

Jan. 27, 1959

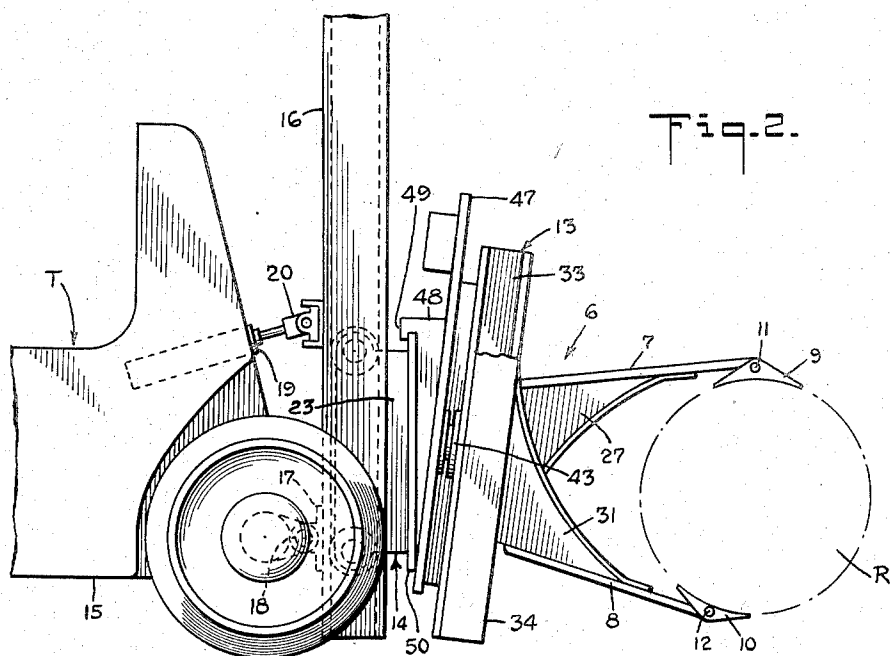
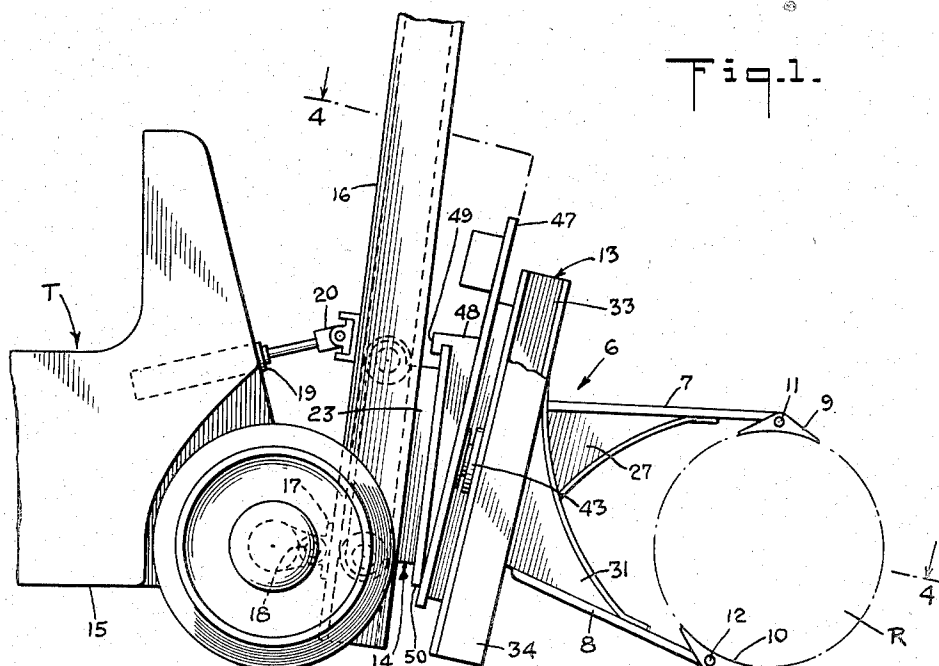
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2,870,929

