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STACKER CRANE WITH PIVOTAL FORK AND EXTENSION MEANS THEREON

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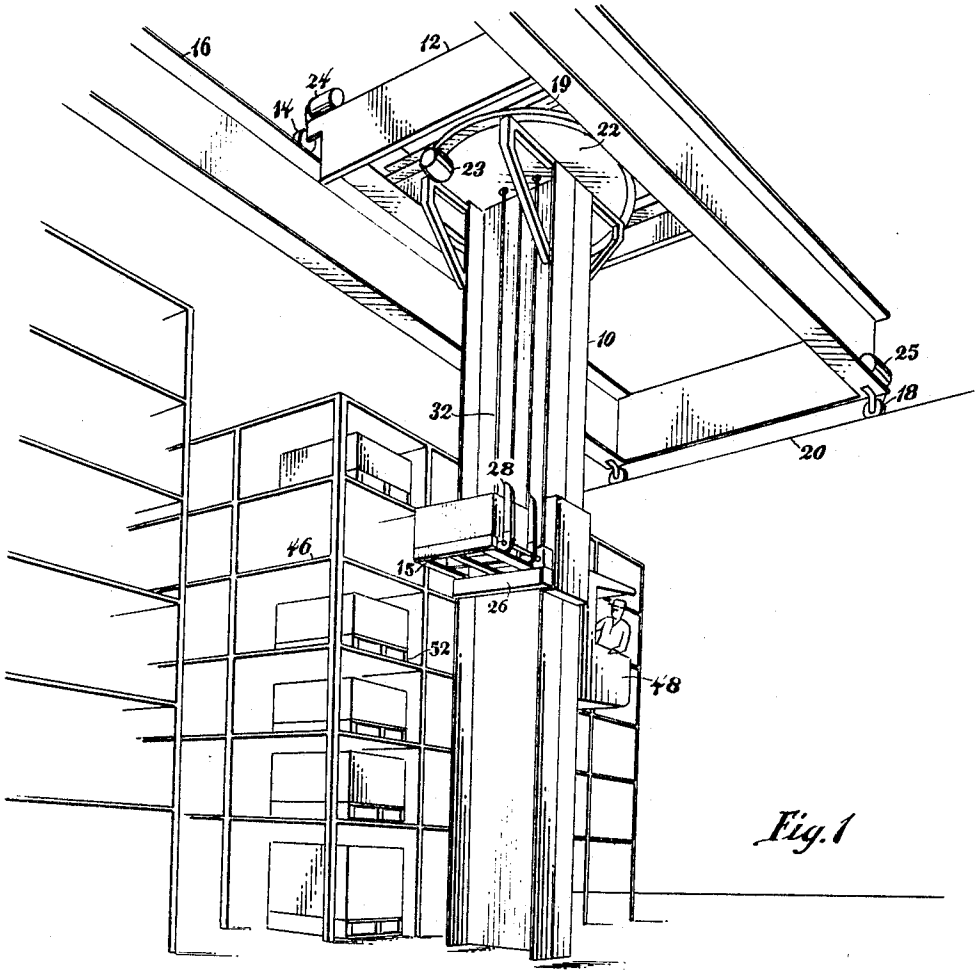


