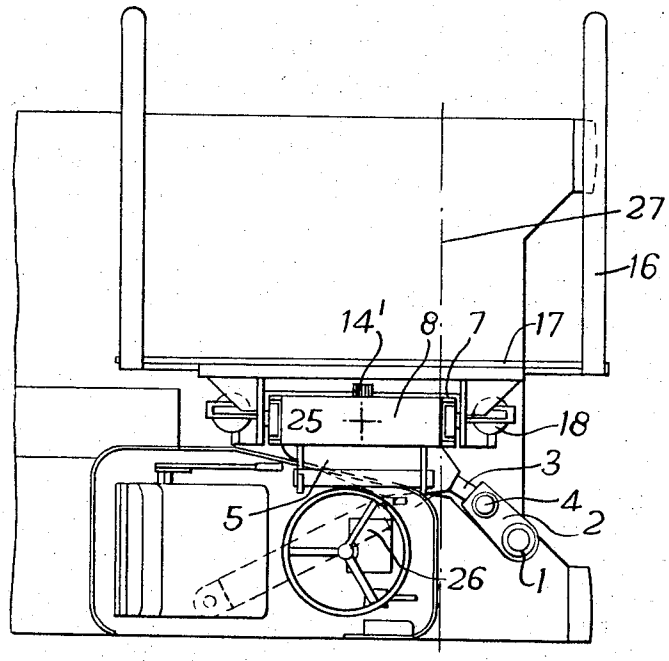
Oct. 3, 1967 L. S. MATHEW ETAL 3,344,941

LIFT TRUCK WITH A LATERALLY MOVABLE MULTI-SECTION MAST ASSEMBLY

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Fig. 1.



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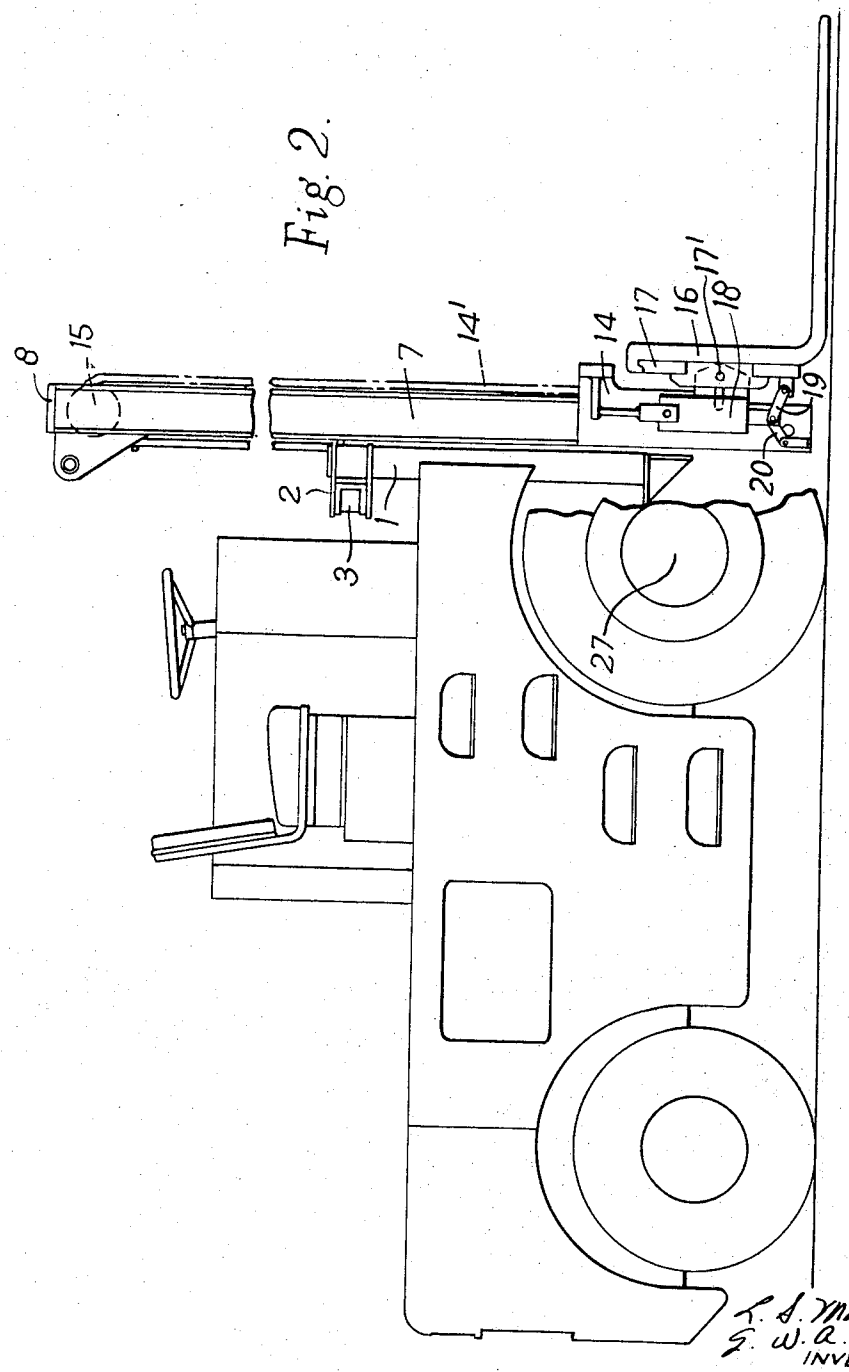
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Fig. 2.



