners 52,54 via displacement arm appendages 56,58. The fasteners 52,54 provide a pivotal connection between the displacement arm 40 and the bridge sleeve 50.

The above arrangement forms a universal joint that provides the necessary relative pivoting and lateral movement between the carriage

26,28 and the bridge 14 to at least reduce the incidence of jamming of the lifting assembly 10, upon initiating movement of the bridge 14 relative to the parallel guides 18,20.

It is to be appreciated that the pivotal connection of the carriages 26,28 to the bridge 14 could adopt a configuration(s) different to that specifically described above. The pivotal connection could, instead, include a rod end, or other pivotal/rotatable linkage arrangement.

The mounting plate 30 includes a safety mechanism in the form of anti-derailment means 30A,30B. The anti-derailment means 30A, 30B are ball bearings or similar, which ensure the carriages 26,28 remain engaged with the guide 18. The anti-derailment means 30A,30B are provided to prevent the bridge 14 and crane crashing to the ground in the event of failure of the rollers 32,34,36,38 or other parts of the carriage 26,28.

The bridge 14 and the parallel guides 18,20 are formed from cold-rolled steel in tube or bar.

It is to be appreciated that part(s) of the above-described arrangement could be incorporated into existing assemblies. In this respect, Applicant envisages that the arrangements illustrated in FIGS. 2, 3, 5 and 6 in their entirety or in part, could be incorporated into existing assemblies.

In FIG. 4, the lifting assembly 10 is shown for parallel guides 18,20 in the form of an I-beam rather than an open channel C-section. In this form the carriages 26,28 capture the beam flanges between the wheels 32,34,36 and 38, as illustrated.

FIGS. 5 and 6 show the carriages 26 adapted to fit an I-beam parallel guide 16. Similarly, the trolley 13 can be fitted to an I-beam bridge (not shown).

The illustrated lifting assembly 10 has been designed to lift objects of up to half a tonne in weight. However, the reader is to appreciate that the lifting assembly 10 of the present invention could be designed to lift any practical weight, including weights well in excess of half a tonne.

The present invention has been found to at least reduce the incidence of jamming experienced by existing assemblies.

The present invention has been found to at least accommodate situations in which the parallel guides 18,20 are not mounted exactly parallel to one another.

The present invention has also been found to require less operator effort to initiate movement of the bridge 14 along the parallel guides 18,20 when compared to existing assemblies.

Moreover, the present invention is particularly useful, because it can be relatively easily incorporated into existing assemblies.

Finally, it is to be understood that various alterations, modifications and/or additions may be introduced into the construction and arrangement of the parts previously described without departing from the spirit or ambit of the invention. For instance, the lifting assembly could incorporate multiple parallel guides and multiple bridges.

CLAIMS:

1. A lifting assembly comprising:

a pair of parallel guides;

a carriage associated with each parallel guide and movable along the length of the said guide;

a connection means pivotally connecting each said carriage to one end of a bridge; and

an attachment means associated with the bridge for supporting a lifting device;

wherein said connection means includes a universal connection to absorb rotational and lateral motions of the bridge when a force is applied to the attachment means.

2. The lifting assembly of claim 1 further comprising a trolley located on the bridge and movable along the bridge, and wherein the attachment means is connected to the trolley.

3. The lifting assembly of claim 1 wherein the connection means comprises a displacement arm pivotally connected to the bridge and pivotally connected to the carriage.

4. The lifting assembly of claim 3 wherein the displacement arm is supported on a ball bearing attached to the carriage.

5. The lifting assembly of claim 4 wherein the ball bearing is located on a seat fixed to the carriage.

6. The lifting assembly of claim 5 wherein the seat is formed from a plastic.

7. The lifting assembly of claim 6 wherein the seat is formed from nylon.

8. The lifting assembly of claim 3 wherein the displacement arm is formed from steel.

9. The lifting assembly of claim 8 wherein the bridge has a bridge sleeve connected to at least one end.

10. The lifting assembly of claim 9 wherein the displacement arm is pivotally connected to the bridge sleeve.

11. The lifting assembly of claim 9 wherein the displacement arm is connected to the bridge sleeve by a linkage pin.

12. The lifting assembly of claim 1 comprising one or more further bridges, each said further bridge being pivotally connected at each end to a carriage associated with a parallel guide.

13. The lifting assembly of claim 1 wherein the carriage includes a guide means.

14. The lifting assembly of claim 13 wherein the guide means is a ball bearing.

15. The lifting assembly of claim 1 comprising one or more further parallel guides, there being at least one carriage associated with each said further parallel guide, said carriage being movable along said parallel guide.