Fig. 1

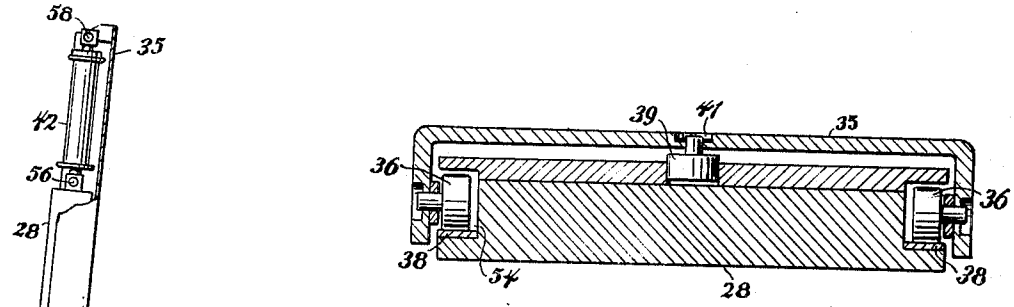


Fig. 3

Fig. 2

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STACKER CRANE WITH PIVOTAL FORK AND EXTENSION MEANS THEREON

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ABSTRACT OF THE DISCLOSURE

A crane that lifts loads vertically and moves them horizontally in accordance with the function of a standard stacker crane, and in addition provides a telescopic horizontal movement of the load lifting device on the crane that moves loads laterally an additionally distance into spaces not accessible with standard apparatus. Such additional horizontal movement is effective to move a load in the confined spaces of warehouses, and it is instrumental in loading, unloading, moving and stacking a quantity of articles in less time and space than is otherwise required.

BACKGROUND OF THE INVENTION

This invention relates to a crane for stacking articles in and removing stored articles from a warehouse. Many industries conserve storage space by maintaining storage of articles in systematically arranged racks stacked one above another in a system of rows with aisles therebetween. A stacker crane of the usual type is suspended from overhead tracks between the racks and is arranged to extend toward the floor and to traverse the aisles between racks to place articles on/or remove articles from storage racks in accordance with the wishes of an operator.

Usually it is very difficult to maneuver a crane into the aisles between spaced racks while carrying a load and place the load on the proper rack without placing and replacing it or "inching" it along until it is situated in the proper position. Conversely, removing an article from a storage rack is usually difficult and slow because a pallet carrying the article must first be partially placed on the forks of a stacker crane, moved, and then released. Then a second or even a third approach is required to place the pallet completely upon the forks of the stacker crane before it may be moved freely and carried safely to another place for further storage or to a place of use.

SUMMARY OF THE INVENTION

The stacker crane of this invention utilizes the normal primary vertical and horizontal movements of a loading device for conventional stacker crane, but in addition is arranged to move a load horizontally a greater distance because of a secondary movement of the load carrying device which may be accomplished simultaneously with the normal horizontal movement so as to conserve time in moving the article from one location to another.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic view of a stacker crane constructed in accordance with the invention,

FIG. 2 is a side elevation illustrating the unique telescopic fork, and

FIG. 3 is a cross section of the telescopic fork as seen from line 3—3 of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Looking now at FIG. 1 of the drawings the numeral **10** designates a vertical mast of a conventional stacker crane

having at its upper end a circular platform **22** supported by the structure **19** for rotary movement about a vertical axis that depends from an overhead trolley **12**. The trolley **12** moves on wheels **14** horizontally along the tracks **16** while the tracks **16** are in turn mounted at their ends for lateral movement on wheels **18** which roll along a fixed elevated track means **20**. Conventional drive means such as the motor **23** is adapted to rotate the mast about its vertical axis, while means **24** moves it laterally along the tracks **16** and other means **25** is adapted to move the entire assembly along the track **20** in accordance with standard practice.

Mounted upon the mast **10** is a carriage **26** having a load carrying platform vertically movable along the mast **10** by a driving means including a conventional elevator device **32**. The carriage **26** includes a fork **28** that may be inserted in a pallet **52** under a load and then lifted vertically on the mast **10** and moved horizontally along tracks **16** and **20** to a given position in a storage rack **46**. Conventionally the mast **10** and carriage thereon moves laterally along an aisle between tiered racks with the forks withdrawn while suspended only from tracks **16** and **20**. The aisle must therefore be sufficiently wide to enable the mast and carriage with the load thereon to be moved into position closely adjacent the rack in spite of the fact that there may be a slight tilting of the mast and some irregularity in the level of the tiered racks themselves. Thus the load carrying crane cannot be directly adjacent the storage racks, but by placing the forks **28** in a rack carrying the load or pallet **52**, moving the forks laterally as far as possible, and then replacing the forks in the rack before again moving them as far as possible, it is quite possible to move most articles through a series of steps or by "joggling" to a predetermined position on the storage racks.

It is however quite necessary to use several time consuming, independent steps, and it is moreover quite necessary that the aisles be sufficiently wide to enable limited lateral manipulation of the load carried on the forks of the crane to the storage racks. The device of this invention performs the stated operation in a single rapid step in a narrow aisle occupying much less space than usually required of a standard crane.

