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Jinks

[11] **3,907,140**

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[54] **LIFT TRUCKS**

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[73] Assignee: **Cleco Industries Ltd.**, England

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[30] **Foreign Application Priority Data**

Aug. 31, 1972 United Kingdom..... 40293/72

[52] **U.S. Cl.** **214/671;** 214/660; 214/730; 214/DIG. 7

[51] **Int. Cl.²** **B66F 9/20**

[58] **Field of Search** ..... 214/670, 671, 672, 673, 214/674, 730, DIG. 7, 660

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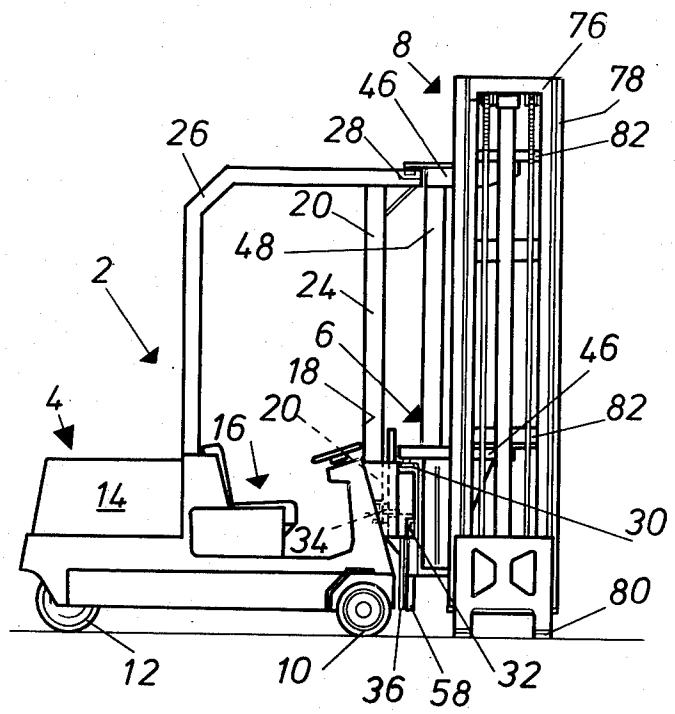
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Primary Examiner—Frank E. Werner
Assistant Examiner—Lawrence J. Oresky
Attorney, Agent, or Firm—Larson, Taylor and Hinds

[57] **ABSTRACT**

A lift truck is adapted for narrow aisle operation by having a fixed mast mounted on the front of the truck which supports a sideways slidable frame having a top and bottom support for a pivotable mast of the lift truck. A counterbalance is provided to counteract the effect on the lift truck stability of the sideways movement of the mast.

