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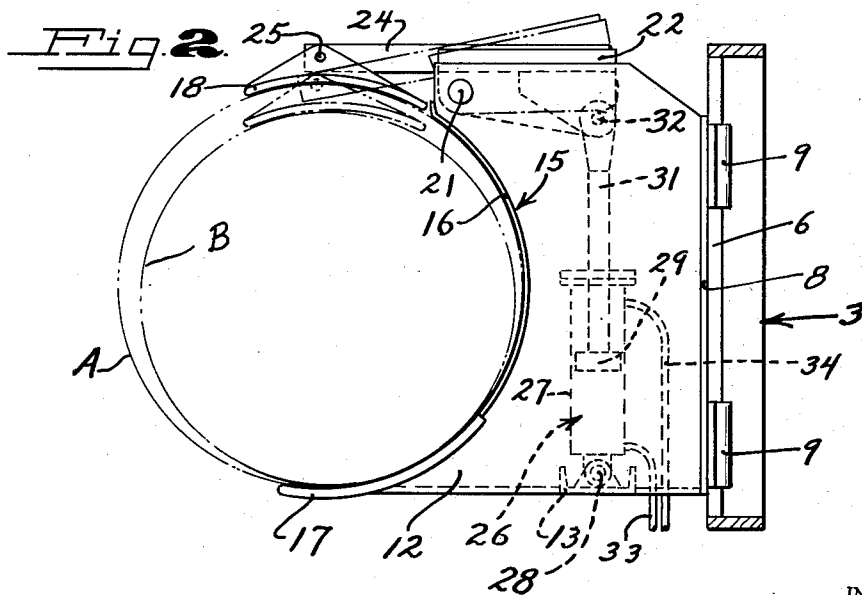
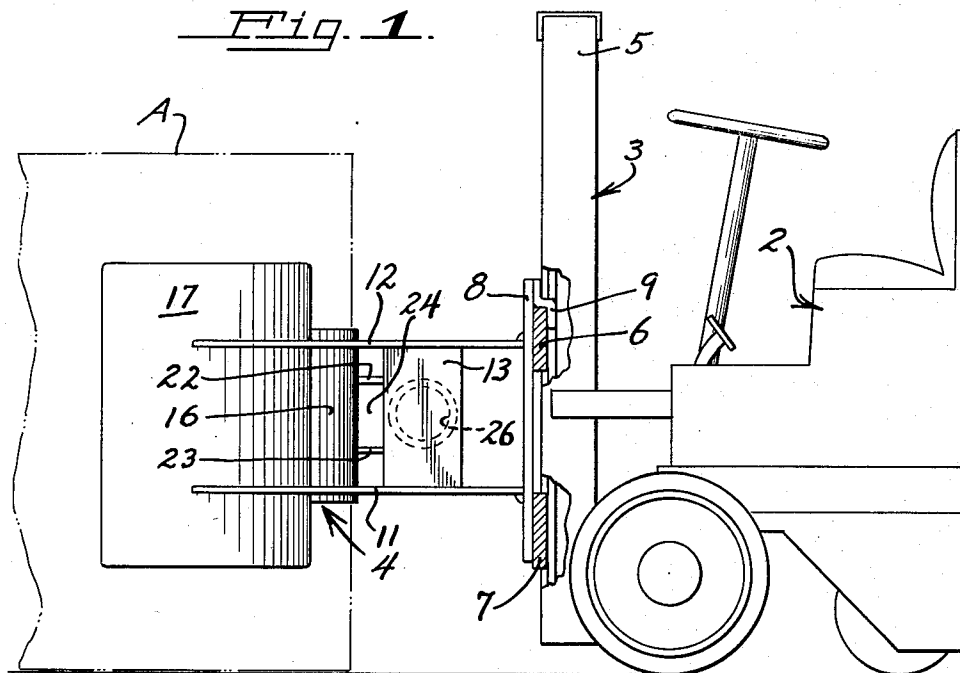
W. W. MacDONALD ET AL

2,667,283

LIFT TRUCK

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3 Sheets-Sheet 1



INVENTOR,
WILLIAM W. MAC DONALD.
JOHN R. POMFRET.
BY
Stephen T. Townsend
ATTORNEY.

