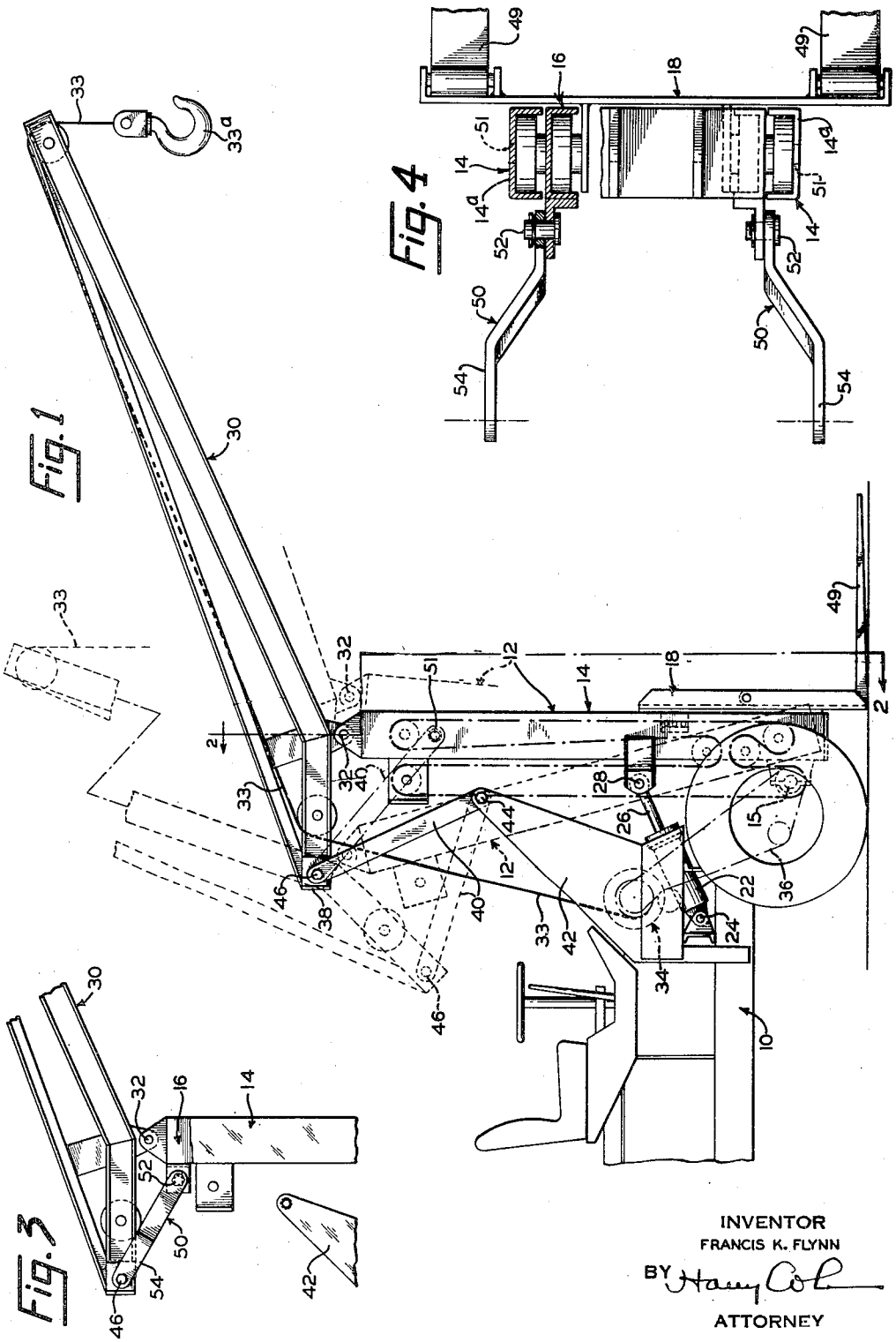
Jan. 17, 1950 F. K. FLYNN 2,494,651

LOAD HANDLING APPARATUS FOR INDUSTRIAL TRUCKS

Filed May 13, 1946 2 Sheets-Sheet 1



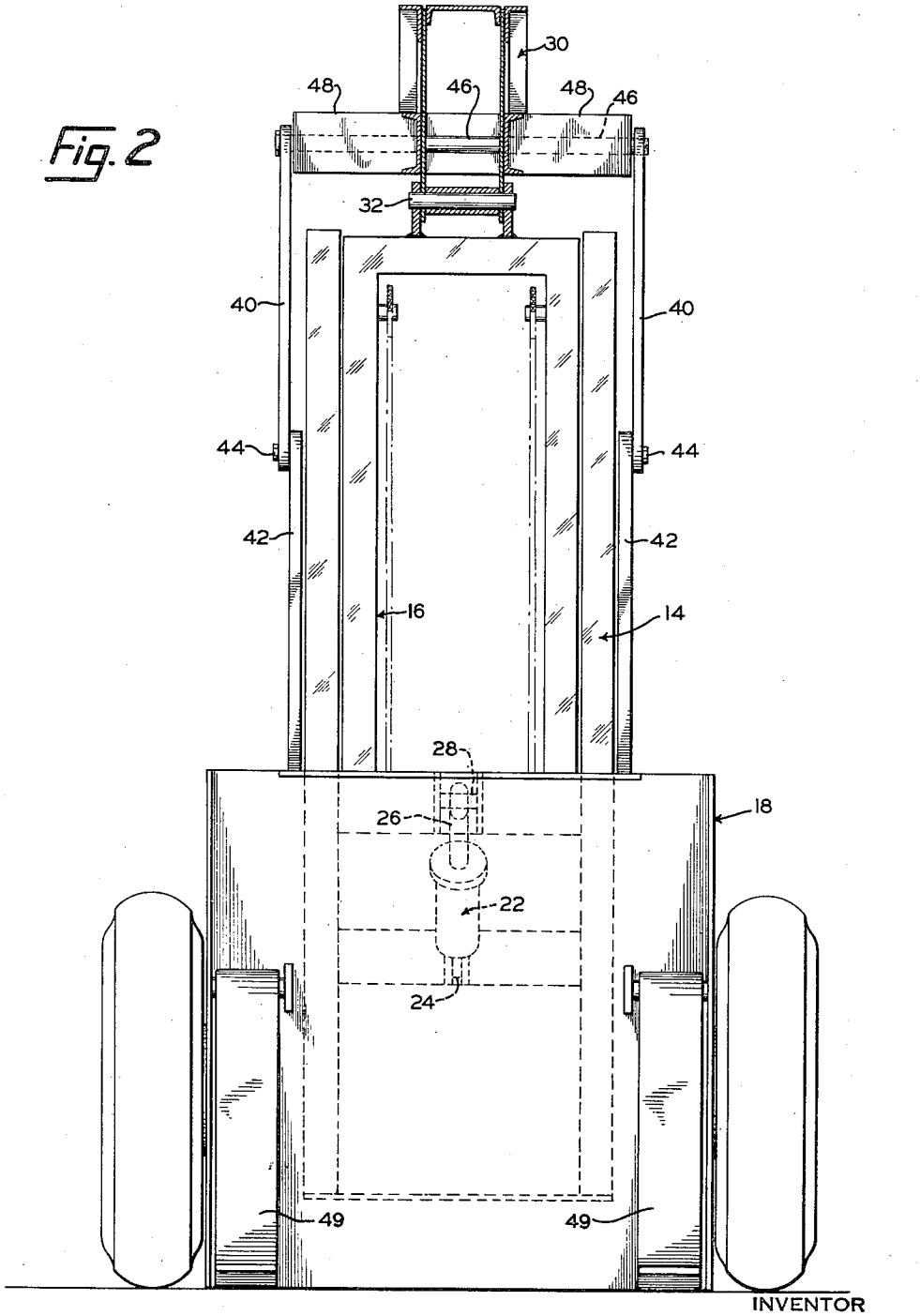
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LOAD HANDLING APPARATUS FOR INDUSTRIAL TRUCKS

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Fig. 2



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LOAD HANDLING APPARATUS FOR INDUSTRIAL TRUCKS

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Application May 13, 1946, Serial No. 669,254

6 Claims. (Cl. 214—65)

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This invention relates to load-handling apparatus and more particularly to such apparatus of the type which comprises a combination lift-truck and crane.

The primary object of the present invention is the provision of load-handling apparatus of the above indicated type wherein the crane boom is topped by tilting the tiering frame.