LOAD MANIPULATING DEVICE FOR LIFT TRUCK

Filed Sept. 25, 1956

3 Sheets-Sheet 1



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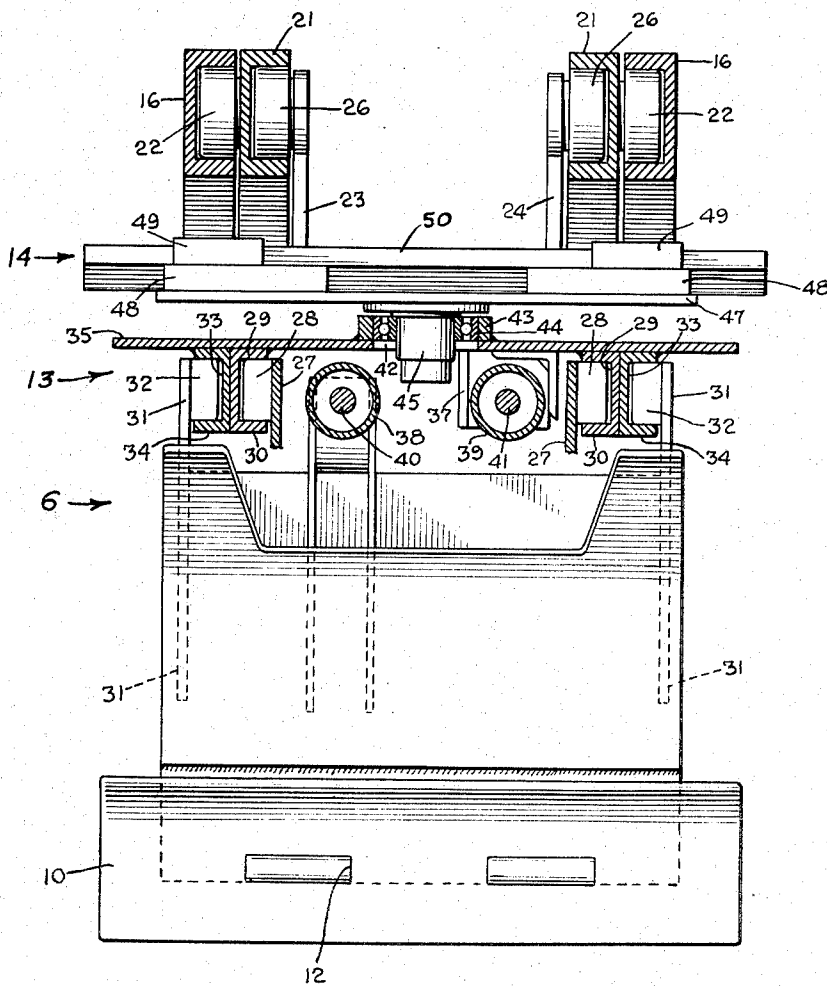
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Fig. 4.