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Fig. 3.

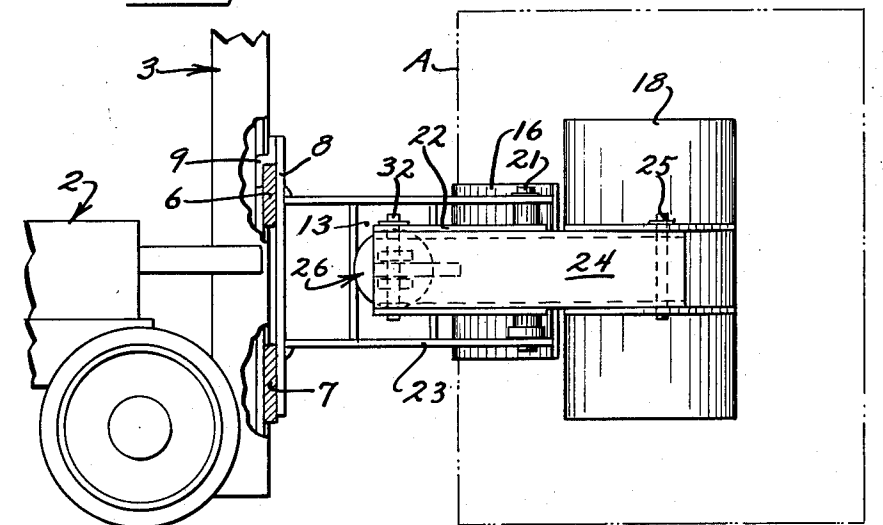
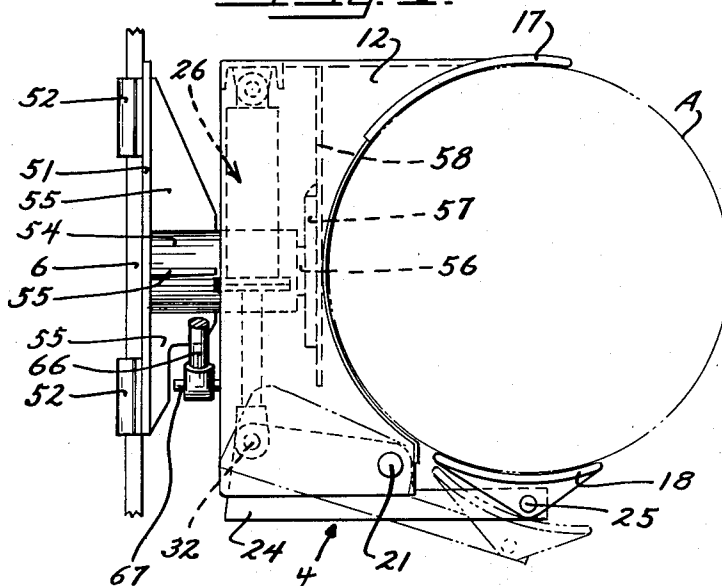


Fig. 4.



INVENTOR,
WILLIAM W. MAC DONALD.
JOHN R. POMFRET.

BY

Stephens-Townsend
ATTORNEY.

