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D. H. NORTON ETAL

3,015,402

VERTICAL-HORIZONTAL FORKLIFT DRUM HANDLING ATTACHMENT

Filed June 5, 1959

4 Sheets-Sheet 1

FIG. 1.

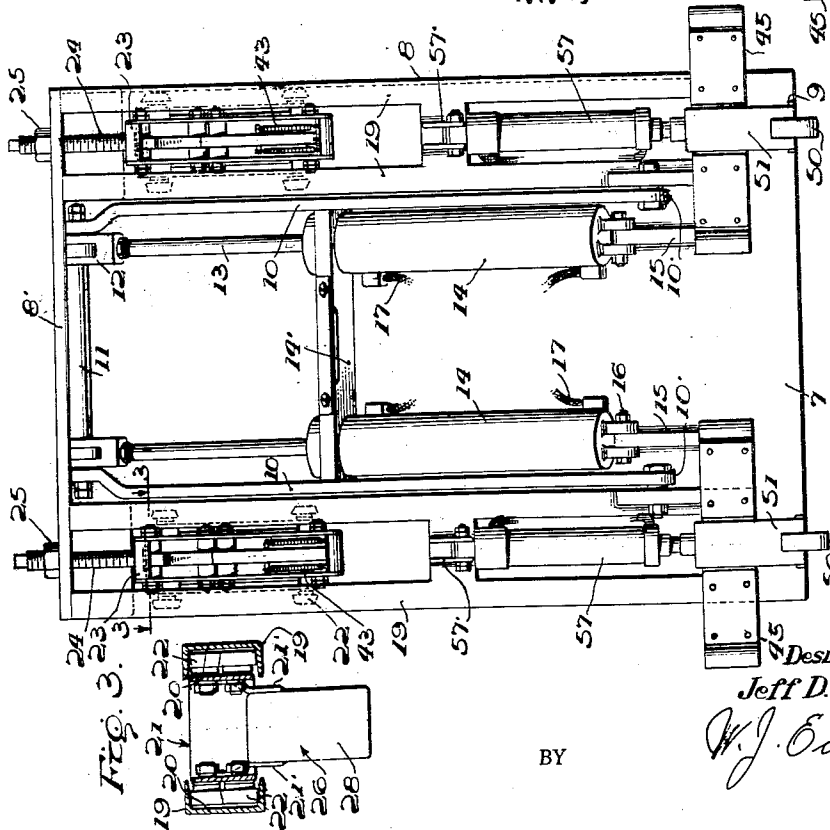
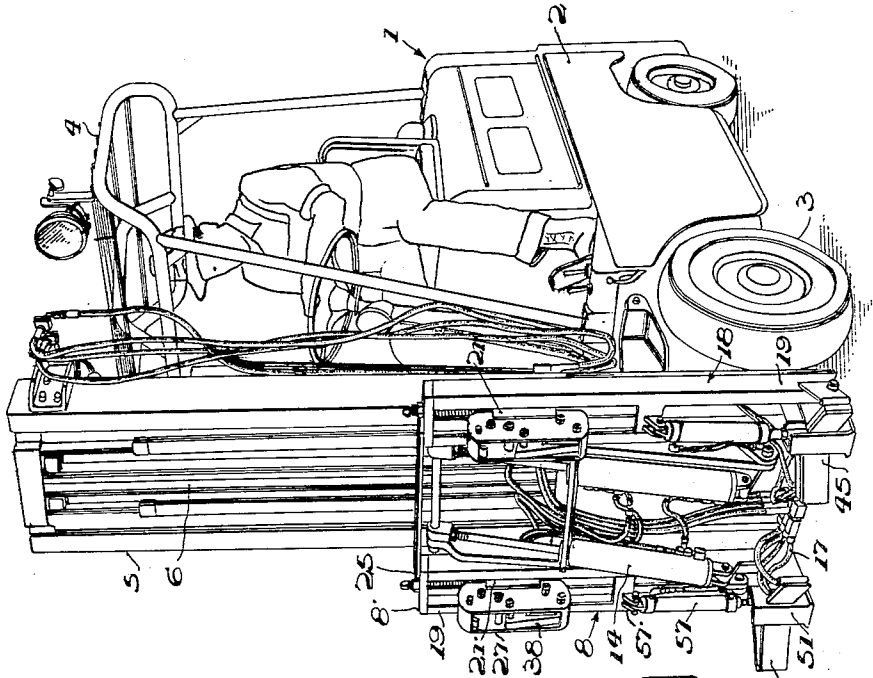


FIG. 2.