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3 Sheets-Sheet 3

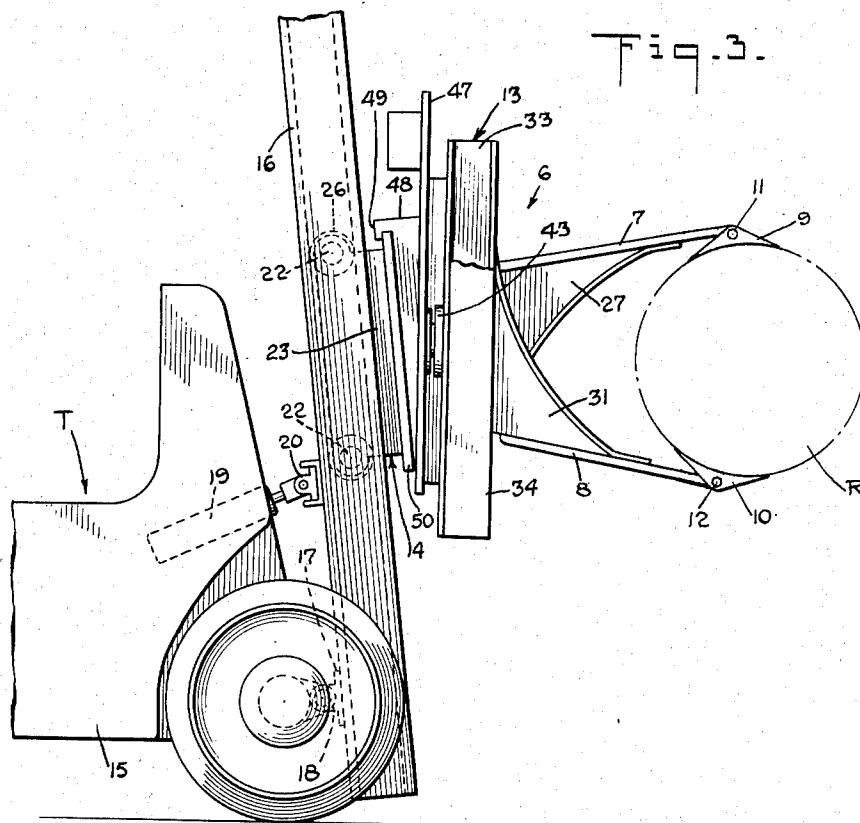
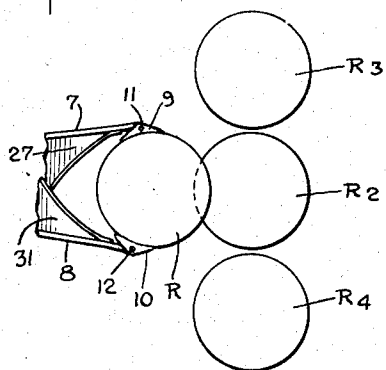


Fig. 5.



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LOAD MANIPULATING DEVICE FOR LIFT TRUCK

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8 Claims. (Cl. 214—652)

This invention relates to a lift truck of the class in which a load manipulating device is mounted on a carriage that moves vertically upon suitable uprights. More particularly, this invention relates to a load manipulating device especially adapted for handling cylindrical loads such as rolls of paper, drums for solids or liquids, and cylinders for storing oxygen or other gases under pressure, all hereinafter referred to as cylindrical loads. To transport a cylindrical load from one place to another, it must first be picked up by the load manipulating device from the floor or ground either when it is standing on end, in which position the axis of the cylindrical load is vertical, or when it is lying on the floor or ground, in which position the axis of the cylindrical load is horizontal. In many cases, once the cylindrical load is picked off the floor or ground, it must be rotated into a different position for stacking. The stacking often must take place in limited areas such as in freight cars or in warehouses having extremely narrow aisles, so that the handling operation becomes very intricate and difficult.

While industrial trucks of the prior art have used spaced clamping arms for handling cylindrical loads, the arrangement of the clamping arms left much to be desired with regard to manageability for picking up said loads. Thus, when a cylindrical load is lying in a horizontal position on the floor or ground, it is very difficult to grab it through the utilization of a pair of spaced clamping arms unless the upper clamping arm overreaches the lower clamping arm so as to be in a position to force the cylindrical load toward the truck and the lower clamping arm. Thereafter, if the cylindrical load is to be stacked vertically, the overreaching of one arm is an obstacle since both clamping arms should extend the same distance from the truck in order to place the vertical cylindrical load in proper compactly stacked relation beside a series of like loads. Similarly, clamping arms of unequal length make it difficult to pick up and transport a vertically positioned cylindrical load. In other words, it is quite apparent to those skilled in the art that in the handling of a cylindrical load in one position, it is highly desirable that the clamping arms be of different length, while in the handling of those loads in another position, it is important that the clamping arms be of the same length. Heretofore in trucks of the type of which my invention relates, it has been the custom to make one clamping arm longer than the other, generally about eight inches longer. This is obviously an arrangement in the nature of a compromise since such an arrangement hinders vertical stacking.