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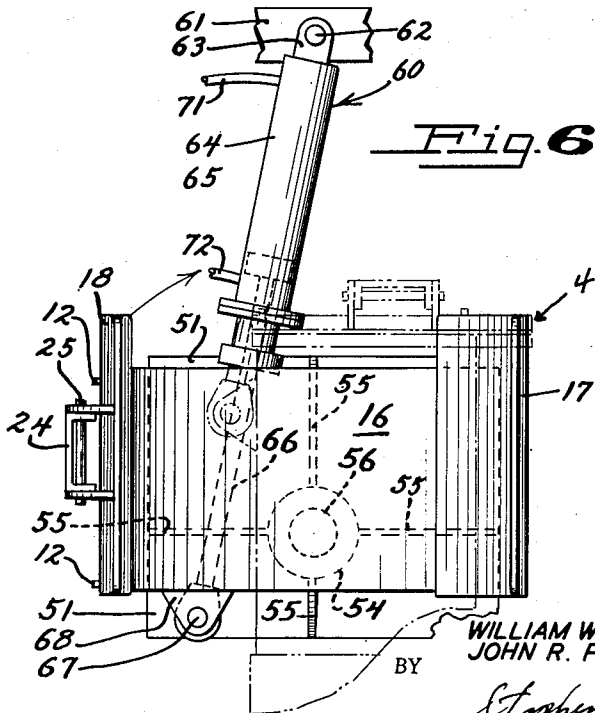
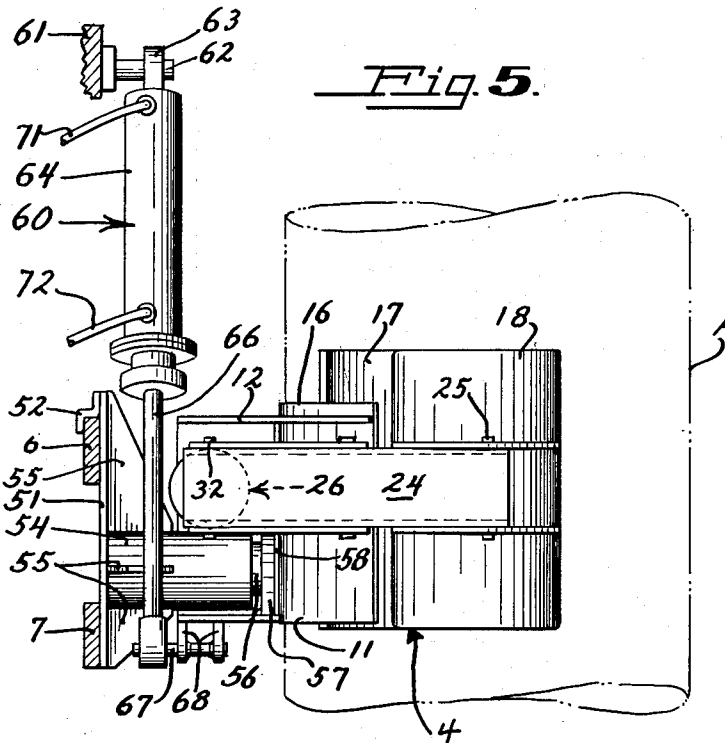
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INVENTOR,
WILLIAM W. MAC DONALD.
JOHN R. POMFRET.

BY

JOHN R. POMFREY.
Stephens. Townsend
 ATTORNEY.

UNITED STATES PATENT OFFICE

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LIFT TRUCK

William W. MacDonald and John R. Pomfret,
San Francisco, Calif., assignors, by mesne as-
signments, to Peterbilt Motors Company, a cor-
poration

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1 Claim. (Cl. 214—653)

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This invention relates to lift trucks, and, more particularly, to improvements in lift trucks adapted to handle rolls of paper, or the like.

A very vexatious problem arises in material handling operations with respect to the transportation, packing and storage of rolls of paper, such as newsprint, or the like. For example, rolls of commercial paper usually weigh from 1000 to 2200 pounds and may weigh up to approximately 8000 pounds. Further, the rolls of paper may vary in the diameter of the rolls very considerably and are difficult to manage, inasmuch as there are no handholds or other means whereby a good purchase could be obtained in order to lift, transport or position the said rolls.

It is common practice, in warehouses and terminals or similar places of material-handling, to utilize lift trucks in order to move the bulky merchandise from place to place at a rapid tempo. However, most lift trucks and clamping mechanisms, in present use, are not suitable to handle rolls of paper. The principal difficulty in handling rolls of paper, by means of heretofore known lift trucks and lifting mechanisms, lies in the fact that the rolls are of great weight, vary in diameter and present a smooth, round surface which does not offer a suitable surface with which to grip the roll. It is possible, of course, to handle rolls of paper by placing the said rolls in a horizontal position and handling them from that position, but to lift a roll and move it when it is upright is a very difficult if not impossible procedure with heretofore known lift trucks.