In accordance with the invention disclosed in the application of Francis K. Flynn and Reuben H. Adelman, Ser. No. 614,566, filed in the U. S. Patent Office on September 5, 1945, now Patent No. 2,445,614, granted July 20, 1948, the crane-boom is removably mounted on the tiering frame and provision is made for tilting the tiering frame when the crane-boom is removed therefrom and for topping the boom when the latter is mounted on the tiering frame, the means for tilting the tiering frame or for topping the boom being connectable alternatively either to said frame or to said boom. In accordance with the present invention, suitable means, preferably a fluid-pressure ram, is connected to the tiering frame for tilting the latter, and the tiering frame and crane-boom, which is pivotally mounted on the tiering frame, are interconnected so that the boom can be topped by tilting the tiering frame.

The above and other objects, features and advantages of this invention will be fully understood from the following description considered in connection with the accompanying drawings which are to be considered as illustrative of the invention but not in limitation thereof.

In the drawings:

Fig. 1 is a side view of load-handling apparatus embodying the present invention, the position of the boom in the topped condition thereof being shown in dotted lines;

Fig. 2 is a front elevation of the apparatus with the boom shown in section on the line 2—2 of Fig. 1;

Fig. 3 is a side view showing means for immobilizing the boom against pivotal movement on the tiering frame, relatively thereto;

Fig. 4 is a top view, partly in section, of the tiering frame and of the boom-immobilizing means, the boom being removed for the purpose of illustration.

Referring now to the drawings in detail, the load-handling apparatus comprises an automotive vehicle or truck 10 which can be of any suitable type but which is preferably of the type shown in U. S. Patent No. 2,223,863, granted December 3, 1940, to Joseph W. Wunsch. The tiering frame 12, comprises the outer section 14, pivotally

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mounted as indicated at 15, the inner section 16, which is movable longitudinally of said outer section, and the load carriage 18 operable by the sprocket chains 20, all as shown and described in the above mentioned application of Flynn and Adelman. It will be understood that the vertical tiering frame 12 is tiltable or pivotally movable forwardly and rearwardly about a horizontal axis by virtue of the pivotal mounting of the lower end of the tiering as indicated at 15. The means for tilting the tiering frame 12 comprises a fluid-pressure ram 22 which is connected at one end thereof to the truck chassis, as indicated at 24, the piston rod 26 of the ram being pivotally connected to the outer section 14 of the tiering frame, as indicated at 28.

The crane boom 30 is pivotally mounted on the tiering frame 12, by the hinge pin 32, for pivotal movement about an axis parallel to the pivotal axis of the tiering frame. As here shown said boom is mounted on the inner or vertically movable section 16 of the tiering frame but it can be mounted instead on the outer section 14, as shown, for example, in the above mentioned application of Flynn and Adelman and in the application of Harry Wunsch and Maurice M. Botnick filed concurrently herewith. Said boom is provided with a hoist line 33 having a hook 33a, and power operated means 34 are provided for operating said hoist line and the sprocket chains 36 which drive the sprocket chains 20 of the load carriage, all as shown and described in each of the aforementioned applications.

In accordance with the present invention, the tiering frame 12 and the crane boom 30 are interconnected so that the boom is pivotally moved on the tiering frame, about the horizontal axis of the hinge pin 32, when the tiering frame is tilted. Thus, the boom can be topped by operation of the ram 22 which is used for tilting the tiering frame. For this purpose the heel 38 of the boom is connected by means of links 40 to stationary parts or supports 42 which are carried by the truck 10. As here shown said parts or supporting means 42 are in the form of upwardly projecting rigid arms. The lower ends of the links 40 are pivotally connected to said arms by pivot pins 44 and the upper ends of said links are pivotally connected to the boom by a cross pin 46 with the provision of spacing sleeves or bushings 48 (Fig. 2). It is apparent, of course, that when the ram 22 is operated for tilting the tiering frame 12 the boom 30 is caused to move pivotally on said tiering frame, relatively thereto, about a horizontal axis parallel to the axis of the tiering

frame, i. e., about the axis of the hinge pin 32. As clearly shown in the drawings, the major longitudinally extending part of boom 30 is disposed at one side of the pivoted axis of the boom on frame 12 and that the links 40 are pivotally connected to the heel of the boom at the opposite side of said pivotal axis and are inclined downwardly and toward said frame so that a comparatively short arcuate movement of the end of the heel of the boom, pursuant to a comparatively small tilting movement of the frame results in considerably greater arcuate movement of said major part of the boom and particularly the end of the latter from which the load-carrying hook 33a is suspended.