It is the object of this invention to provide an improved load manipulating device for a lift truck of the class described that will facilitate the handling of cylindrical loads and the stacking of the loads in any desired position.

As a feature of my invention, I utilize on the load manipulating device a pair of clamping arms that are so mounted as to be of equal or nearly equal length, but

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with means whereby one arm can overreach the other. While utilizing that arrangement, I am able nevertheless to lift and to stack the load with the uprights of the truck nearly vertical so that the uprights will not by their position interfere with the handling of the load.

In brief, I mount the clamping arms of my invention on a load carriage for vertical movement on the usual uprights of an industrial truck, the clamping arms being further adapted for rotation relatively to said load carriage. As a particular feature of my invention, the clamping arms, while of the same length, are tilted forwardly relatively to the load carriage. The arrangement is such that the arms, when rotated to vertical position with the uprights vertical, will be tilted a few degrees away from the horizontal. The extent of tilt of the clamping arms that I found preferable is six degrees. It will then be obvious that, with the truck uprights substantially vertical, one of the equal clamping arms will overreach the other. Moreover, when the uprights are tilted forward six degrees, the clamping arms of my clamp will be in a position tilted twelve degrees. Thus, there will be a rather considerable overreach of the upper clamping arm relatively to the lower clamping arm so that a cylindrical load lying on the floor or ground with its axis horizontal may be readily clamped.

Now, when it is desired to stack the cylindrical load in a vertical position, the uprights need only to be tilted back six degrees from their normal vertical position, thus bringing the cylindrical load being handled into full vertical position. In other words, that tilting of the uprights will compensate for the six degree tilt of the clamp arms. Those skilled in the art will appreciate that the rearward tilt of six degrees of the uprights will not be such as to hinder the stacking of the load, even to a relatively high position. Therefore, through the particular arrangement that I have conceived by my invention, I am able to contribute the overreaching required for handling cylindrical loads lying in a horizontal position while obtaining the uniform clamping arm length required for vertical stacking.

Those skilled in the art will appreciate that it is possible to obtain a twelve degree positioning of the clamping arms without the angular arm mounting that I utilize in my invention. For example, the uprights may be designed to tilt forward twelve degrees, but such movement forward of the load clamp and the uprights is not advisable since it will tend to upset the balance of the truck and will require the utilization of large counterweights. Those skilled in the art will further appreciate that, theoretically, the load clamp may be mounted at a larger angle than I have set forth above so as to require no forward tilting of the uprights in order to handle a horizontally positioned cylindrical load. Thus, conceivably, the load clamp might be mounted at an angle of twelve degrees relatively to the uprights so as not to require any tilting of the uprights forwardly in order to place the clamp in position to clamp a horizontal cylindrical load. However, that would require a rearward tilting of the uprights twelve degrees in order to hold the cylindrical load vertically for vertical stacking. A rearward twelve degree tilt of the uprights would be quite serious, because the load would then be moved rearwardly away from a particularly location as it was elevated, thereby preventing effective stacking. In view of this, the novel and ingenious concept that I have developed contributes a clamping arrangement that is effective for all purposes, and has very considerable advantages over the prior art.

The foregoing is a rather broad outline of the important features of my invention and has been presented in order that the detailed description thereof that follows may be better understood, and in order that my contribu-

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tion to the art may be better appreciated. There are, of course, additional features of my invention that will be described hereinafter and which will form the subject of the claims appended thereto. Those skilled in the art will appreciate that the conception on which my disclosure is based may be readily utilized as a basis for the designing of other structures for carrying out the purposes of my invention. It is important, therefore, that the claims be regarded as including such equivalent constructions as do not depart from the spirit and scope of my invention, in order to prevent the appropriation of my invention by those skilled in the art.