It is the principal object of the present invention to provide a lift truck with means whereby rolls of paper, or similar objects of great weight, may be lifted, when in upright position, and moved from place to place.

It is a further object of the present invention to provide a lift mechanism, for use on lift trucks, with self-adjustable clamping means whereby rolls of paper of varying diameters may be gripped firmly and securely without manual adjustment of the clamping mechanism.

It is a further object of the present invention to provide a self-adjustable clamp for lift mechanisms for use on lift trucks, or the like, which is entirely safe in operation and which securely holds a roll of paper, or the like, when said roll is in upright position.

It is a further object of the present invention to provide a lift mechanism adapted to grip securely a roll of paper, or the like, while said roll is in an upright position and then, subsequently, rotate the roll through a 90° and place the said roll in a horizontal position.

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A further object of the present invention is to provide a clamping mechanism for lift trucks, or the like, wherein the clamping plates are adapted to adjust themselves automatically to different radii of work being handled, as, for example, rolls of paper of different sizes and types.

A further object of the present invention is to provide a mechanism of the character mentioned, which is rugged in construction, relatively simple to manufacture, assemble and operate and which is comparatively inexpensive.

Further objects and advantages will become apparent upon referring to the specification and accompanying drawings in which similar characters of reference represent corresponding parts in the several views.

Referring to the drawings:

Fig. 1 is a side elevational view of a lift truck having a novel work-clamping mechanism carried thereby.

Fig. 2 is a top plan view of the lift mechanism and clamping mechanism.

Fig. 3 is a side elevational view of a fragmentary part of a lift truck and clamping mechanism taken from a side opposite from that indicated in Fig. 1.

Fig. 4 is a top plan view of a modification of the invention.

Fig. 5 is a side elevational view of the modification illustrated in Fig. 4.

Fig. 6 is a front elevational view of the modification of the clamping mechanism illustrated in Figs. 4 and 5.

As illustrated herein, the novel clamping mechanism is carried by a lift truck, indicated generally at 2, which may be of conventional design and carries at the front end thereof a vertical lift hoist, indicated generally at 3. Carried by the lifting mechanism is a clamping mechanism, indicated generally at 4, which said clamping mechanism is adapted to grip an article to be transported, such as a roll of paper, illustrated generally at A. The lifting mechanism 3 comprises a vertical mast or hoist guide frame 5, which said frame comprises frame plates 6 and 7 which are adapted to be elevated and lowered in unison in the frame at the will of the operator of the truck through a suitable conventional lifting power mechanism and control therefor (not shown).

The clamping mechanism, indicated generally at 4, comprises a vertical plate 8 which carries a shoe 9, which said shoe 9 is adapted to engage the lifting plate 6 so that the clamping mechanism is elevated or lowered in accordance and in unison with the lifting plates 6 and 7.

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The clamping mechanism frame, to which the plate 8 is rigidly affixed, comprises two vertically spaced, horizontally disposed frame plates 11 and 12, having a frame spacer member 13 disposed vertically therebetween and adjacent to one side thereof, and which said spacer member is rigidly affixed to each of said plates 11 and 12.

The fore end plates 11 and 12 are formed arcuately, as at 15, to receive a rigid curved plate 16 which serves as a spacer member for plates 11 and 12, to which it is rigidly attached, and also serves as a work support. A rigid clamping and guide plate 17, forming a continuation of one end of the curved plate 16 and which is rigidly attached thereto, is formed arcuately in accordance with the curvature of plate 17. The rigid clamp 17 is rigidly affixed to the forward portions of plates 11 and 12.

