Fig. 1.
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 forward-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 the mast and carried by the carrier frame 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 eccentrically swung fork members 4 about a vertical axis 4, which is thus the axis about which the mast sways. 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 utilized 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 15 or cables which pass from a fixed anchorage point on the frame members 16 over a pulley 17 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 rotatable in relation to the carrier frame 14 about a pivot 19, 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 therefrom, and 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 downward 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 axle 27 of the mast will offset the centre line of the machine (where it lies in the 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 28 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
3,344,941

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 swivelling lift truck made in accordance with the present invention may be made more compact than a swivelling 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 instance 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 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 that shown. That is to say that 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 fixed 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 swivelling 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 moveable 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 theron 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 swivelling 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 guide way 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 9, wherein the truck includes an axle on which the wheels nearest the mast are mounted, and the first guide part terminates above the lower edges of the, 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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