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Fig. 3.

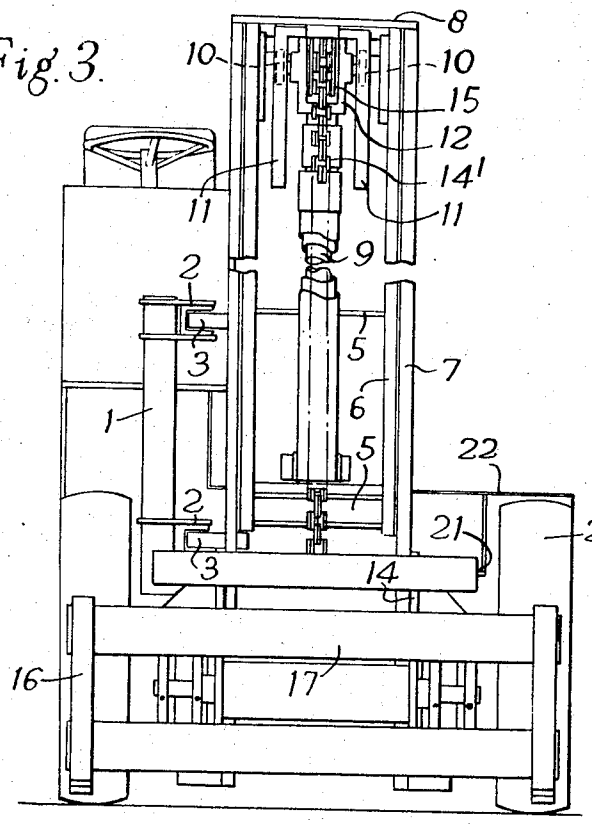
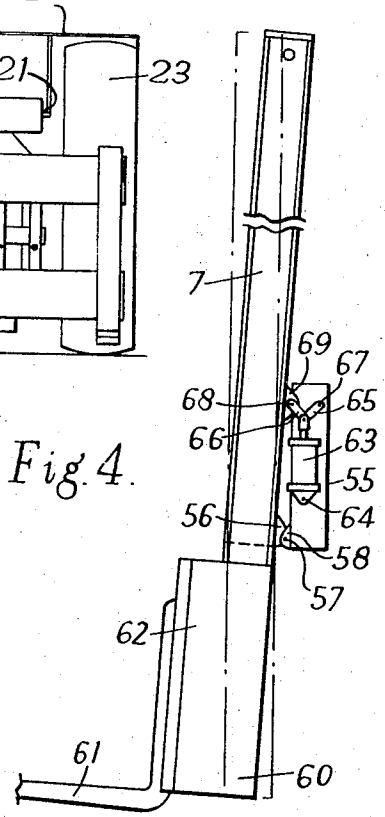


Fig. 4.