12 Claims, 8 Drawing Figures



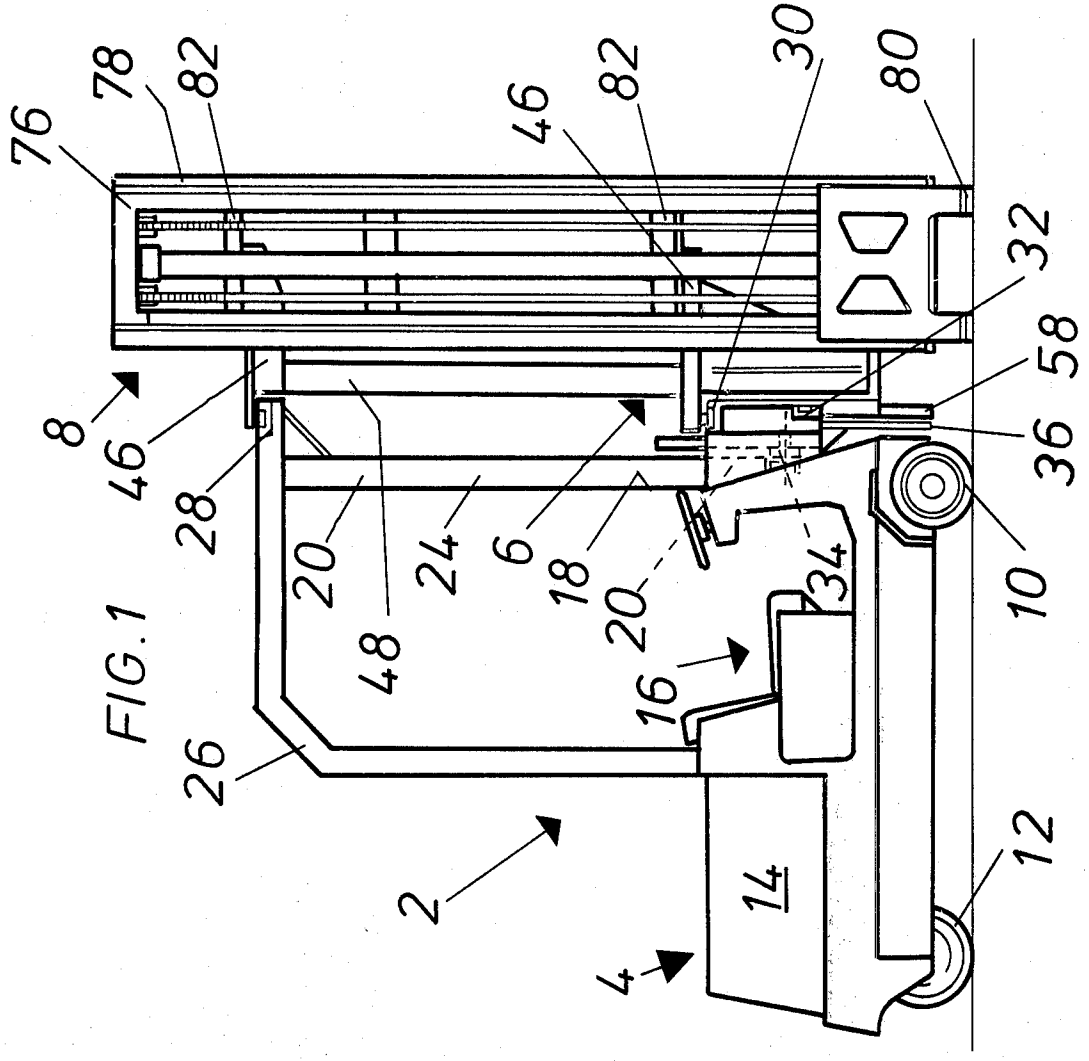

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FIG. 1

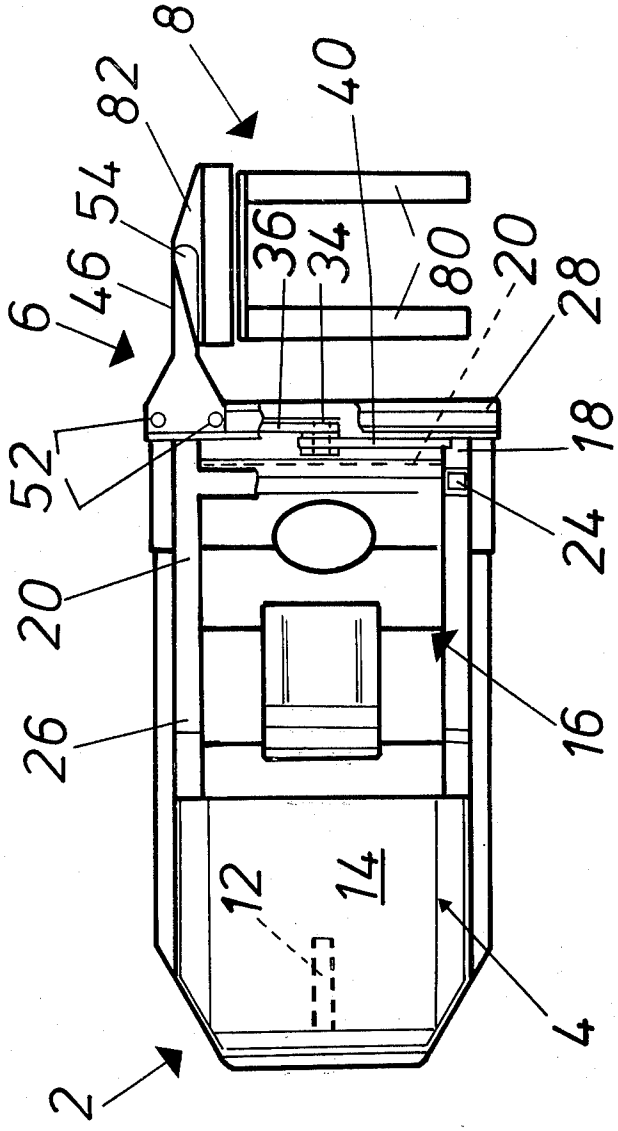
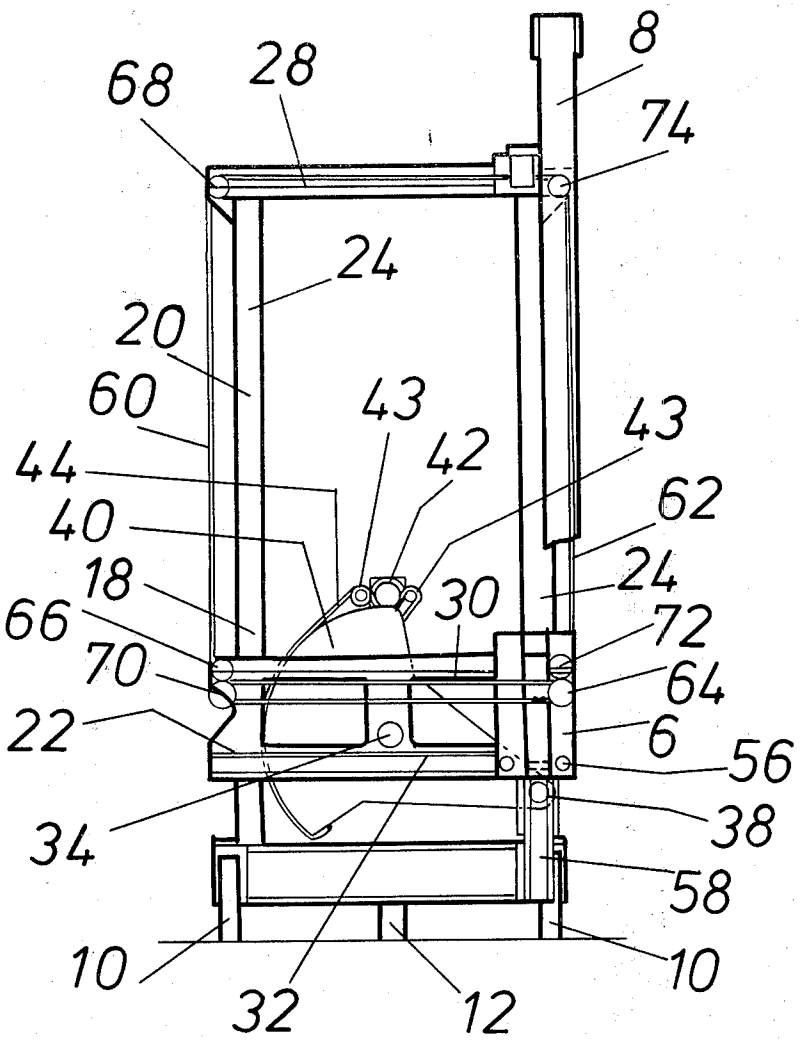