Opposite from plate 17 there is disposed a vertical pivot pin 21, journaled in plates 11 and 12, adjacent to the forward end thereof and disposed therebetween. Rotatably mounted on pin 21 are plates 22 and 23, which said plates are disposed horizontally between plates 11 and 12. Between the plates 22 and 23 and rigidly secured thereto is a channel-shaped arm 24, which said arm 24 extends forwardly beyond plates 11 and 12 and plates 22 and 23 to a position substantially diametrically opposed to the forward end of clamping arm or plate 17. The arm 24 mounts a vertically disposed pivot pin 25, to which is pivotally attached an arcuate clamping plate 18. The clamping plate or arm 17 and clamping plate 18 are provided with load-engaging surfaces having substantially the same degree of curvature as each other and the plate 16. The clamping plate 18, hereinafter sometimes referred to as a "floating plate," is hingedly mounted on the forward end of arm 24 and may pivot freely with respect thereto for self adjustment to the curvature of the load being handled by the lifting apparatus. The movement of the floating plate 18 is indicated in dotted lines in Fig. 2, showing the same as applied to the load B of lesser diameter than that indicated by the reference indicia A. Thus the floating plate insures a tight gripping of work being handled by the device.

It is further noted that the leading edge of the rigid clamp plate 17 extends in a forward direction and is adapted to extend between rolls of paper, or the like, positioned in close proximity to one another, thus serving as an entering wedge to guide or position the roll relative to the clamping plates 17 and 18.

The rotatable arm 24 is actuated from releasing to gripping position, and vice versa, by a hydraulic ram mechanism, generally indicated at 26. The ram mechanism 26 comprises a cylinder 27, which is pivotally connected, as at 28, to frame spacer member 13 for movement in a plane parallel to horizontal plates 11 and 12. Disposed within cylinder 27 is a piston 29, to which is rigidly affixed a piston rod 31, which, in turn, is pivotally connected to a pivot pin 32 mounted on plates 22 and 23 at the rearward end thereof.

The ram mechanism is of the double acting type having a fluid connection, as at 33, at one end thereof and, as at 34, at the other end thereof. The fluid source and valve mechanism to control entry and discharge of hydraulic fluid into and from cylinder 27 are not shown and may be of the conventional type well known in the art. Arm 24, with attached floating plate 18, may be moved arcuately to and from the work handled

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by operation of the ram mechanism 26 through suitable control mechanism conveniently available to the driver of the lift truck.

A modification of the present invention, as shown in Figs. 4, 5 and 6, embodies the features of the invention hereinabove mentioned with respect to the floating plate, rigid plate and movable arm, to which the floating plate is attached. In addition to these features, the modification shows a means whereby the work may be rotated through an arc of 90° after the work has been clamped securely in position and elevated. The ability to rotate work being handled through an arc of 90°, after elevation thereof, is particularly useful in certain material handling operations, such as loading rolls of paper, or the like, on truck beds, or the like.

The modification of the invention illustrated in Figs. 4, 5 and 6 utilizes the same construction generally as that described with reference to the invention disclosed in Figs. 1, 2 and 3, and, therefore, reference numerals referring to common parts will be used. The modification comprises a rigid vertical plate 51 which carries shoes 52 adapted to coact with the plate 6 in the same manner described with reference to Figs. 1, 2 and 3. Affixed rigidly to the plate 51 and extending at right angles thereto is a hub 54, provided with radially extending, strengthening ribs 55, which said ribs also are rigidly secured to the plate 51. Disposed rotatably within the bearing hub 54 is an axle stub 56, formed with an annular flange 57 at the forward end thereto. The hub 54 extends forwardly between the plates 11 and 12 of the clamping mechanism, generally indicated at 4, and which has heretofore been fully described. Rigidly positioned between the plates 11 and 12 and secured thereto is a transverse plate 58, to which is rigidly mounted the flange 57. Thus rotation of axle 56, with respect to hub 54, will cause rotation of the entire clamping mechanism 4.

The mechanism for causing rotation of the clamping mechanism about the horizontal axis of the hub 54, which is indicated generally at 60 in Figs. 5 and 6, will now be described. Attached to the upper front portion of the elevating device, as indicated at 61, and which said device travels in unison with the lifting plates 6 in the hoist mast, is a forwardly projecting pin 62, to which is pivotally mounted, as at 63, a hydraulic cylinder 64. The cylinder 64 contains a piston head 65, to which is attached rigidly a piston rod 66, which, in turn, is pivotally connected to a pin 67, which said pin is rigidly secured to the bottom of plate 11 adjacent to one side thereof near the rear. The actuating mechanism 60 comprises the cylinder 64 of the double-acting type, having a point of entry, as at 71 and 72, at opposite ends thereof. The source of hydraulic fluid and the valve control mechanism adapted to control the movement of the piston rod are not shown, and which said source and mechanism may be of suitable conventional type well known in the art. Thus, upon actuation of the piston 65, the clamping mechanism may be rotated about the axis of axle 56, as illustrated in dotted lines in Fig. 6.