Referring now to the drawings, wherein certain elements not essential to the understanding of my invention have been omitted in the interest of clarity:

Fig. 1 is a side view showing my novel load clamp mounted on a truck, with the clamp in position to pick up a horizontal load;

Figs. 2 and 3 are similar to Fig. 1, but show the movements of my load clamp when lifting the load;

Fig. 4 is a cross section on the broken line 4—4 in Fig. 1;

Fig. 5 is a diagrammatic plan view showing the stacking of a load.

Referring now more particularly to Figs. 1, 2, and 3 of the drawings, I indicate my novel load clamp generally by the numeral 6, that clamp having an upper clamping arm 7 and a lower clamping arm 8 of substantially the same length. I prefer to equip the clamping arms 7, 8, with load contacting pads 9, 10, that are pivoted at 11, 12, whereby to be self adjusting relatively to the load surface. To facilitate an understanding of my invention, I shall first state briefly that the load clamp 6 is mounted through conventional load rotating means 13 on a lifting carriage 14 that moves vertically on lift truck T. In Fig. 1, I show clamping arms 7 and 8 clamping a roll of paper R that rests on the ground. In Figs. 2 and 3, the clamped roll R has been lifted to different heights. In Fig. 5, the clamping arms 7, 8 have been rotated to position the roll of paper R vertically preparatory to stacking the same relatively to other rolls of paper R₂, R₃, R₄.

The lifting carriage 14 and its mounting on the truck T actually are conventional, but to appreciate my invention it is necessary to realize that truck T has a main frame 15 on which a pair of primary uprights 16 will tilt, as through brackets 17 on pivots 18. The tilting of uprights 16 may be effected through tilt rams 19 which are suitably connected at 20 to the primary uprights 16, as will be understood by persons acquainted with the art. I have chosen to show also a pair of secondary uprights 21, Fig. 4, that are equipped with rollers 22 moving in the channels of uprights 16 whereby the secondary uprights will be extended relatively to the primary uprights, but those secondary uprights 21 are not essential to my invention and one pair of uprights will suffice. The carriage 14 has brackets 23 and 24 on which are rollers 26 that are engaged in the channels of secondary uprights 21, as shown in Fig. 4, to mount the carriage 14 for vertical movement. Carriage 14 will be moved vertically through conventional means, not shown, as will be well understood by those skilled in the art. It is merely necessary to know here that carriage 14 will have lifting movement, and will also tilt through tilting of the truck uprights on pivots 18.

The clamping arms 7, 8 of load clamp 6 may be mounted for movement relatively to one another by those means that are shown in the prior art. I have chosen to show the clamping arm 7 constructed with wings 27, Figs. 1 to 4, the ends of those wings having slide blocks 28 that are guided in the channels 29 of channel members 30. The lower clamping arm 8 similarly has wings 31 with slide blocks 32 that are guided in the channels 33 of channel members 34. The channel members 30 and 34 are fixed to a rotator plate 35,

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and on this plate 35 are suitable brackets 37, one of which is shown in Fig. 4, carrying hydraulic ram assemblies 38 and 39. The ram piston 40 of hydraulic ram assembly 38 and ram piston 41 of the hydraulic ram assembly 39 are suitably fixed to their respective clamping arms. The rams 40, 41 by their movement will effect necessary movement of the clamping arms 7 and 8 relatively to one another whereby to clamp or to release a load, as will be appreciated by those skilled in the art.

As shown in Fig. 4, the rotator plate 35 is formed with an opening 42 substantially centrally thereof, and has an integral mounting sleeve 43 around said opening 42 for a ball bearing 44. I further utilize a base member or plate 47 having an integral stub shaft 45 assembled to bearing 44 whereby to support the rotator plate 35 and clamp arms 7, 8, for rotation. Actually, I can utilize in my invention any type of rotating and mounting means for the clamp arms 7, 8, and I have described particular means simply for purposes of disclosure. It is important at this point to know simply that my clamp arms 7, 8 will rotate bodily, while mounted for vertical movement on the truck T.