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United States Patent Office

3,344,941

Patented Oct. 3, 1967

3,344,941

LIFT TRUCK WITH A LATERALLY MOVABLE MULTI-SECTION MAST ASSEMBLY

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Filed Jan. 7, 1965, Ser. No. 423,983
Claims priority, application Great Britain, Jan. 10, 1964, 1,279/64
10 Claims. (Cl. 214—674)

The present invention relates to lift trucks, which are commonly used for lifting, stacking and local movement of material. In particular, the present invention relates to a lift truck, in which the carrier frame for the lift forks or other load-supporting element may be slewed from the normal forwardly facing position to a sideway facing position, so that a long load, such as timber, pipes or steel beams, may be carried lengthwise of the lift truck.

According to this invention there is provided a lift truck having a body, front and rear wheels on which the body is carried, and a mast mounted on the body and comprising a first guide part fixed against movement in an up-and-down direction, a lift jack secured at its lower end to said first guide part, a second guide part guided for movement along the first guide part between an upper limiting position and a lower limiting position determined by the limits of extension of said lift jack, a carrier frame guided for movement up and down the second guide part, the mast being mounted for slewing relative to the body about a fixed axis to bring the carrier frame into a laterally facing position and into a forward-facing position, said lift jack having its upper end guidedly movable upwardly into and downwardly out of abutting engagement with the second guide part for providing a lost motion connection between the upper end of the jack and the second guide part, flexible tie members anchored at one end to the first guide part, extending over guide means carried by the upper end of the jack and secured at the other end to the carrier frame, and stop means for preventing downward movement of the second guide part beyond a predetermined level when the carrier frame is in said laterally facing position, which level is higher than said lower limiting position, whereby further lowering movement of the jack after the second guide part comes into engagement with the stop means lowers the carrier frame further by virtue of the lost motion connection. One form of lift truck made in accordance with the present invention is hereinafter described with reference to the accompanying drawings, wherein:

FIGURE 1 is a plan view, with the forks slewed to the sideways-facing position,

FIGURE 2 is a side view, with the forks in the forward-facing position, and

FIGURE 3 is a front view of a lift truck made in accordance with the invention.

FIGURE 4 is an illustration of an alternative form of mast.

The mast of a lift truck of the present invention as shown in FIGURES 1–3 is supported by a short rigid king post **1**, by which laterally projecting bearing members are supported. The bearing members **2** directly carry a pair of support ears **3** which turn in the bearing members **2** about a vertical axis **4**, which is thus the axis about which the mast swings. The ears **3** are of heavy section and are welded to a mast support frame **5**, to which is secured the stationary guide **6** of the mast, the foot of the stationary guide **6** terminating well above the level of the front axle of the lift truck, as can be seen from FIGURE 3. The mast support frame **5** turns about the axis **4** in the manner of a gate. A moving guide **7** is vertically movable along the stationary guide **6** in the conventional manner and incorporates a cross member **8**. The cross member **8** contacts the top of the stationary guide **6** in the fully lowered position of the mast and in that condition the foot of the moving guide **7** is close to the ground, as can be seen in FIGURE 2. The raising and lowering of the moving guide **7** is effected by a jack **9**, which is pivotally connected at its lower end to the frame **5**. The upper end of the jack **9** carries rollers **10**, which travel in channel-shaped guides **11** secured to the cross member **8**. The rollers **10** are carried on a U-shaped frame member **12**, the upper ends of which butt against the cross member **8** when the jack **9** is utilised for lifting the moving guide **7**. It will be easily seen that the frame member **12** may be lowered in relation to the cross member **8** if the moving guide **7** is supported in a raised position.