In accordance with this invention there is carried on the several tines of the forks **28** an extension **35** which can be moved laterally with respect to the fork itself. Thus a load on a pallet carried by the forks **28** may be moved laterally a distance equal to the lateral movement of the forks on the track of the carriage, plus an additional lateral movement due to the extension of the surface **35** which comprises a movable platform of the load. The movable platform thus includes an independent telescopic surface **35** for each tine of the fork. The telescopic surface comprises a U-shaped member having inwardly directed rollers **36** resting on tracks **38** in outwardly facing grooves **54** of each tine of the fork. A roller guide **39** is rotatably mounted at **41** in the telescopic member **35** and adapted to ride in a groove in the upper surface of fork **28** to maintain the surface **35** perfectly centered as it is moved forward or backward. The surface **35** is moved relative to the forks **28** by an actuating means which comprises a fluid motor **42**, one end of which is pivotally secured at **56** to the fixed end of each tine **28** while its opposite end is pivotally fixed at **58** to the movable surface **35**. Suitable fluid supply ducts (not shown) connect the fluid motor with a supply of fluid under pressure whereby its supply to the fluid motor extends the movable surface **35** outward so that a load thereon may be moved laterally a distance greater than normally possible. Upon reaching its lateral limit as determined by the travel of fluid motor **42** the load thereon may be lowered on to the rack such as

that shown at **46** by lowering the carriage on the mast whereby the load will be supported by the rack and the movable extension **35** may be withdrawn. Subsequently, the forks **28** are withdrawn from the pallet until there is no interference of the withdrawn forks with the storage rack at either side of the aisle. At this point the entire mast is moved on the overhead tracks down the aisle to a succeeding location where it is again used to either place a load upon the storage rack or to withdraw a load therefrom in the manner above defined.

The stacking crane may thus be used to either place an article on the racks or to remove a stored article therefrom, dependent only upon the will of the operator in cab **48** who controls the position of forks **28** by proper actuation of the driving means.

In order that the forks may be used on both sides of an aisle without rotary or lateral adjustment of the mast, a double "flip" type fork is provided. This fork comprises two sets of tines arranged substantially normal to one another about a pivot rod **37** in accordance with FIG. 2 of the drawing. Turning of the pivot rod about its axis and actuation of either set of forks to a horizontal position may be made by either manual or power driven means in the cab **48** (not shown). By this arrangement the fork is adapted to project horizontally into the space between tiered racks at either side of the mast without movement of the mast, and either place an article on the rack or remove an article therefrom as determined by the operator.

The control panel in cab **48** is movable vertically up or down the mast **10** along with carriage **26**. The cab **48** houses an operator who has access to the control panel for the various motors that control the disposition of the stacker crane. Thus an operator is able to move the lifting device to any spot in a given area and to any vertical elevation with respect to the mast in a minimum of time while utilizing a minimum of space.

While this invention has been described with reference to the accompanying drawings it is readily understood by those skilled in the art that it permits modification within the scope of the appended claim.

I claim:

1. A crane for moving a load both horizontally and vertically comprising in combination an elevated track, a vertically disposed mast depending from said track, trolley means for moving the mast horizontally along the track, a carriage including means for moving said carriage vertically along the mast, a pair of spaced substantially perpendicular arranged support forks being rigidly interconnected to each other at one end thereof, horizontal pivot means mounted at the interconnected ends, means for selectively pivoting said support forks about said pivot means between two operative positions wherein one set of support forks are in a substantially horizontally load carrying positions and the other set of support forks are disposed in a vertical upright position, means for moving the fork horizontally along the carriage, a telescopic extension carried on the tines of each of the support fork, and hydraulic means on the support fork for extending the tines thereof by actuating the telescopic extension whereby a load carried on the telescopic extension may be moved laterally a distance greater than the lateral movement of the support fork on the carriage the lateral movement of the telescopic extension with respect to the fork is substantially less than the lateral movement of the support fork with respect to the carriage.

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