I shall now describe the extremely novel concept of my invention. As will be seen in Figs. 1, 2, 3 and 4, the base plate 47 has fixed thereto a pair of wedge-shaped brackets or hangers 48 which taper vertically from top to bottom. The top of each bracket 48 has a hooked portion 49, the nose of which is adapted to hook over the top edge of the front plate 50 of the load carriage 14. The lower portions of the tapered brackets 48 will then rest against the carriage front plate 50, thus supporting the clamp arms 7, 8, in a position that is downwardly tilted a few degrees. I have found that I achieve excellent results when the degree of tilt between load clamp 6 and truck uprights 16 is six degrees. Of course, I do not wish to be limited to the particular tapered brackets 48 for achieving the tilt I have described, since it is conceivable that other means may be utilized to effect a tilted mounting of the clamp arms.

I shall now describe the operation of my novel load clamp in order that my invention may be more fully appreciated. Thus, as will be apparent from the foregoing description, with the upright 16 of the truck T in their normal, substantially vertical position, and the clamping arms 7 and 8 rotated into vertical alignment as in Fig. 2, the upper clamping arm 7 will overreach the lower clamping arm 8 somewhat. That is due to the fact that the clamping arms 7, 8, are mounted on the load carriage 14 at an angle to the uprights 16. Now, assuming first that it is desired to handle a roll of paper R that lies in a horizontal position on the floor or ground, the uprights 16 are tilted forward to the position shown in Fig. 1. That is, uprights 16 are tilted about six degrees from their normal vertical position by tilt rams 19, thereby causing the clamping arms 7, 8 to be tilted forward a total of twelve degrees. The overreach of upper clamping arm 7 will then be considerable, relatively to the lower clamping arm 8. To clamp roll of paper R as it is lying on the floor or ground, the truck, with the clamping arms in vertical alignment and spaced apart a distance slightly greater than the diameter of roll R, is first moved toward said roll R. The thin forward edge of pivoted pad 10 on lower clamping arm 8 will then come into contact with roll R. The clamping arms 7 and 8 are then caused to move relatively to each other and the upper clamping arm 7, because of its twelve degree overreach, will clamp the roll R against said pad 10 through the action of pivoted pad 9 on said clamping arm 7. Thereby the roll R will be firmly clamped between clamping arms 7 and 8 as is shown in Fig. 1.

To transport the clamped roll R, the uprights 16 will be tilted rearwardly, passing first through the position shown in Fig. 2 whereby to lift roll R from the ground, and then to the position shown in Fig. 3. The load car-

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riage 14 will be moved vertically on the uprights 16 as shown in Fig. 3, whereby to lift the clamp arms 7, 8 and roll R to a desired height. It may be noted at this point that clamp arms 7, 8 when lifted will move rearwardly, due to the rearward tilt of the uprights 16. Thereby the roll R moves rearwardly toward the truck, enabling me actually to increase the stability of the truck. If it is desired to stack the roll R in a vertical position, the clamp assembly is rotated through 90 degrees to the position indicated in Fig. 5. To compensate for the six degree tilt of the clamp attachment, the uprights 16 need only to be tilted rearwardly six degrees from their normal vertical position to bring the roll R into full vertical position. With the uprights 16 thus tilted rearwardly, and with the clamp assembly holding the roll R in vertical position, the truck moves forward so that it can place the said roll on top of and in vertical alignment with the roll R₂ on which it is to rest. Since the rearward tilt of uprights 16 is merely six degrees, that tilt does not hinder the stacking of the roll R even when it is raised to a relatively high position. Accordingly, through the use in my invention of clamping arms of substantially the same length, I am able not only to obtain the overreach required for handling cylindrical loads that lie in a horizontal position, but I achieve also the uniform clamping arm length required for vertical stacking.