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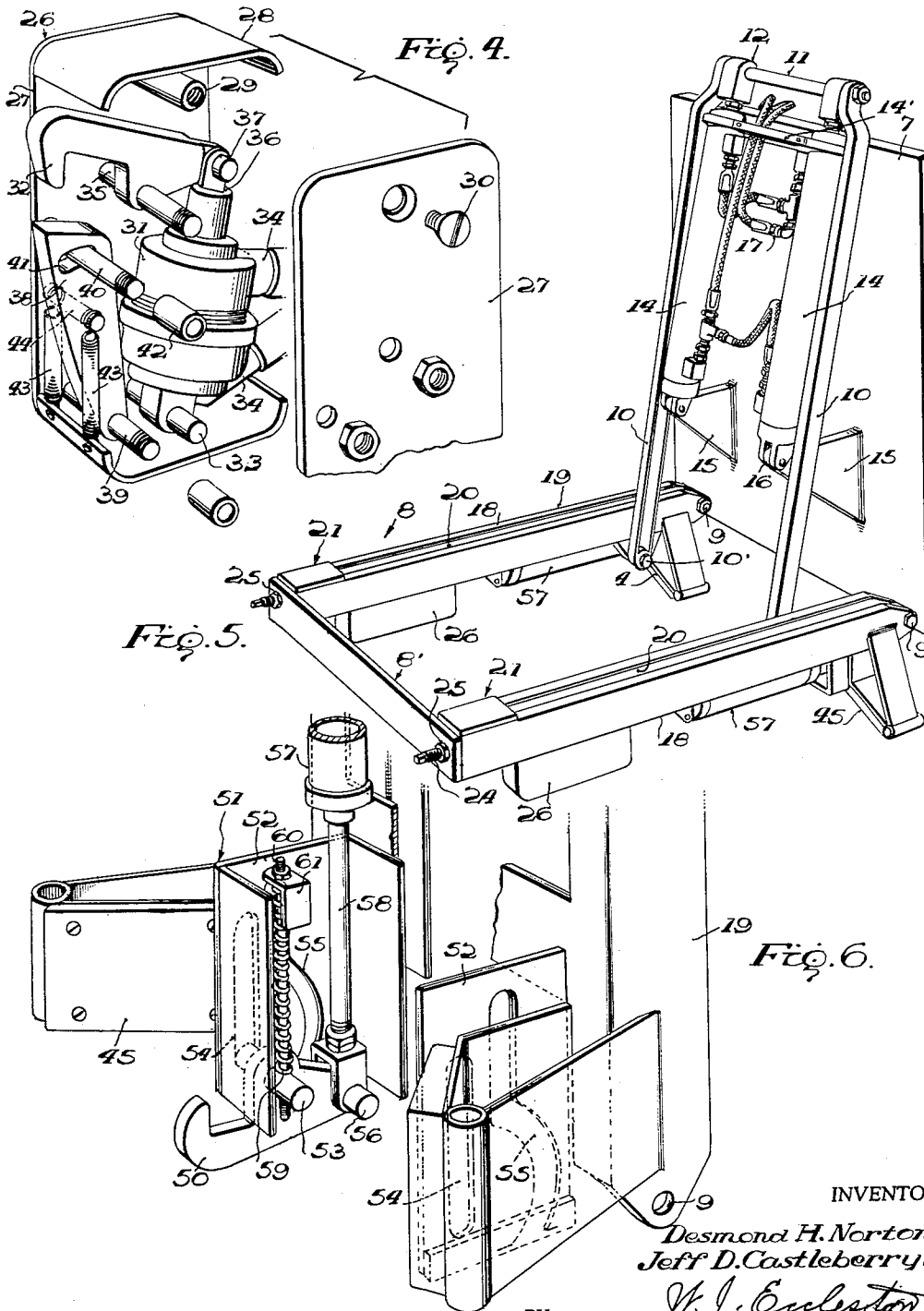
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4 Sheets-Sheet 2