FIG. 2

FIG. 3


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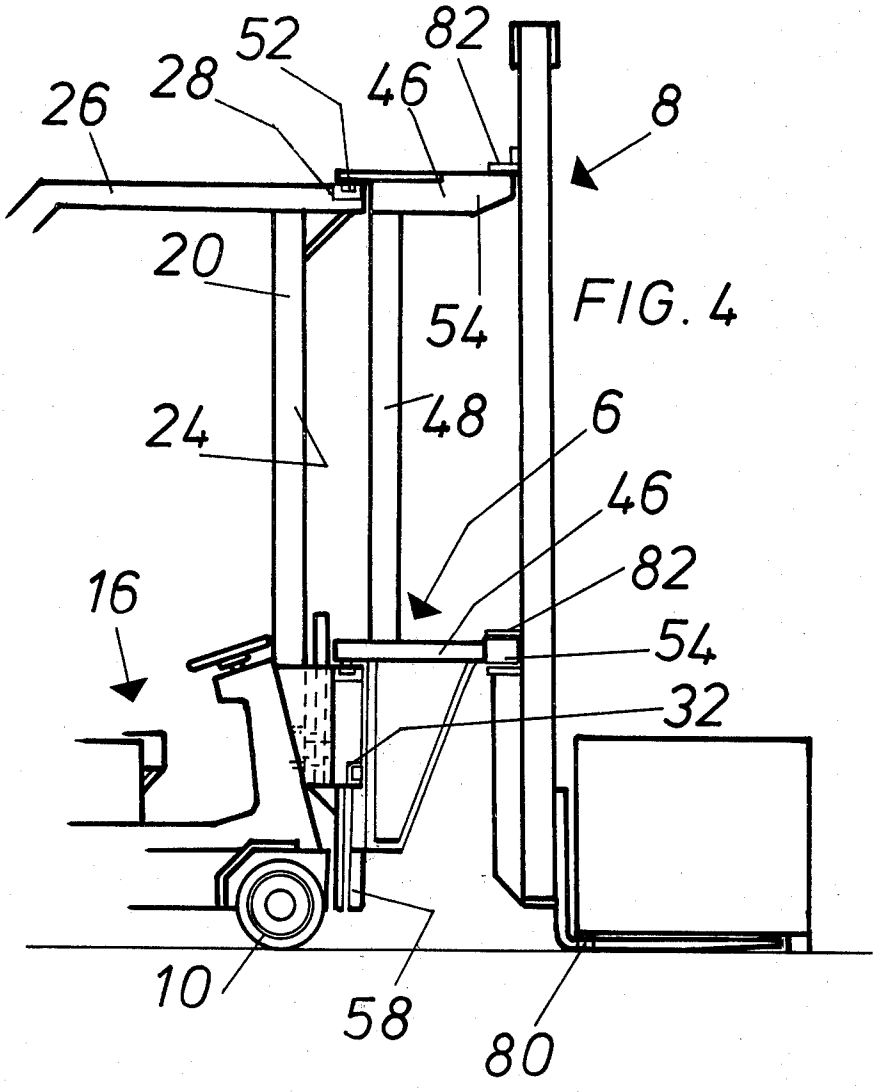


