United States Patent [19]

Carlund

[11] **3,726,427**

[45] **Apr. 10, 1973**

[54] **LIFT TRUCKS**

[75] Inventor: **Rolf L. Carlund,** Mjolby, Sweden

[73] Assignee: **AB Bygg-Och Transportekonomi (BT),** Mjolby, Sweden

[22] Filed: **Aug. 25, 1971**

[21] Appl. No.: **174,785**

[52] **U.S. Cl.** ..... **214/701 P**

[51] **Int. Cl.** **B66f 9/16**

[58] **Field of Search** 214/660, 700, 701, 214/702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715

[56] **References Cited**

UNITED STATES PATENTS

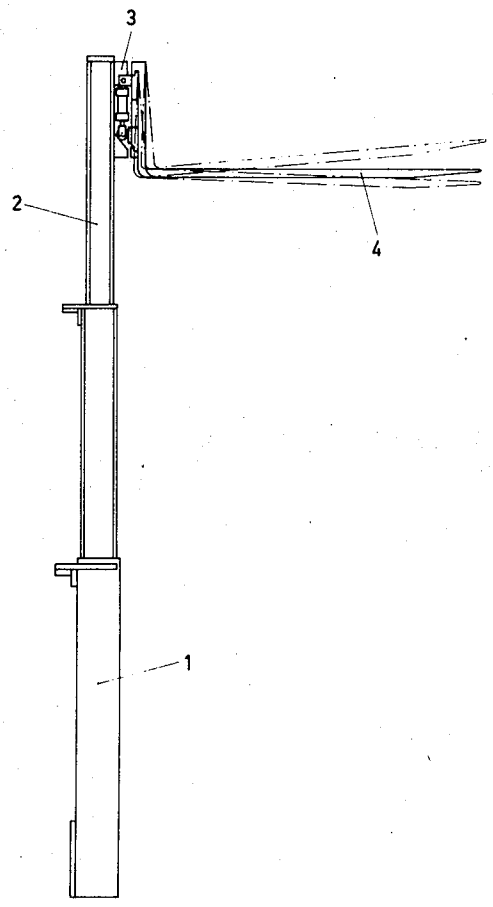
3,083,853	4/1963	Hastings, Jr.	214/660
3,532,239	10/1970	May	214/660

Primary Examiner—Gerald M. Forlenza
Assistant Examiner—Lawrence J. Oresky
Attorney—David Toren et al.

[57] **ABSTRACT**

A lift truck having a mast, a load carriage for movement up and down said mast and provided with forks which are rotatably mounted in said load carriage about a horizontal, transversal shaft. The load carriage and the forks are each provided with a supporting surface, said surfaces converging against each other. Hydraulic means cause two rollers to move between the two supporting surfaces in the converging and diverging direction thereof to rotate the forks in either direction round its horizontal shaft. The rollers are freely rotatable in relation to each other, the one for engagement with only one supporting surface and the other with only the other supporting surface.