To pick up the roll R when that roll stands between juxtaposed rolls R₃, R₄, Fig. 5, the clamping arms 7 and 8 are spread apart a distance slightly greater than the diameter of roll R, with those arms vertical as in Fig. 5 so that they have the same effective length, and the uprights 16 tilted backwards six degrees from the vertical. The truck is then driven forward to move the pads 9 and 10 on clamping arms 7 and 8 into juxtaposed relation to opposed sides of the roll that is to be picked up. It is extremely important to realize that, since the arms 7, 8 are the same length, those arms do not need to extend substantially past the diameter of the roll when in gripping relation to that roll. Thus, the clamp pads 9 and 10 can act when the rolls are stacked side by side with relatively little space between them, as in Fig. 5. Therefore, I am able to handle a vertical load when other loads are stacked in closely juxtaposed relation to both sides of the load that is to be handled. It will be understood from the description I have already made that, upon picking up and transporting the vertical load, my clamp can deposit the load in either vertical or horizontal position. If, for example, it is desired to place the load in a horizontal position on the ground, the clamp arms 7, 8 and load R will simply be rotated 90 degrees to horizontal position, as in Fig. 3, and then the uprights 16 will be tilted forward six degrees and the load carriage 14 lowered to the position shown in Fig. 1. In that position, the roll R will readily roll off the pad 10 when the clamping arms 7, 8 are caused to move relatively away from each other.

I believe that the operation of my extremely novel load manipulating device will now be fully understood, and that those skilled in the art will have no difficulty in appreciating the very considerable value of my invention. I wish to emphasize, however, that my invention is not limited to the precise details that I have shown, and it is necessary to realize merely that my contribution resides in the concept of means that will rotate a cylindrical load between horizontal and vertical positions, and that will handle the load in either of those positions, while requiring almost no space at the sides of the load for moving into engagement with that load. These things I am able to accomplish through structure that actually is rather simple, utilizing my exceedingly novel inventive concept.

I now claim:

1. In a truck of the class described, a pair of uprights, means for tilting said uprights, a carriage mounted

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for movement on said uprights in a linear direction determined by the vertical position of said uprights, a pair of clamping arms, means mounting said clamping arms to rotate with one another on said carriage and also to move relatively to one another for gripping a cylindrical load therebetween, a portion of said mounting means lying at an angle of six degrees to said uprights whereby to hold said clamping arms equidistant longitudinally from said truck when said uprights are tilted rearwardly six degrees from their normal vertical position, and said mounting means by so holding the clamping arms causing one of said clamping arms to overreach the other when said clamping arms are in vertically aligned relation and said uprights are in their normal vertical position on said truck.

2. In a truck of the class described, a pair of uprights, means for tilting said uprights, a carriage mounted for movement on said uprights in a linear direction determined by the vertical position of said uprights, a pair of clamping arms, means mounting said clamping arms to rotate with one another on said carriage and also to move relatively to one another for gripping a cylindrical load, a portion of said mounting means lying at an angle of six degrees to said uprights whereby to hold said clamping arms equidistant longitudinally from said truck when said uprights are tilted rearwardly six degrees from their normal vertical position, and said mounting means by so holding the clamping arms causing one of said clamping arms to overreach the other an appreciable distance when said clamping arms are in vertically aligned relation and said uprights are in their normal vertical position, with said one arm overreaching the other to a greater extent when said uprights are tilted forward six degrees from their normal vertical position on said truck.

3. In a truck of the class described, a pair of uprights, means for tilting said uprights, a carriage mounted for movement on said uprights in a linear direction determined by the vertical position of said uprights, a pair of clamping arms, means mounting said clamping arms to rotate with one another on said carriage and also to move relatively to one another for gripping a cylindrical load, said mounting means including a support for said clamping arms and a wedge-shaped bracket between said support and said carriage, said wedge-shaped bracket having its widest part at the top thereof to hold said support at an angle of six degrees to said uprights whereby to place said clamping arms equidistant longitudinally from said truck when said uprights are tilted rearwardly six degrees from their normal vertical position, and said bracket by so holding the support causing one of said clamping arms to overreach the other when said clamping arms are in vertically aligned relation and said uprights are tilted forward six degrees from their normal vertical position.