FIG. 4

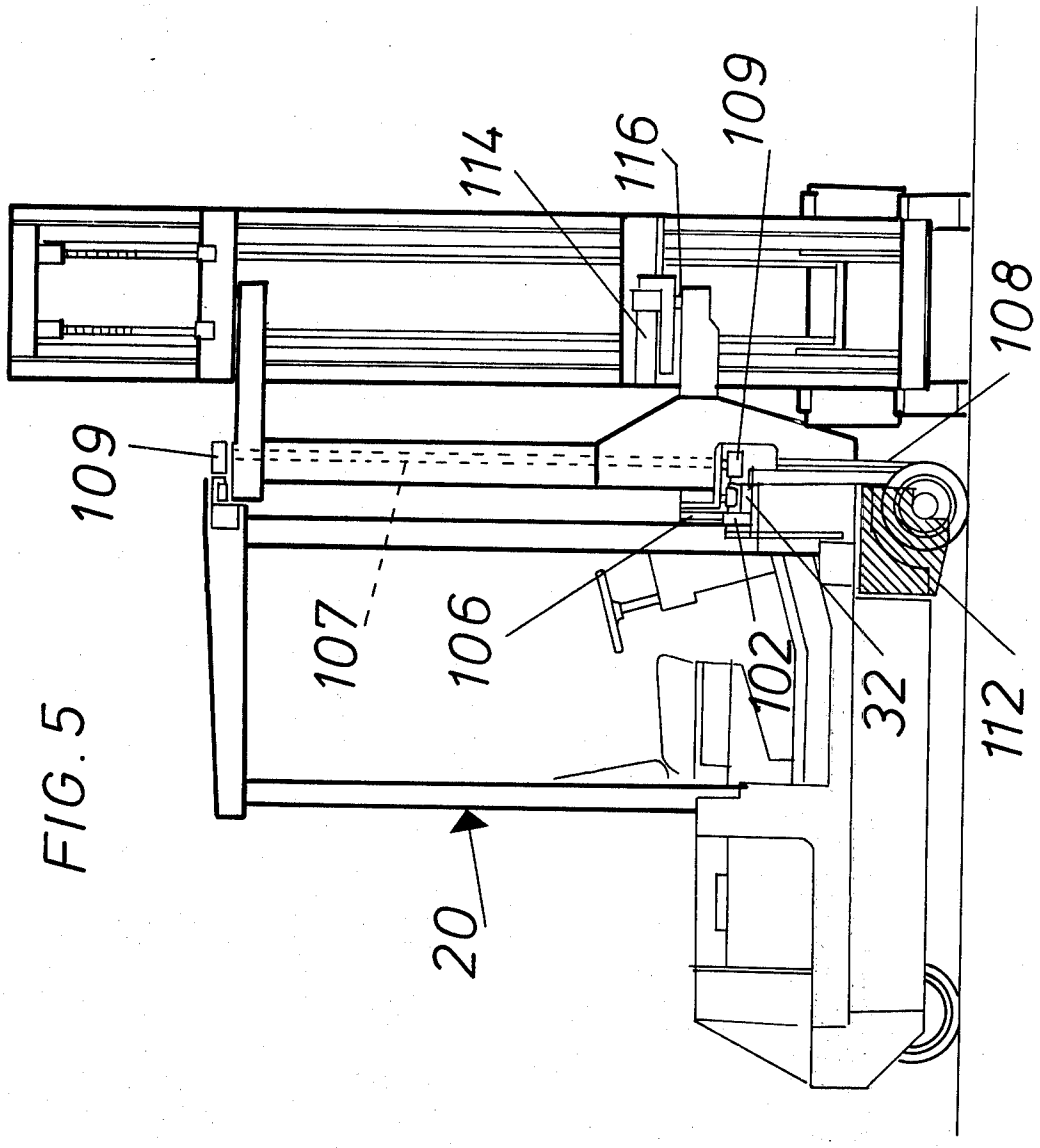


FIG. 5

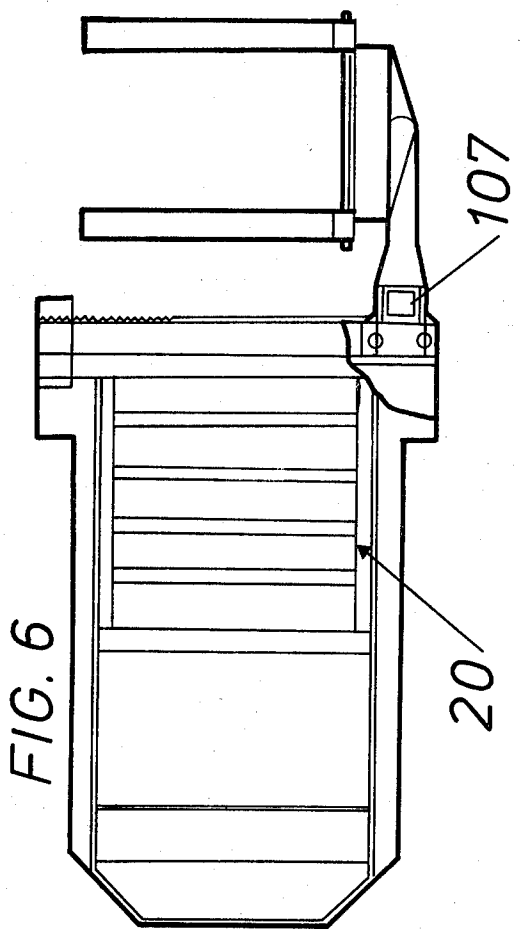


FIG. 6

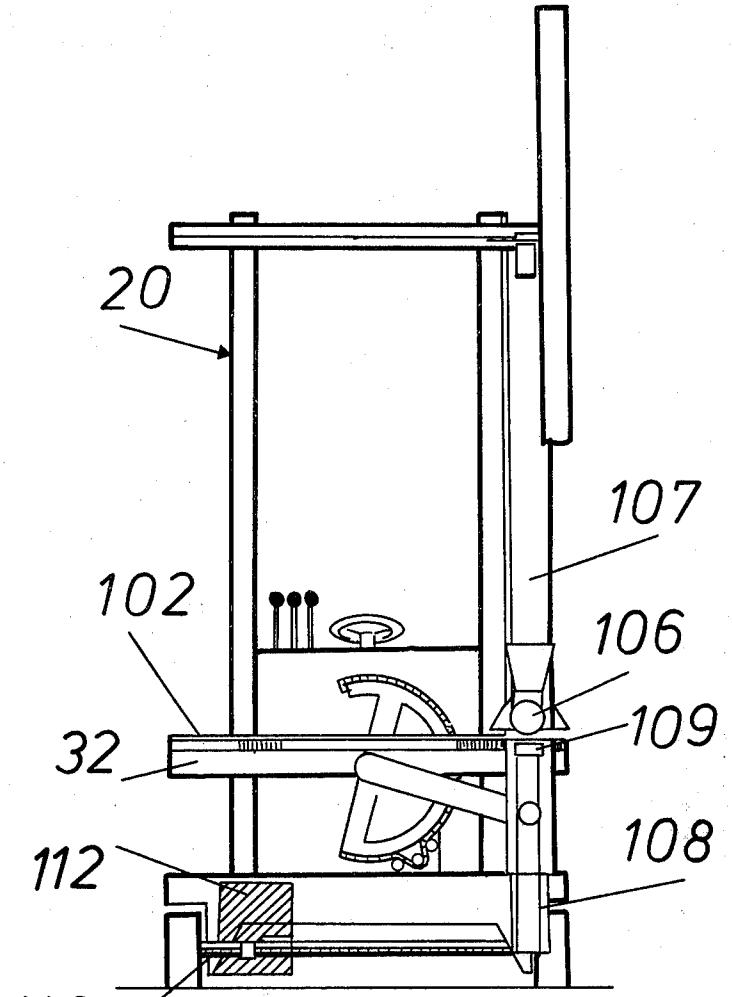


FIG. 7

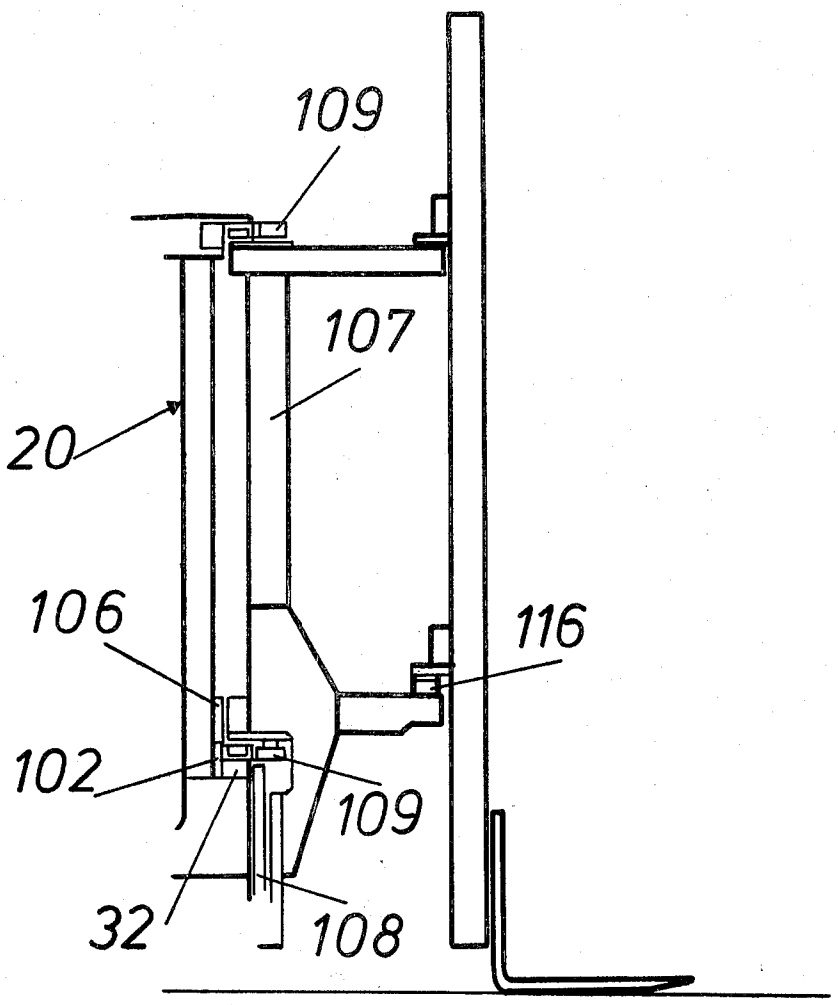


FIG. 8

LIFT TRUCKS

The invention relates to lift trucks and especially to lift trucks adapted for narrow aisle operation.

The invention provides a lift truck comprising a truck body, a mast fixed at the front of the truck body, a carriage extending along the fixed mast and secured to the mast at an upper position and to the mast and/or body at a lower position so as to allow the carriage to be traversed along the front of the truck body and movable mast pivotably secured at an upper and lower position to forwardly cantilevered parts of the carriage mounting a load carriage. In operation the mast can be faced to either side of the lift truck or to the front. The fixed mast defines an overhead guard over a driver's station on the truck body and means are provided to ensure that upper and lower positions of the extensible mast are traversed in unison. Conveniently the means comprises a shaft rotatably secured in the carriage and pinions secured to the shaft and engaging a transversely extending rack secured in a fixed position with respect to the truck body adjacent the upper and lower end of the carriage. Advantageously the carriage comprises at least two transversely spaced rollers having a vertical axis of rotation adjacent the upper end of the carriage and adjacent the lower end of the carriage engaging in transversely extending rail members on the fixed mast and/or front of the truck body and the carriage has a roller