It will be understood that the tiering frame may be operated for handling the load, i. e., the load carriage 18 which is provided with lift forks 49, may be raised by the operation of the sprocket chains 20 to a maximum height at which the load is clear of the boom, as described in the above mentioned application of Harry Wunsch and Maurice M. Botnick. When the boom is, as here shown, mounted on the inner section 16 of the tiering frame and it is desired to operate the tiering frame for raising the load to the maximum possible extent within the lifting range of the apparatus, this can be accomplished by disconnecting the links 40 from the arms 42 so that the boom is movable upwardly with the inner section 16 of the tiering frame. In such case, that is, when links 40 are disconnected so that the boom can be raised by raising the inner section of the tiering frame, the boom is immobilized in respect to the tiering frame whereby to hold said boom in fixed relation on the tiering frame. For that purpose links 50 are provided, said links being connected at their opposite ends, as shown in Figs. 3 and 4, to the boom and to the inner section of the tiering frame. More particularly, as illustrated, the links 50 are connected to the tiering frame section 16 by removable pins 52 and are connected to the boom by the cross pin 46, the links 40 having been removed. It will be noted that the links 50 have laterally offset portions 54 so that the upper ends of said links are engageable with the adjacent ends of the cross pin 46 without removing the spacer sleeves or bushings 48. It will be understood, however, links 50 may be straight throughout their lengths in which case shorter spacer sleeves or bushings can be substituted for the spacer sleeves 48 on cross pin 46 to hold the upper ends of the straight links in registry with the lower ends thereof.

It will be understood also that when the boom 30 is pivotally mounted on the outer section 14 of the tiering frame, and it is desired to immobilize the boom, the links 40 are likewise disconnected and the boom is held against movement on the tiering frame substantially in the same manner as described above with reference to the securement of the links 50 to the boom and to the inner tiering frame section. In the latter case, the lower ends of the immobilizing links may be connected to the outer tiering frame section instead of to the inner tiering frame section if so desired. However, instead of using separate links, the links 40 can be used for immobilizing the boom by disconnecting links 40 from arms 42 and connecting the lower ends of said links to the outer section 14 of the tiering frame, the upper ends of said links remaining connected to cross pin 46. For this purpose the side channels 14a of section 14 may be provided

with openings 51 to receive pins or bolts for fixing the lower ends of links 40 to said section of the tiering frame. In Fig. 1, the connection of links 40 to side channels 14a is illustrated by the dot and dash line positions of said links. It will be understood that links 40 may thus be connected to side channels 14a either when the boom is mounted on the outer section of the tiering frame or when said boom is mounted on the inner section of the tiering frame, whereby to immobilize the boom on the frame. In the event, however, that the boom is mounted on the inner section of the tiering frame and it is desired to raise the inner section with the boom thereon, links 40 are removed and the boom is immobilized by the links 50, as hereinbefore described.

It will be noted additionally that the boom 30 may be removed entirely from the tiering frame when it is desired to utilize the latter for handling the load without utilizing the crane. For that purpose, that is to enable the boom 30 to be removed, the hinge pin 32 is removed and the links 40 are disconnected from the arms 42. Preferably, in removing the boom, the method and apparatus described in the above mentioned application of Harry Wunsch and Maurice M. Botnick are utilized, although any other means and apparatus may be employed if so desired for removing the boom from the tiering frame.

It will be understood that the invention may be embodied otherwise than as herein shown or described and that various changes in the details of construction and in the arrangement of parts may be made without departing from the underlying idea or principles of the invention within the scope of the appended claims.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In load-handling apparatus comprising a lift truck provided with a vertical tiering frame mounted for pivotal movement about a horizontal axis, a crane-boom mounted on said tiering frame for pivotal movement thereon relatively thereto about a horizontal axis parallel to said first mentioned axis, and means connected to said frame for moving the same about said pivotal axis thereof; means pivotally connected to a stationary part of said truck and pivotally connected to said boom rearwardly of its said pivotal axis for imparting pivotal movement to said boom when said frame is pivotally moved by said frame-moving means, said means being detachable from said stationary part of the truck and attachable to said frame for preventing pivotal movement of the boom on said frame.