16. The lifting assembly of claim 1 wherein the bridge is a beam.

17. The lifting assembly of claim 16 wherein the beam is an I-beam.

18. The lifting assembly of claim 16 wherein the beam is a hollow

C-section.

19. The lifting assembly of claim 1 wherein the guides are fixed to a ceiling.

20. The lifting assembly of claim 1 wherein the guides are suspended from a superstructure at a required height.

21. The lifting assembly of claim 1 wherein the carriage includes an anti-derailment means.

22. The lifting assembly of claim 21 wherein the anti-derailment means is ball bearings.

23. The lifting assembly of claim 1 wherein the carriage has one or more mounting plates supporting rollers.

24. The lifting assembly of claim 23 wherein the rollers are wheels.

25. The lifting assembly of claim 23 wherein the rollers are ball bearings.

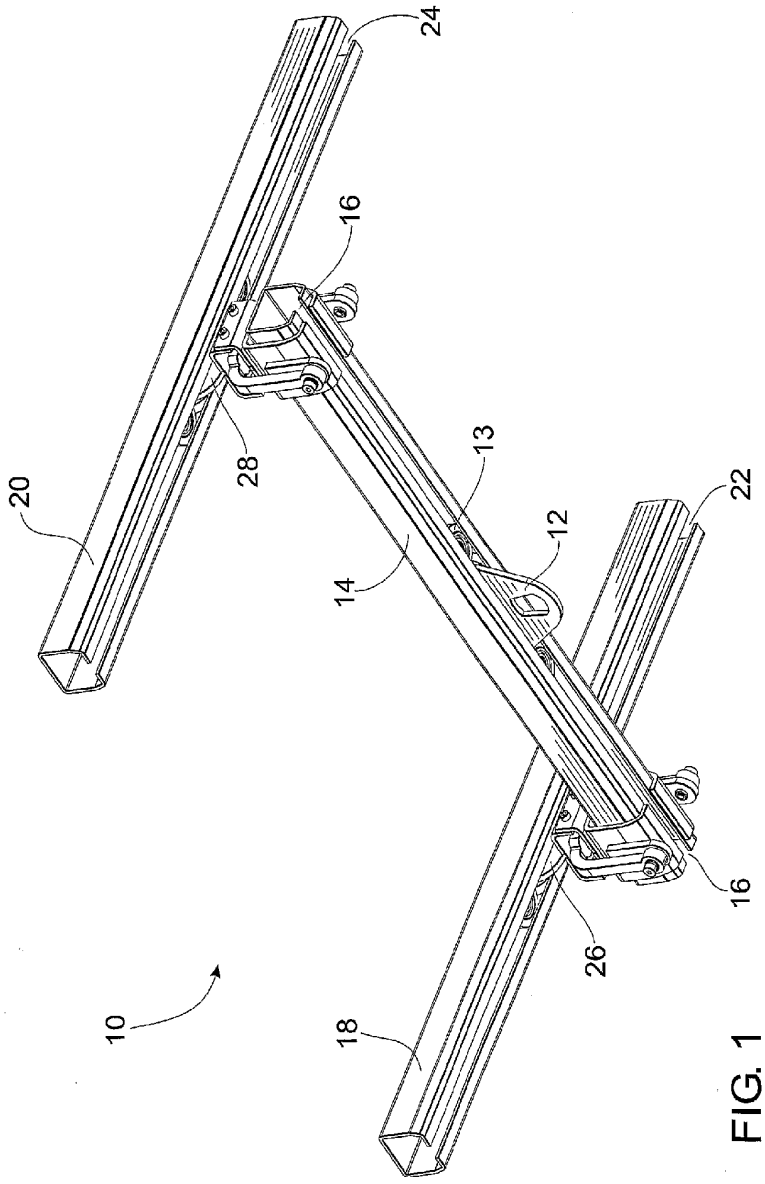


FIG. 1

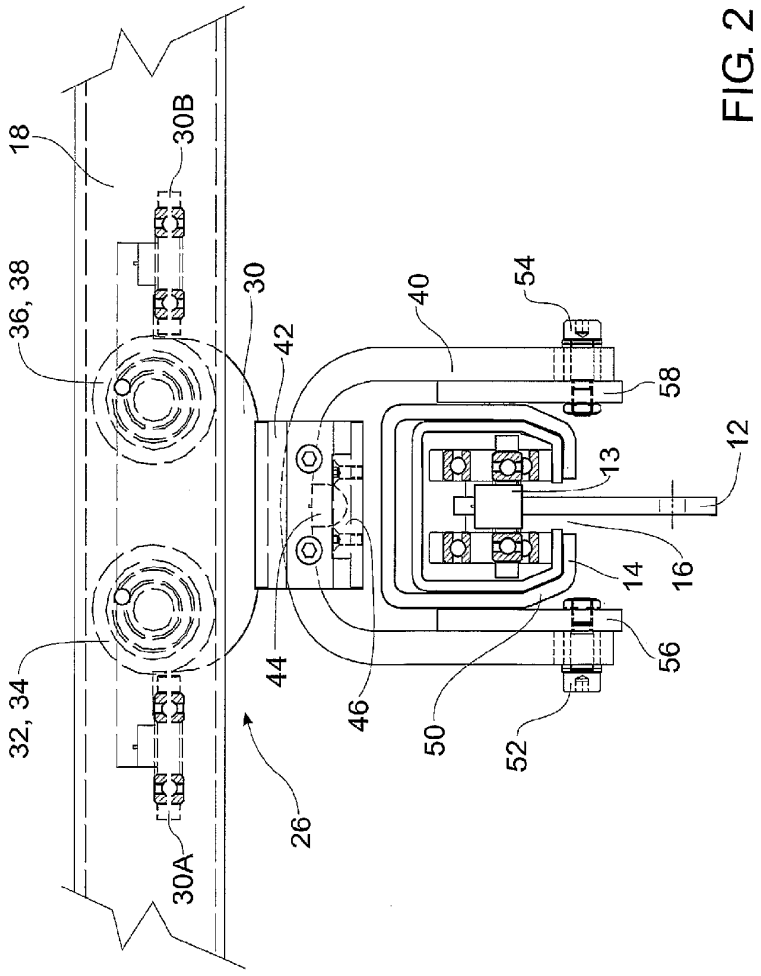
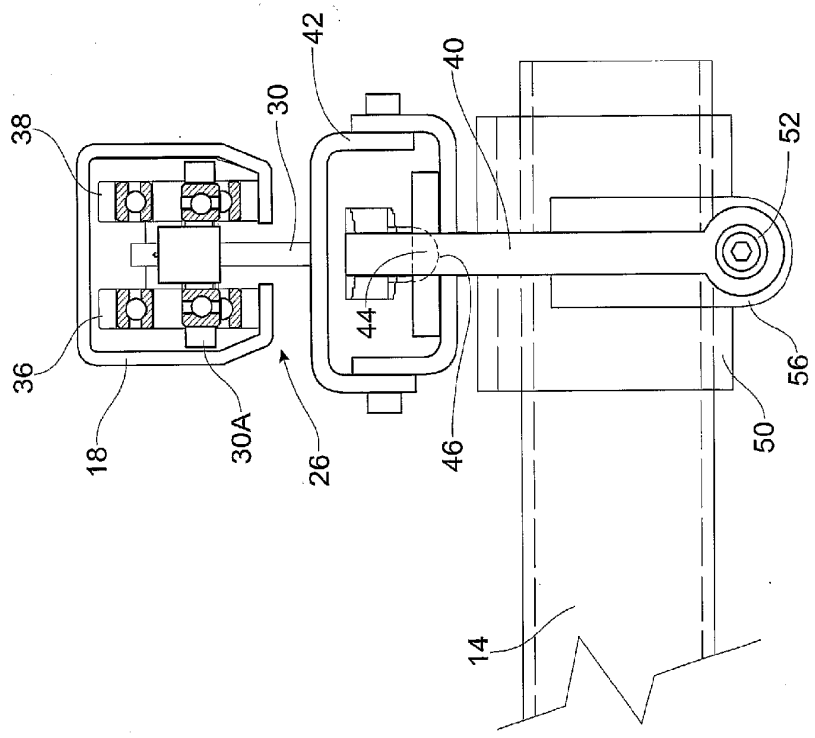