having a horizontal axis of rotation for engaging a transverse member on the fixed mast or lift truck body. Suitably the lift truck comprises a weight, conveniently mounted on the body which is moved to provide a counterbalance when the mast is moved to either side. Preferably a weight is provided traversible at the same time as but in an opposite direction to the traverse of the carriage for providing a counter balance. In one construction the weight is mounted slidably on a front axle of the truck body.

Preferably the carriage is connected to an arm, pivotably mounted on the front of the truck body to traverse the carriage. Suitably the carriage is traversed by arm pivotably mounted centrally on the front of body to move in a plane across the front which engages an upright member on the carriage. If the arm is arranged to move through a substantial arc say 158 when moving the carriage from side to side at a constant angular speed, the speed of the carriage is reduced on approaching either side of the lift truck. Preferably a roller is mounted on the arm engaging in a longitudinal slot in the carriage. The arm may also be connected to the weight to provide a counterbalance to the mast.

The mast is preferably pivoted at two or more vertically spaced positions.

The invention is more particularly described with reference to the drawings accompanying this and the Provisional Specification in which:

FIGS. **1, 2** and **3** are a side, top and front elevation of a lift truck according to the invention with the mast in a position for stacking to one side;

FIG. **4** is a side view of the lift truck of FIGS. **1** to **3** with the mast in a position for stacking to the front; and

FIGS. **5, 6, 7** and **8** are a side, top, front and partial side view of another lift truck according to the invention.

With reference to FIGS. **1** to **4** a lift truck **2** comprises a body **4** which support a carriage **6** which is cantilevered out from the body **4** and a mast **8** pivoted on the forward end of the carriage **6.**

The lift truck is of the counterbalanced type with the mast **8** supported at the front and has a pair of freely rotatable non-steerable front wheels **10** and a single driven and steerable rear wheel **12.** Rear twin-drive wheels with linked steering may also be used (See FIG. **2**). A battery **14** is mounted adjacent the rear of the body **4** and a driver's station **16** is mounted near the front of the body **4.** On the front of the body **4** is mounted a frame **18** supporting the carriage in its cantilevered position which frame comprises a rigid upright mast **20** and transverse support **22.**

The rigid mast **20** comprises a pair of spaced posts **24** mounted on the front of the body **4** and a pair of support members **26** which pass overhead of the driver's station **16** and are mounted directly behind it on the body **4.** At the top, the posts **24** are connected by a first rail **28** for traversing the carriage **6** to absorb the forwardly directly pull of the cantilevered carriage **6.**

The transverse support **22** carries a second rail **30** for traversing the carriage absorbing horizontally directed forces and a third rail **32** for absorbing vertically directed forces.