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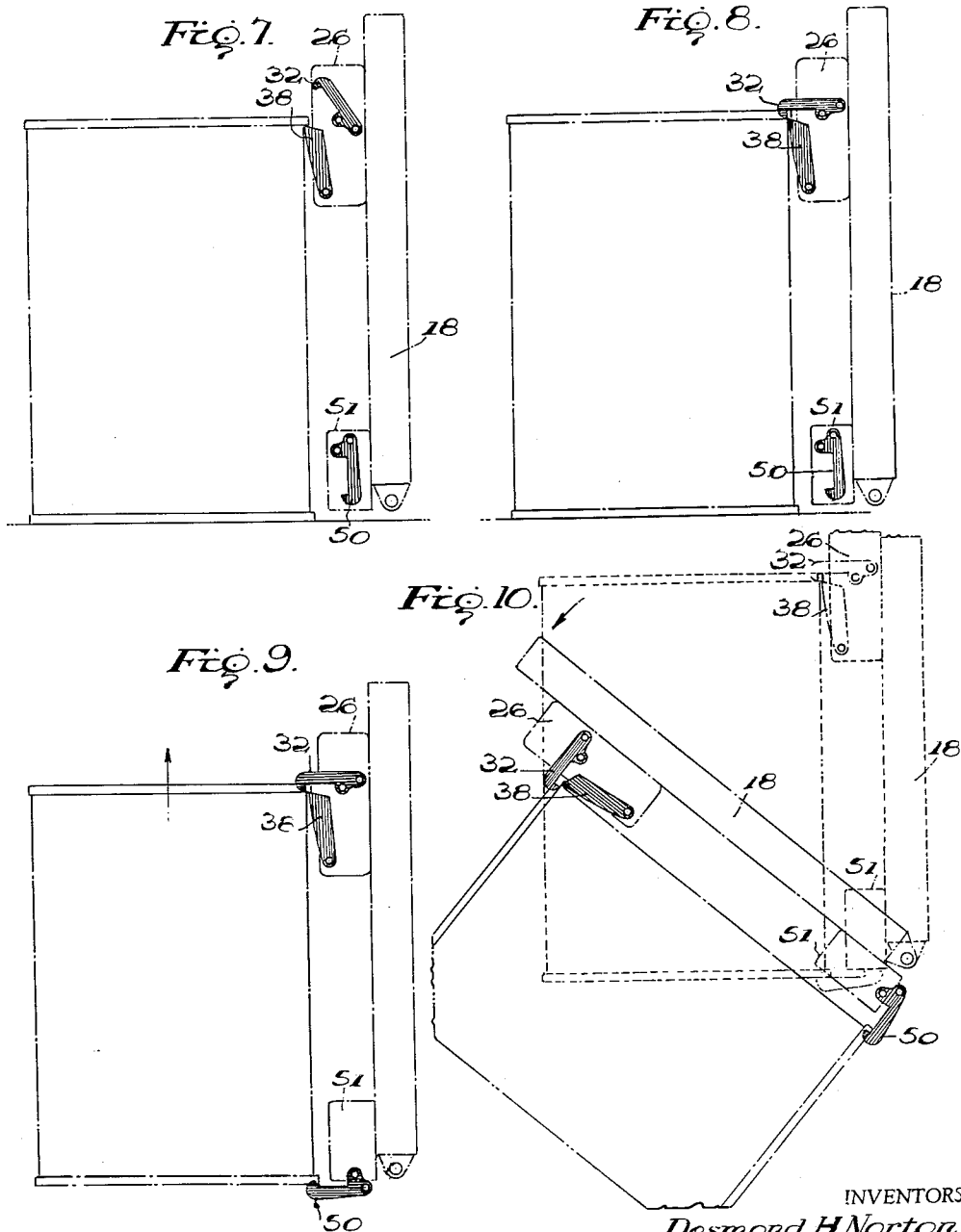
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4 Sheets-Sheet 3