A carrier frame **14** is movable up and down the moving guide **7** and such movement is effected in the usual way by connecting the carrier frame **14** to the end of one or more chains **14'** or cables which pass from a fixed anchorage point on the frame member **5** over a pulley **15** supported in the frame member **12**. Consequently any extension or retraction of the jack **9** will lead to vertical movement of the carrier frame **14**, irrespective of whether this is accompanied by movement of the moving guide **7**. The mast structure, comprised of the members **6** and **7**, does not tilt in a vertical plane relative to the king post **1** (assuming the king post **1** to be in a vertical position). In order to provide the necessary forward and rearward tilting movement of the carrier forks **16**, the forks **16** are supported on a backing member **17**, which is tiltable in relation to the carrier frame **14** about a pivot **17'**, this tilting movement being produced by jacks **18** which act on a pair of links **19** and **20**, which are respectively pivotally connected to the members **14** and **17**.

At a level slightly below the foot of the fixed guide **6**, the lift truck is provided with a decked area **21**. In operation the mast is slewed from the position shown in FIGURE 1 to a position at right angles thereto, after the jack **9** has been operated sufficiently to raise the foot of the moving guide **7** above the level of the decked area **21**. At this position the loading forks **16** will have been raised to a height which is approximately double the height of the foot of the moving guide **7** above ground level. In order to bring the load closer to the ground and thus to improve the stability of the lift truck during travel, it is only necessary to lower the jack **9**. This will, after a short distance, bring the foot of the moving guide **7** down onto the platform **21**, whilst further retraction of the jack **9** causes the rollers **10** to move down within their guides **11**, simultaneously lowering the carrier frame **14**. This retraction movement can be continued until the forks **16** are brought down onto a load-supporting deck **22**, which may be positioned at a level close to the top of the wheel **23**.

The slewing movement of the mast structure is effected by means of a jack **26**, which is pivoted at one end to the frame **5** and at the other end to the frame of the lift truck at a position somewhere beneath the seat of the driver. When the mast is slewed into the travelling position, the axis **25** of the mast will move off the centre line of the machine (where it lies in the formal forward loading position) towards the driver's side of the machine. This means that the centre of gravity of a load supported on the forks will lie inside the position of the wheel **23**. The axis **25** of the mast will also move to the rear of axis **27** of the front axle of the lift truck, providing that the load is supported with its centre of gravity lying approximately midway between the forks **16**.

These arrangements of the mast of a slewing lift truck permit the load supported on the forks to be carried at

a lower level and closer to the centre line of the lift truck than was possible in the construction described in our prior British Patent No. 828,640. It is therefore possible to carry greater loads safely on a lift truck constructed in accordance with the present invention than was possible with a lift truck of the same size made in accordance with our said prior British patent. Put in another way, it may be said that a slewing lift truck made in accordance with the present invention may be made more compact than a slewing lift truck of like load capacity made in accordance with British Patent No. 828,640.

It is of course a simple matter to construct a lift truck to the foregoing specification but which is a mirror image, for use in countries where the operator normally sits on the opposite side.

In FIGURE 4 a side view of an alternative form of mast is shown, which is supported in exactly the same manner as the mast of the lift truck shown in FIGURES 1–3. The king post **1** supports a modified mast support frame **55** in the same way as the frame **5**. The mast support frame **55** is caused to turn about the vertical pivot axis **4** by means of a jack in exactly the same manner as illustrated in FIGURE 1. The stationary guide of the mast cannot be seen in FIGURE 4, but at its lower end it is provided with ears **56**, which are pivotally connected at **57** to ears **58** on the mast support frame **55**. In the fully lowered position of the carrier frame shown in FIGURE 4 the moving guide **7** extends down substantially to ground level, whereas the lower end of the stationary guide is level with the lower edge of the support frame **55**.