In between the front of the body **4** and the support **20,** is mounted on a fixed shaft **34** an arm **36** for moving the carriage **6** from side to side. The shaft **34** is arranged in the longitudinal direction centrally on the front of the truck body **4.** The arm **36** carries on one end a roller **38** for engaging the carriage **6.** The arm **36** carries also a counterweight **40** in the form of a segment of thick metal plate. The arm **36** is pivoted by means of a hydraulic motor which engages, aided by jockey sprockets **43,** a chain **44** laid over the edge of the segmental weight **40** and secured to both ends of the segmental weight.

The carriage **6** comprises a pair of horizontal members **46** which are connected by a vertical tie-bar **48** and the lower one of which members is firmly secured by support plate **50.** At the rear of the upper and lower horizontal member **46** is provided a pair of rollers **52** engaging in the rails **28** and **30** respectively. At the front of the horizontal members **46** there are pivots **54** for supporting the mast **8.** Underneath the lower member **46** are mounted a pair of rollers for engaging with the rail **32** and an upright member **58** which defines a channel for engaging with the roller **38** on the arm **36.** Fixed to the lower part and upper part of the traverse carriage are a pair of chains **60** and **62** which pass over rollers **64, 66, 68** and **70, 72, 74** respectively which rollers are mounted on the frame **18.** Movement of the upper and lower parts of the carriage are thereby synchronized.

The mast **8** is extensible and comprises inner and outer mast sections **76** and **78** and a ram and chain arrangement for raising and lower forks **80** supported by the inner mast section **76.** A pair of transverse support members **82** are fixed to the outer mast and are pivotably supported by the pivots **54.** A hydraulic rotator is mounted on the carriage **6** to control the angular position of the mast **8** and rotate it about approximately 180°. Guide rollers may be affixed to the side of the lift truck to enable it to pass through a narrow aisle.

In operation, the lift truck can be driven into an aisle not much wider than the truck body **4** and the driver can pick up or deposit a load on either side or deposit it in the aisle for another truck to pick up. If the driver

were to enter an aisle with the mast in the middle and pointing forwardly as in FIG. **4** and it is desired to pick up a load on the right, the driver causes the carriage to traverse to the left whilst at the same time rotating the mast to the right to reach the position shown in FIGS. **1** to **3.** Subsequently the driver causes the carriage to traverse to the right to pick up the load.

The weight associated with the arm **36** reduces the unbalance resulting from the sideways displacement of the mast. The actuation of the arm causes the mast to slow down gradually in a harmonic motion when reaching either side of the truck.

With reference to FIGS. **5** to **8,** a lift truck has the same basic lay-out of the lift truck previously described. In the following only those parts are described in which the lift truck materially differs from the one previously described.

At the top of the rigid mast **20** the posts are connected by a first rail **100** having a central channel facing downward. The transverse support **32** carries both a bottom rail **30** for absorbing horizontally directed forces and a hardened steel flat **102** fixed to the side of the rail **30** for taking the downward force of the extendible mast, carriage and load.

The arm **36** is not connected to a counterweight and comprises a simple arm with the roller **38** and a motor for rotating the arm **36** located by the pivot of the arm.

The carriage has rollers suitably placed for location in or on the rails **100, 30** and on the steel flat **102.** The roller **106** for engaging the steel flat **102** is of hardened steel and located centrally of the roller **52** located in the rail **30.** The carriage has also mounted in a vertical square section tube **107,** a vertical shaft extending between the pair of horizontal members and carrying pinions **109** keyed to the shaft for meshing with racks mounted on the outside of the rails **100** and **30.** In this way the carriage is retained in a strictly vertical position as it is moved from side to side by the arm **36.**

The carriage also has an extension **108** extending downward below the rail **30** and connected to one endless chain guided over sprockets **110** on either side of the truck. Connected to the chain is a weighted block **112** which is slidably mounted on the front axle of the truck. The block **112** is secured so that it moves in a direction opposite to that of the carriage when it is shifted by the arm **36.** A large and effective counterbalance can thus be achieved.

The mast **8** is rotated on the carriage **6** by means of a ram **114** mounted on the back of the mast and having a rod with a section of rack which engages a fixed pinion **116** on the carriage **6.** Movement of the stem causes the mast to be rotated.

In further constructions the mast can be a telescopic triple section mast or a non-extensible single section mast. The lift trucks may also be modified to make the operator's station elevatable at the same time as the load carriage to provide better supervision during loading and unloading manoeuvres. The operator's station may then be mounted between the posts and members **24** and **26** and may be supported by the fixed mast.

The lift trucks are capable of manipulating heavy loads safely in narrow aisles.

Reference is made to the British Patent 1,326,914 which describes and claims a lift truck having a movable mast which is extensible and traversible with respect to the truck, a mast fixed with respect to the truck and a mast steady arm interconnecting upper portions of the movable mast and the fixed mast which is secured at one end of the movable mast and retained at the other end in a guide secured to the fixed mast and allowing traverse of the mast steady arm with the movable mast.