4. In a truck of the class described, a pair of uprights, means for tilting said uprights, a carriage mounted for movement on said uprights in a linear direction determined by the vertical position of said uprights, a pair of clamping arms of substantially equal length, means mounting said clamping arms to rotate with one another in a particular axis on said carriage and also to move relatively to one another for gripping a cylindrical load, said mounting means including a support for said clamping arms and wedge-shaped brackets between said support and said carriage to hold said support at an angle relatively to said uprights, said brackets by so holding the support placing said clamping arms equidistant longitudinally from said truck in any position to which the arms are rotated when said uprights are tilted rearwardly to compensate for said angle of the support, and said mounting means causing one of said clamping arms to overreach the other when said clamping arms are rotated into vertically aligned relation and said uprights are in their normal vertical position.

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5. In a truck of the class described, a pair of uprights, means for tilting said uprights, a carriage mounted for movement on said uprights in a linear direction determined by the vertical position of said uprights, a pair of clamping arms, means mounting said clamping arms to rotate with one another in a common axis on said carriage and also to move relatively to one another for gripping a cylindrical load, and said arms extending lengthwise substantially equal distances from a plane perpendicular to the said axis of rotation, the improvement that comprises a portion on said mounting means so holding the axis in which the arms rotate that said axis is horizontal when said uprights are tilted rearwardly a predetermined distance, and said portion causing said axis to lie at an angle downwardly when said uprights are vertical whereby to place one of said clamping arms in overreaching relation to the other when said clamping arms are in one rotated position relatively to said carriage.

6. In a truck of the class described, a pair of uprights, means for tilting said uprights, a carriage mounted for movement on said uprights in a linear direction determined by the vertical position of said uprights, a pair of clamping arms, and means mounting said clamping arms to rotate with one another in a common axis on said carriage and also to move relatively to one another for gripping a cylindrical load therebetween, the improvement that comprises a portion on said mounting means so holding the axis in which the arms rotate that said axis is horizontal when said uprights are tilted rearwardly a predetermined distance, and said portion causing said axis to lie at an angle downwardly when said uprights are vertical whereby to place one of said clamping arms in overreaching relation to the other when said clamping arms are in one rotated position relatively to said carriage.

7. In a truck of the class described, a pair of uprights, means for tilting said uprights relatively to the truck, a carriage mounted for movement on said uprights in a linear direction determined by the vertical position of said uprights, a pair of clamping arms, means mounting

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said clamping arms to rotate with one another on said carriage and also to move relatively to one another for gripping a cylindrical load therebetween, said mounting means including a portion so holding said clamping arms that said arms extend forwardly substantially equal distances relatively to said truck in the positions to which said arms rotate when said uprights are in a predetermined rearwardly tilted position, said portion of the mounting means by so holding the clamping arms enabling said arms to clamp a vertical cylindrical load that is stacked in closely juxtaposed relation to other loads, and one of said clamping arms overreaching the other arm through movement of said uprights away from their rearwardly tilted position whereby to enable said arms to clamp a load that is horizontally positioned on the ground.

8. In a truck of the class described, a pair of uprights, means for tilting said uprights relatively to the truck, a carriage mounted for movement on said uprights in a linear direction determined by the vertical position of said uprights, a pair of clamping arms, means mounting said clamping arms to rotate with one another in a particular axis on said carriage and also to move relatively to one another for gripping a cylindrical load therebetween, said mounting means including a portion tapered inwardly and downwardly to lie at an angle to said uprights whereby to hold horizontal the axis of rotation of said arms when said uprights are tilted rearwardly a predetermined amount, said clamping arms then adapted to clamp and to rotate a load vertically, and one of said clamping arms overreaching the other through movement of said uprights away from their rearwardly tilted position.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 22,895	Clapp	July 8, 1947
2,494,505	Bouchar	Jan. 10, 1950
2,604,220	Frischmann	July 22, 1952
2,724,520	Overbeck	Nov. 22, 1955