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4 Sheets-Sheet 4

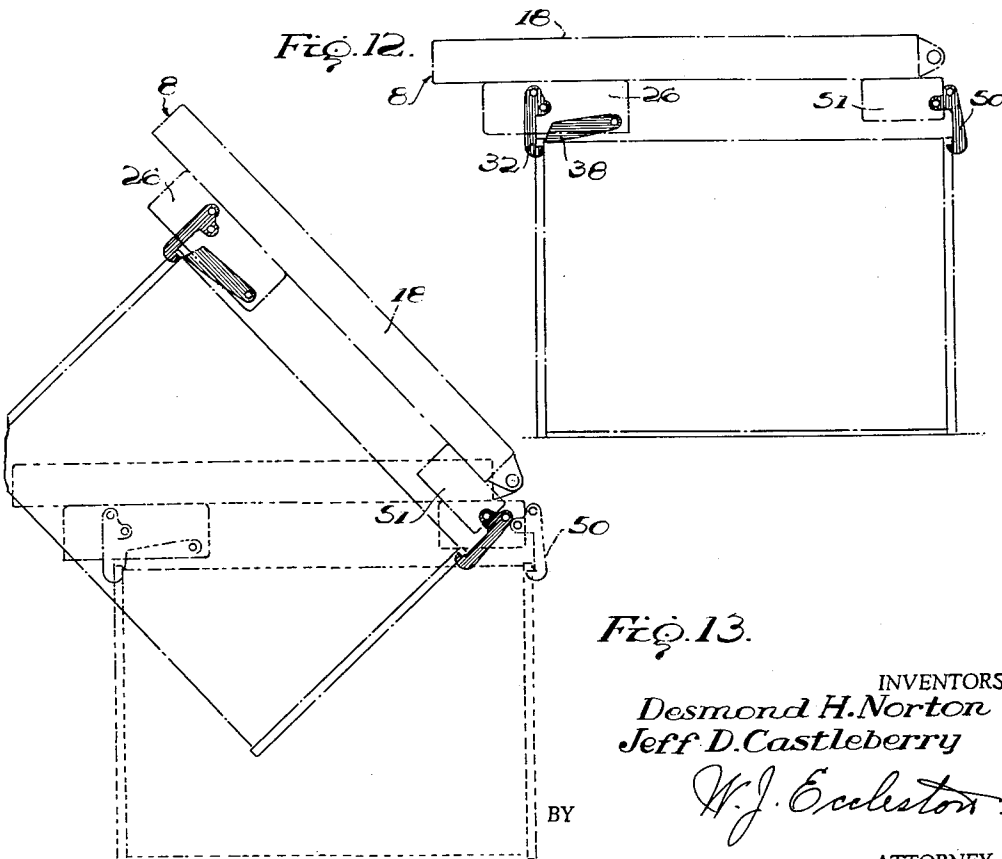
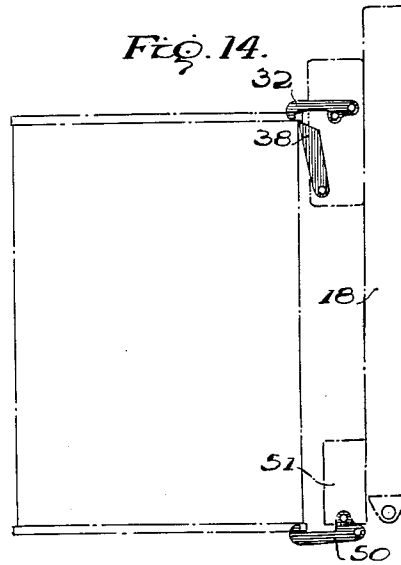
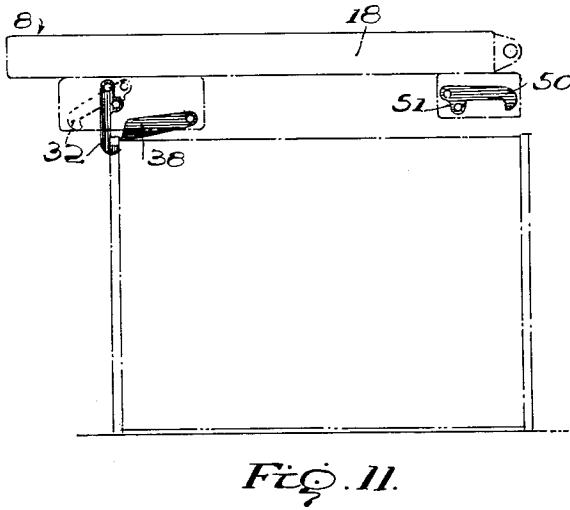


Fig. 13.

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VERTICAL-HORIZONTAL FORKLIFT DRUM HANDLING ATTACHMENT

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12 Claims. (Cl. 214—620)

(Granted under Title 35, U.S. Code (1952) sec. 266)

This invention described herein, if patented, may be manufactured and used by or for the Government for governmental purposes, without the payment to us of any royalty thereon.