FIG. 2

FIG. 3



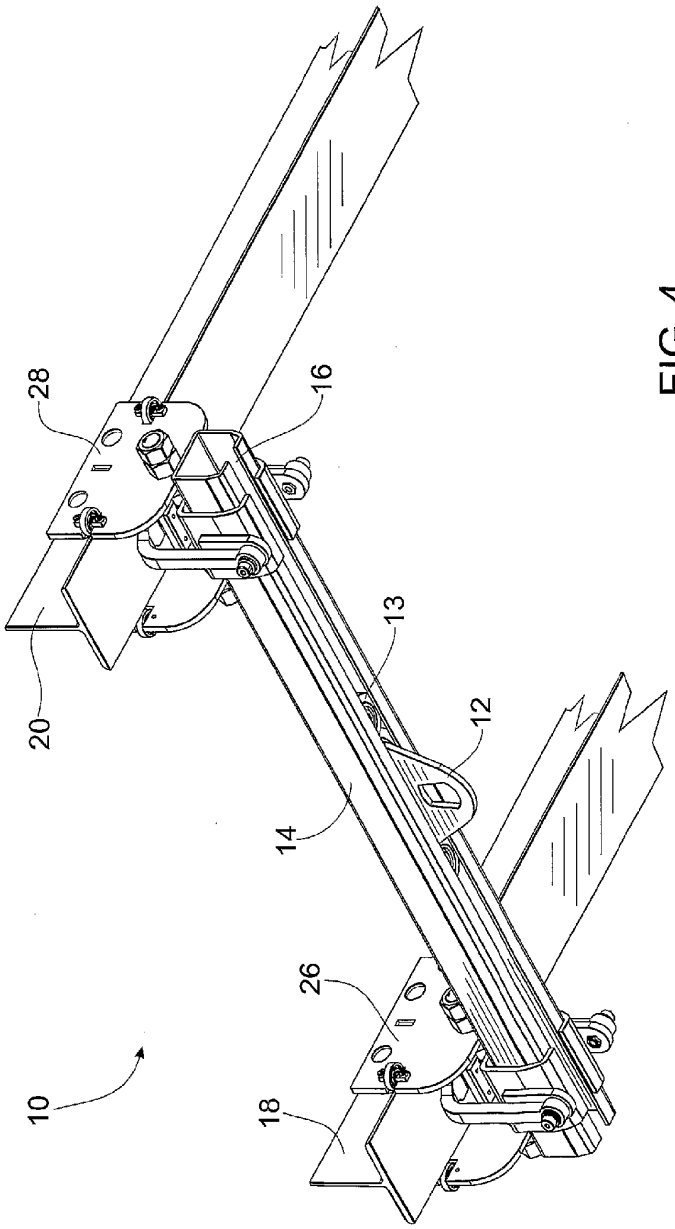
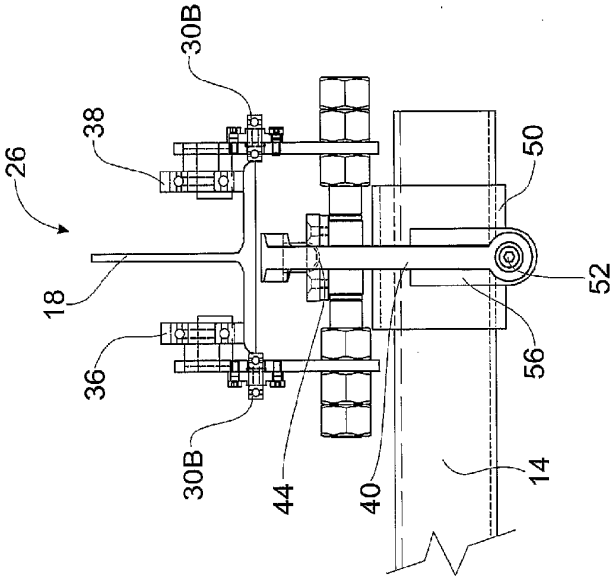


FIG. 4


30B
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26
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18
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56
30B
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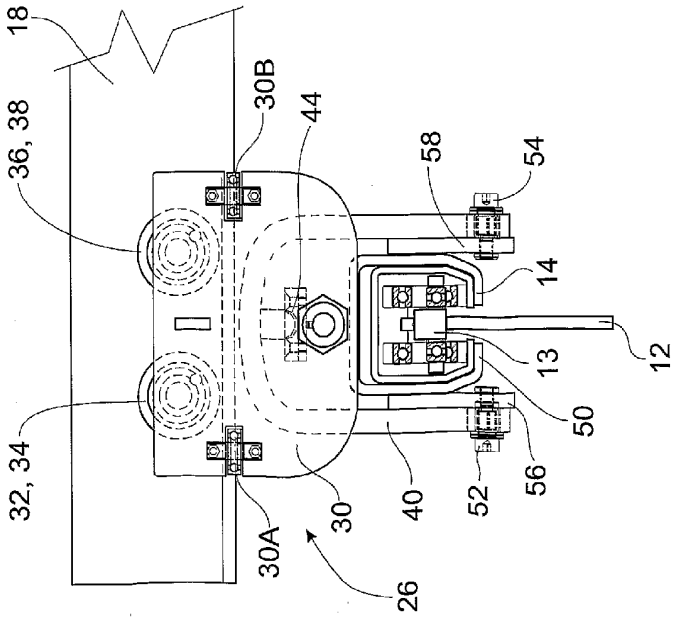
40
14

FIG. 6


18
30B
36, 38
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32, 34
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30A
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FIG. 5