I claim:

1. A lift truck comprising a truck body, wheels supporting the truck body, a driver's station on the truck body and a pair of transversely spaced wheels at the front of the truck body;

a fixed mast rigidly secured to the truck body and extending upwardly thereof to a level above the driver's station, at least one upper transversely extending member secured to the front of the fixed mast adjacent the upper part thereof above the forward field of view of the driver's station, at least one lower transversely extending member secured in a fixed position with respect to the truck body at the front and adjacent the lower part of the fixed mast;

a traverse carriage extending alongside the front of the fixed mast, rigidly interconnected upper and lower means on the carriage for slidably engaging the said upper and lower transversely extending members respectively, means for sliding the upper and lower means simultaneously from side to side of the truck body with respect to their respective transversely extending members, and upper and lower forwardly cantilevered members secured to the carriage at the level of the upper and lower transversely extending members respectively; a movable mast pivotably supported by the upper and lower forwardly cantilevered members at the level of the upper and lower transversely extending members respectively and pivotable about an upright axis, means for pivoting the movable mast on the upper and lower members from a forward facing position 90° to either side of the truck body and a load carriage for raising and lowering a load and supported at the front of the movable mast.

2. A lift truck as claimed in claim **1,** wherein the driver's station is provided adjacent the front of the truck body and wherein the fixed mast comprises a plurality of upright posts secured in front of and behind the driver's station to the truck body and interconnected at the top to define thereby an overhead guard.

3. Lift truck as claimed in claim **1** in which a chain is provided interconnecting the carriage and the fixed mast to cause upper and lower parts of the carriage to move sideways in unison.

4. Lift truck as claimed in claim **1** in which a rack is associated with each of the transversely extending members and an upright shaft is rotatably mounted in the carriage and pinions are keyed to upper and lower parts of the shaft for engaging the racks and traversing upper and lower parts of the carriage in unison.

5. Lift truck according to claim **1,** wherein the means for slidably engaging the transversely extending members comprises a pair of transversely spaced rollers having a vertical axis of rotation and the transversely extending members comprise members having a U-shaped section for receiving the rollers.

6. Lift truck according to claim **5** wherein the means for slidably engaging the transversely extending members comprises a roller having a horizontal axis of rotation and the transversely extending members comprise a flat mounted adjacent the lower part of the fixed mast for supporting said roller edgeways.

7. Lift truck according to claim 1 in which a weight is mounted adjacent the front of the truck body and means are provided for moving that weight transversely at the same time as, but in an opposite direction to, the carriage to thereby provide a counter balance.

8. Lift truck as claimed in claim 7 in which a shaft is provided extending between the transversely spaced wheels at the front of the truck body, the weight is mounted slidably on said shaft and a chain is provided interconnecting the weight and the carriage.

9. Lift truck as claimed in claim 1 in which the means for sliding the carriage from side to side comprise an arm pivotably along a substantially horizontal axis and mounted at the front of the truck body, a roller secured to the arm and an upright slot in the carriage for engaging the roller on the arm.

10. Lift truck comprising a truck body, wheels supporting the truck body and including a pair of transversely spaced wheels at the front of the truck body, said pair of wheels being interconnected by a shaft, a driver's station adjacent the front of the truck body;

a fixed mast having upright posts secured in front of and behind the driver's station to the truck body and interconnected at the top to a pair of transversely spaced posts being provided in front of the driver's station, a transversely extending U-sectioned member secured adjacent the top to said pair of posts, a transversely extending U-sectioned member secured adjacent the bottom of said pair of posts, a transversely extending steel flat secured adjacent the latter U-sectioned member;

a traverse carriage extending alongside the front of the truck body and the front of the fixed mast, a pair of transversely spaced rollers rotatably mounted on vertical centres at an upper part of the carriage and received in the U-sectioned member adjacent the top of the posts, a pair of further transversely spaced rollers rotatably mounted on vertical centres at a lower part of the carriage and received in the U-sectioned member adjacent the bottom of the posts, a single roller mounted on the carriage rotatable on a horizontal centre for bearing edgeways on top of the steel flat;

an arm pivotable along a substantially horizontal axis and mounted at the front of the truck body, a roller secured to the arm and an upright slot in the carriage for engaging the roller on the arm to thereby enable the carriage to be moved from side to side of the truck body;

upper and lower forwardly cantilevered members secured to the carriage;

a movable mast pivotably supported by the upper and lower members, means for pivotting the mast on the upper and lower members and a load carriage for raising and lowering a load supported at the front of the movable mast, whereby the load carriage can be turned to the front or to either side of the truck body.

11. Lift truck according to claim 10, further comprising

a weight slidably mounted on the shaft interconnecting the front wheels and a chain interconnecting the weight and the traverse carriage to cause the weight to be slid sideways in a direction opposite to the carriage to counteract the effect of a sideways shift of a load on the movable mast.

12. Lift truck according to claim 1 wherein said means for sliding the upper and lower means comprises a drive means for sliding the carriage from side to side of the truck and a means mounted on the upper and lower means for synchronizing the sliding movement thereof with respect to the corresponding upper and lower transversely extending members.

* * * * *