In operation, the clamping mechanism is positioned about the load to be handled and the floating plate 18 adjusts itself automatically to the degree of curvature of the said load. The operator of the lifting device then actuates the ram assembly 26 in order to move the arm 24 to a clamping position relative to the work and rigid

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arm 17. The clamp mechanism is then elevated in the usual fashion through the hoisting mechanism 3. After the load has been elevated, the operator of the lift truck may then actuate the ram mechanism 60, through suitable conventional control means (not shown) in order to rotate the clamping mechanism about the axis of rotation of axle 56 in order to position the load in a horizontal position, as indicated in dotted lines in Fig. 6. The operator may, of course, reverse the movement of the piston 65 and piston rod 66 in order to return the load being handled to a vertical or upright position, thence lower the same by means of the lifting mechanism, and then release the load by return operation of piston 29 and rod 31.

One of the main advantages of the present invention is the ability of the device to position a roll of paper, or the like, with respect to the clamping plates. Thus, if rolls of paper, or like material, are stacked side by side in close proximity to each other, the rigid clamp or guide plate 17 serves as an entering wedge between adjacent rolls of paper, or the like, in order to pry them apart and position the article to be lifted relative to the clamping mechanism. Further, assuming that the rolls of paper to be transported are in horizontal position, the modified form of the present invention may be rotated to position the leading edge of the rigid plate parallel to the lower surface of the roll and may then be wedged beneath the roll to serve as a scoop in order to position the said roll relative to the clamping mechanism. Then the arm 24 may be actuated to clamp the floating plate 18 against the upper surface of the roll in order to grip the same securely. Thereafter the roll may be elevated by the lifting mechanism and, once elevated, may be transported in horizontal position, or the clamping mechanism may be rotated to position the roll in upright or vertical position.

The "floating plate" 18 is very important in order to grip securely the load being transported. Particularly advantageous is the function of the floating plate in use with rolls of paper of varying diameter and wherein the sides of the rolls vary from one another in degree of curvature. The floating plate adjusts itself to the particular curvature of the surface to be gripped without need of manual adjustment thereof and enables an effective clamping pressure to be exerted against the roll of paper, or the like, to insure a positive grip. For example, to lift glossy or smooth-finish paper rolls, a positive grip is essential in order to insure safe and economic

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transport. The present "floating plate" clamp arrangement operates effectively and satisfies the requirement of a positive gripping position of clamping members relative to load even when handling rolls of different diameters.

The invention has been described in specific detail with respect to assembly and construction by way of example and illustration for purposes of clarity of description and understanding, but it is understood that various changes, alterations and modifications in structure and assembly may be practiced within the spirit of the invention and scope of the appended claim.

We claim:

In a lift truck having a hoisting mechanism, the combination of a rigid frame, a connection to connect said frame to said hoisting mechanism comprising a rotatable element, a rigid arm having an arcuate load engaging surface connected rigidly to said frame, a movable arm connected pivotally to said frame and spaced from said rigid arm, a clamp plate having an arcuate load engaging surface mounted pivotally on said movable arm, an arcuate load support connected rigidly to said frame and disposed between said rigid arm and said plate, means connected to said frame to move said movable arm and plate toward and away from said rigid arm, and means connected to said frame to rotate said frame and attached arms about the axis of rotation of said rotatable element, said last named means comprising a cylinder secured pivotally to said lift truck, and a piston having a piston rod reciprocal in said cylinder, said piston rod connected pivotally to said frame.

WILLIAM W. MacDONALD.
JOHN R. POMFRET.

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