3 Claims, 4 Drawing Figures



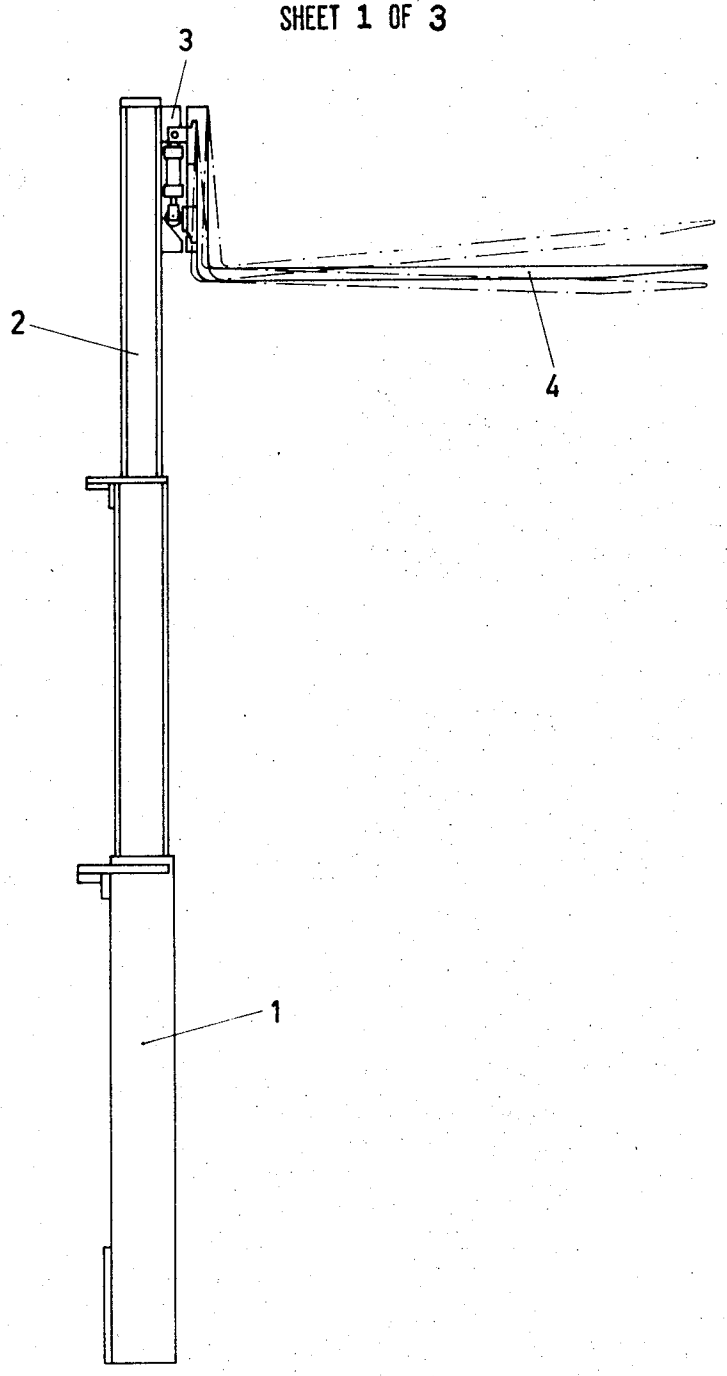


Fig. 1

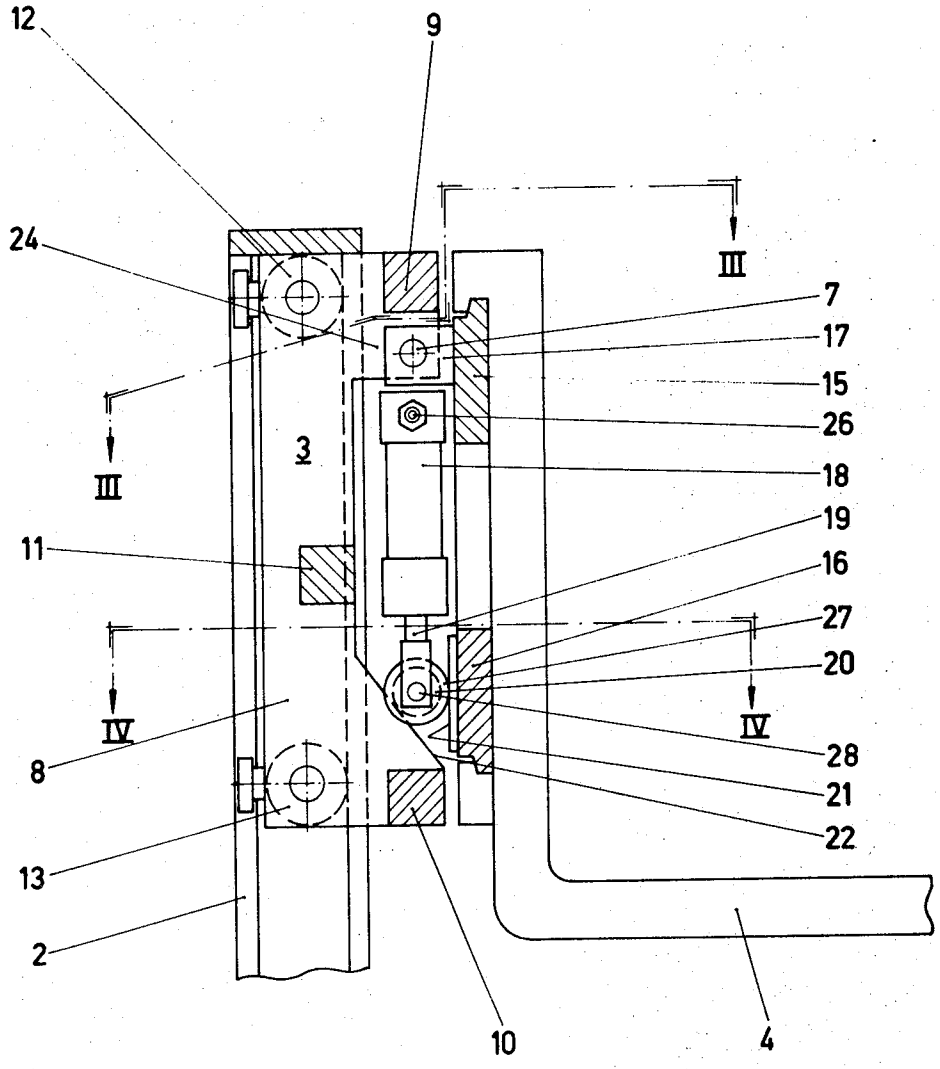


Fig. 2

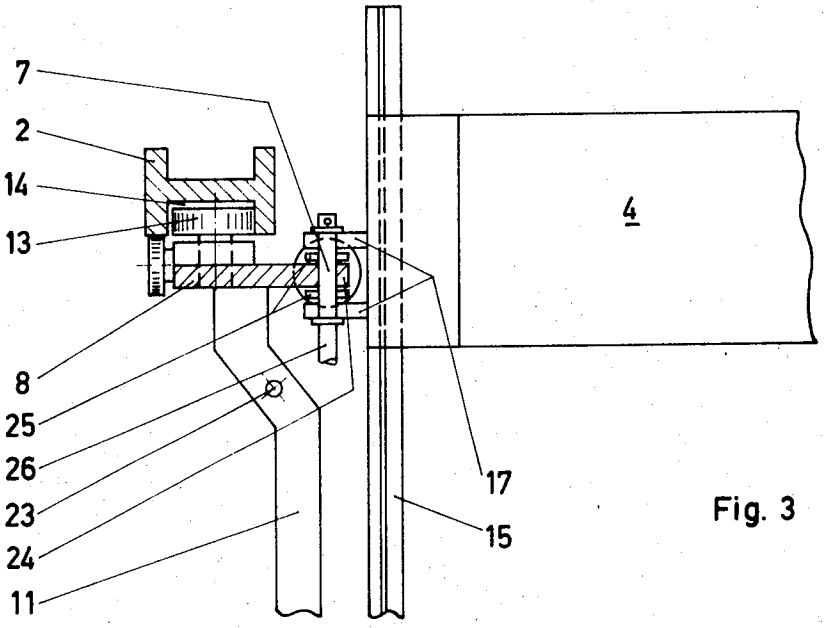


Fig. 3

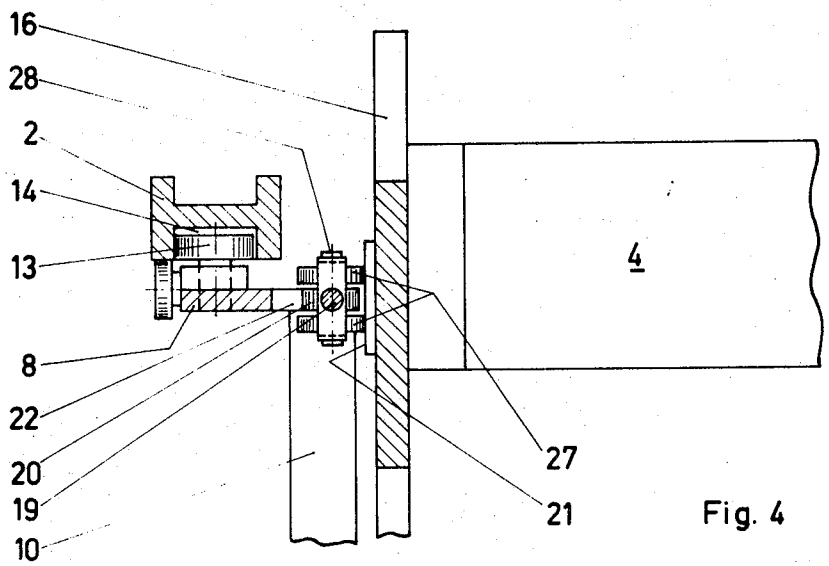


Fig. 4

LIFT TRUCKS

The present invention relates to a lift truck having a mast, a load carriage for movement up and down said mast and provided with forks which are rotatably mounted in the load carriage about a horizontal, transversal shaft and through hydraulic means are rotated about said shaft.

It is a principal object of the invention to achieve in a simple way that the forks at every moment can be given the most favorable inclination as possible in relation to the horizontal plane. It is desirable for different working moments to have different angular positions of the forks. During stacking another angular position is wanted than during horizontal transport. Through a fixed connection of the mast to the truck and, when it is required, only an adjustment of the inclination of the forks, the adjusted mass magnitude is decreased. Thereby the adjustment is also made as near the load as possible, which reduces undesirable swinging movements of the mast to a minimum.

This and other objects and advantages of the invention will be apparent to those familiar with the art when the following description is read in conjunction with the drawings in which:

FIG. 1 is a side view of the mast of a lift truck,

FIG. 2 is a vertical sectional view of a load carriage, provided with forks and movable up and down said mast,

FIG. 3 is a cross-sectional view on the line III—III in FIG. 2, and

FIG. 4 is a cross-sectional view on the line IV—IV in FIG. 2.