2. In load-handling apparatus comprising a lift truck provided with a vertical tiering frame mounted for pivotal movement about a horizontal axis and having a vertically movable section, a crane-boom mounted on said section of the tiering frame for pivotal movement thereon relatively thereto about a horizontal axis parallel to said first mentioned axis, and means connected to said frame for moving the same about said pivotal axis thereof; means pivotally connected to a stationary part of said truck and pivotally connected to said boom rearwardly of its said pivotal axis for imparting pivotal movement to said boom when said frame is pivotally moved by said frame-moving means, said boom-pivoting means being releasable and said vertically movable section of the tiering frame being vertically movable when said boom-pivoting means is released, and means for releasably connecting said boom to said frame

for releasably preventing movement of said boom relative to said frame.

3. In load handling apparatus comprising a lift truck provided with a vertical tiering frame mounted thereon for pivotal movement about a horizontal axis, power-operated means carried by said truck and connected to said frame between the opposite ends of the latter for positively tilting said frame about said axis forwardly and rearwardly of a vertical line passing through said axis, a crane boom pivotally mounted between its ends on said frame for pivotal movement in relation to said frame about a horizontal axis parallel to said first mentioned axis, the rear end of said boom being disposed rearwardly of said vertical line, and means for topping said boom comprising at a point located rearwardly of said frame means pivotally connected to said truck and pivotally connected to said boom at a point located rearwardly of said first mentioned point in the vertical upright position of said frame for pivotally moving the forward part of the boom upwardly when said frame is moved rearwardly of said vertical line and for pivotally moving the forward part of the boom in the opposite direction when said frame is moved forwardly.

4. In load handling apparatus comprising a lift truck provided with a vertical tiering frame mounted thereon for pivotal movement about a horizontal axis, a ram carried by said truck and connected to said frame between the opposite ends of the latter for positively tilting said frame about said axis forwardly and rearwardly of a vertical line passing through said axis, a crane boom pivotally mounted between its ends on said frame for pivotal movement in relation to said frame about a horizontal axis parallel to said first mentioned axis, the major longitudinally extending part of said boom being disposed at one side of said pivotal axis thereof, and means for pivotally moving said boom on its said axis comprising means pivotally connected to said truck at a point located rearwardly of said frame and pivotally connected to said boom at a point located above and rearwardly of said first mentioned point in the vertical upright position of said frame pivotally moving said boom to raise the forward end thereof when said frame is tilted rearwardly.

5. In load handling apparatus comprising a lift truck provided with a vertical tiering frame mounted thereon for pivotal movement about a horizontal axis, power-operated means carried by said truck and connected to said frame between the opposite ends of the latter for tilting said

frame about said axis forwardly and backwardly of a vertical line passing through said axis, a crane boom pivotally mounted between its ends on said frame for pivotal movement about a horizontal axis parallel to said first mentioned axis, the major longitudinally extending part of said boom being disposed at one side of said pivotal axis thereof, and means for pivotally moving said boom on said frame about said boom axis comprising rigid link means inclined downwardly and forwardly toward said frame in the vertical upright position of the latter and pivotally connected at the opposite ends thereof to said truck rearwardly of said frame and to said boom rearwardly of said boom axis.

6. In load handling apparatus comprising a lift truck provided with a vertical tiering frame mounted thereon for pivotal movement about a horizontal axis, a ram carried by said truck and connected to said frame between the opposite ends of the latter for tilting said frame about said axis forwardly and rearwardly of a vertical line passing through said axis, a crane boom pivotally mounted between its ends on said frame for pivotal movement about a horizontal axis parallel to said first mentioned axis, the major longitudinally extending part of said boom being disposed forwardly of said frame, and means for pivotally moving said boom on its said axis comprising rigid link means extending downwardly and forwardly and pivotally connected at the opposite ends thereof to said truck rearwardly of said frame and to said boom rearwardly of said frame, respectively, in the vertical upright position of said frame for imparting pivotal movement to said boom to raise the forward part thereof in response to the tilting of said frame by said ram rearwardly of said vertical line.

FRANCIS K. FLYNN.

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