In this instance the carrier frame **60** is of conventional construction and there is no necessity of providing any means for moving the forks **61** in relation to the back plate **62**, although this facility may be provided, if desired, in the same manner as illustrated in FIGURE 2.

In the mast of FIGURE 4 tilting movement of the forks is provided by a pair of jacks **63**, pivotally connected at **64** to the mast support frame **55** and each operating a pair of toggle levers **65**, **66**, respectively pivoted to the support frame **55** at **68** and to an ear **69** of the moving guide at **70**.

Except for the pivotal support of the stationary guide, the construction of the stationary guide and moving guide is the same as shown in FIGURES 1–3 and in particular the means for raising and lowering the moving guide **7** is the same as there shown. It will be understood that in the forward facing position the middle of the mast will lie substantially on the centre line of the lift truck, whilst the king post **1** will be offset to the same extent or to a slightly greater extent from the centre line of the lift truck as compared with the construction of FIGURES 1–3.

We claim:

1. A lift truck having a body, front and rear wheels on which the body is carried, and a mast mounted on the body and comprising a first guide part fixed against movement in an up-and-down direction, a lift jack secured at its lower end to said first guide part and having guide means at the upper end thereof, a second guide part guided for movement along the first guide part between an upper limiting position and a lower limiting position determined by the limits of extension of said lift jack, a carrier frame guided for movement up and down the second guide part, the mast being mounted on the body for slewing relative to the body about a fixed axis to bring the carrier frame into a laterally facing position and into a forward-facing position, said lift jack having its upper end guided and movable upwardly into and downwardly out of abutting engagement with the second guide part for providing a lost motion connection between the upper end of the jack and the second guide part, flexible tie members anchored at one end to the first guide part, extending over the guide means carried by the upper end of the jack and secured at the other end to the carrier frame, and stop means on said lift truck for preventing downward movement of the second guide part beyond a predetermined level when the carrier frame is in said laterally facing position, which level is higher than said lower limiting position, whereby further lowering movement of the jack after the second guide part comes into engagement with the stop means lowers the carrier frame further by virtue of the lost motion connection.

2. A lift truck as claimed in claim **1**, wherein the body has supporting means thereon onto which the carrier frame can be lowered by said further lowering movement of the jack.

3. A lift truck as claimed in claim **2**, wherein the supporting means comprises a deck extending laterally from the mast.

4. A lift truck as claimed in claim **1**, wherein the axis of the slewing movement of the mast is laterally offset from the centerline of the truck and from that centerline of the carrier frame which extends in a fore-and-aft direction when the carrier frame is in said forward-facing position.

5. A lift truck as claimed in claim **4**, wherein said centerline of the carrier frame is on the centerline of the truck when the carrier frame is in said forward-facing position.

6. A lift truck as claimed in claim **1**, wherein a guideway is provided at the upper end portion of the second guide part and extends lengthwise of the second guide part for guiding the upper end of the jack into abutting engagement with the second guide part.

7. A lift truck as claimed in claim **1**, in which said mast further comprises tilting means for tilting the carrier frame backward towards said axis.

8. A lift truck as claimed in claim **7**, wherein the tilting means comprises means engaging said first guide part for tilting said first guide part relative to said axis.

9. A lift truck is claimed in claim **7**, wherein the tilting means comprises means engaging said carrier frame for tilting the carrier frame relative to the second guide part.

10. A lift truck as claimed in claim **1**, wherein the truck includes an axle on which the wheels nearer the mast are mounted, and the first guide part terminates above the level of the axle, the second guide part being capable of downward movement sufficiently far to bring the foot thereof into close proximity to the ground, and said stop means being positioned to prevent the foot of the second guide part from being lowered substantially below the foot of the first guide part when the carrier frame is in said laterally facing position.

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