In the drawings 1 is a mast section fastened to the chassis of the truck and included in an extendable mast, which for this purpose comprises mast sections telescopically displaceable in relation to each other. Of these sections the inner or upper section is indicated by the numeral 2. Each of these sections in a known way includes a pair of uprights positioned at a horizontal distance from each other.

Up and down the mast section 2 moves a load carriage 3 provided with forks 4. The load carriage 3 includes two columns 8 positioned at a horizontal distance from each other and connected together through cross bars 9, 10 and 11. In each column 8 there are two guide rollers, an upper one 12 and lower one 13, which run in vertical grooves 14 in the mast section 2. The movement of the load carriage 3 is effected by means of two lift chains (not shown) secured to holes 23 (FIG. 3) in the cross bar 11. The upper ends of the columns 8 are in their front edges provided with ears 24, each receiving a shaft 7.

The forks 4 in a conventional way are placed on two horizontal rulers 15 and 16. The rear side of the upper ruler 15 is provided with ears 17 for cooperation with the shafts 7.

From each shaft 7 there is hanging a hydraulic cylinder 18, the upper end of which is provided with securing elements 25 (FIG. 3) for that purpose. Each of the two hydraulic cylinders 18 is provided with a piston rod 19, to the lower end of which is secured a transversal shaft 28. About said shaft are rollers 20 and 27 separately rotatably mounted. Of these rollers an outer pair 27, having the same larger diameter, engages a vertical supporting surface 21 made on the rear side of the lower ruler 16, whereas an intermediate roller 20, having a smaller diameter, engages a narrow, inclined supporting surface 22, made on the front side of the lower end of the column 8. These supporting surfaces 21 and 22 are converging against each other in a downward direction. The hydraulic cylinders 18 are provided with supply pipes 26, through which the cylinders are supplied with pressure oil.

When the pressure oil is supplied to the cylinders 18 the piston-rods 19 with the rollers 20 and 27 are pressed down, which means that the supporting surface 21 is forced to move away from the supporting surface 22, this being stationary in relation to the mast section 2. During this operation the reaction forces of the cylinders are taken by the shafts 7. The movement forward of the supporting surface 21 is transferred to the ruler 16 and the forks 4, so that these are rotated anticlockwise about the shafts 7 and thereby are given a changed inclination. Through reversing of the direction of the oil flow the inclination of the forks can be changed in the opposite direction and by shutting off a certain oil quantity a certain inclination can be maintained during a working moment.

The control of the quantity and speed of the oil supplied to or removed from the hydraulic cylinders is made by means of a hydraulic valve, in a conventional way placed near the truck driver.

Having described my invention, I claim:

1. A lift truck comprising an upwardly extending mast, a load carriage positioned on said mast for movement in the up and down direction, a horizontal transversal shaft mounted on said load carriage, forks rotatively mounted on said shaft, hydraulic means in engagement with said shaft and arranged for rotating said forks about said shaft, a movable coupling member operatively engaged with said hydraulic means, a pair of oppositely arranged supporting surfaces, one of which is on the load carriage and the other of which is on the forks, said two surfaces converging toward each other, at least two rollers freely rotatable relative to one another, said rollers mounted on said movable member and one of said rollers is in engagement with only one of said supporting surfaces and the other said roller is in engagement with only the other said supporting surface so that when said movable member is moved by said hydraulic means said rollers contacting said surface causes the surface of said forks to move to and from the surface of said load carriage and rotates said forks about said horizontal shaft.

2. A lift truck, as set forth in claim 1, wherein said hydraulic means includes a cylinder which depends downwardly from said horizontal shaft, said movable member includes a piston-rod attached to the lower end of said cylinder, and said supporting surfaces are arranged to converge toward one another in the downward direction.

3. A lift truck, as set forth in claim 2, wherein said one of said supporting surfaces is secured on said forks, said one of said supporting surfaces is relatively wide and is positioned substantially vertically, said other one of said supporting surfaces is secured in said load carriage and is inclined relative to the one of said support surfaces, said other one of said support surfaces is narrower than said one of said support surfaces, said rollers comprise two outer rollers and an intermediate roller positioned between said outer rollers, said two

outer rollers arranged to engage said one of said supporting surfaces, a shaft secured to and extending transversely of said piston-rod, said two outer rollers rotatively mounted on said shaft on said piston-rod, said intermediate roller rotatively mounted on said shaft on said piston-rod and having a diameter smaller than that of said two outer rollers, and said intermediate roller being arranged to engage the other one of said supporting surfaces.

* * * * *