This invention relates to an attachment for forklift trucks and has for its primary object to provide an attachment for conventional forklift trucks which will serve to grasp oil drums and the like while they are either standing on their ends or lying on their sides, and then rotate them through an angle of ninety degrees, if desired, so that they may be stacked in either upright position or on their sides regardless of the positions they originally occupied.

Another object of the invention consists in providing such an attachment which is readily adjustable to accommodate drums of various sizes.

A further object of the invention resides in providing such an attachment which is hydraulically operated, is capable of operating on two drums simultaneously, and yet which is of relatively simple and inexpensive construction.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawings, in which,

FIGURE 1 is a perspective view of a conventional forklift truck with the attachment in position thereon;

FIGURE 2 is an enlarged front elevational view of the attachment disconnected from the forklift truck;

FIGURE 3 is a detailed sectional view taken on line 3—3 of FIGURE 2;

FIGURE 4 is an exploded view of the gripper mechanism for one of the beads of an oil drum;

FIGURE 5 is a detailed perspective view of the oscillating arm in lowered position;

FIGURE 6 is an exploded perspective view of the hook and operative parts for the opposite end of an oil drum;

FIGURES 7, 8, 9, and 10 are detailed views of the gripping mechanism showing the various positions for gripping the opposite ends of the oil drum in its vertical position and then turning it into a horizontal position; and

FIGURES 11, 12, 13, and 14 are views showing the various positions of the grippers in lifting a drum from its horizontal position and swinging it to a vertical position.

Referring to the drawings in greater detail and by reference numerals, the numeral 1 indicates a conventional type of forklift truck provided with the usual body 2, wheels 3, overhead guard 4, and mast 5 which carries the lifting mechanism 6 in lieu of forks usually employed in this type of material handling equipment.

In the present instance, the forks have been removed from the lifting mechanism and a plate 7 secured in position thereon. To the bottom of this plate is pivotally connected an arm 8 of more or less U-shape design and having its ends pivoted to the lower edge of the base plate 7 as indicated by the numeral 9. This arm is adapted to be swung into horizontal position as shown in FIGURE 5 or into substantially vertical position as shown in FIGURES 1 and 2 and to this end rods 10 are pivotally connected at 10' to the opposite legs of the U-shaped arm near the pivot points 9 and are connected to-

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gether at their upper ends by cross bar 11. Connected to this cross bar are the ends 12 of piston rods 13 which are operatively associated with the cylinders 14. These cylinders are fixed at their lower ends on brackets 15 as indicated by the numeral 16 and are provided at their opposite ends with openings for the cyclic reception of fluid pressure through the medium of a conventional fluid pressure system as indicated in part by the flexible hose connections 17. The upper ends of the cylinders 14 are disposed in openings in a cross bar 14'.

The arm 8 heretofore referred to has its legs 18 formed of channel members 19 which are so arranged as to provide trackways 20. Mounted on each of these trackways is a carriage 21 provided with wheels or rollers 22 which are positioned in the channel portions of the members 19, there being four rollers to each carriage, and as will be noted in FIGURES 2 and 3, the upper rollers on each side of the carriage are arranged to engage the forward wall of the channel 19 so as to maintain the stability of the carriage. As heretofore indicated this attachment is intended to operate upon two articles at the same time and, of course, there are two of these carriages, one on each leg 18 of the arm 8. Secured in the cross bar 23 of each of the carriages is a screw 24 which extends upwardly through the cross bar 8' of the arm 8 and receives an adjusting nut 25 whereby the carriage may be raised or lowered as desired for use in connection with oil drums of different heights.

Fixed on the carriage 21 by brackets 21' and extending forwardly thereof is a casing 26 indicated in detail in FIGURE 4 and comprising side plates 27 and top plate 28, the front of the casing being left open to permit the jaws of the gripper to extend therethrough and securely engage one of the beads of an oil drum as shown in FIGURES 7 to 14 inclusive. The side walls 27 of the casing are secured together by means of the threaded sleeve 29 and screw 30, and the operating cylinder 31 for the upper jaw 32 is pivotally mounted within the casing by means of a shaft 33 which is fixedly secured to the side walls 27 of the casing. Fluid pressure is admitted to the upper and lower ends of the cylinders 31 through pressure tubes 34. The upper jaws 32 are pivotally mounted within the casing 26 on a shaft 35 and has its inner end pivotally connected to the piston rod 36 of cylinder 31 as indicated by the numeral 37. The lower jaw of this gripper is indicated by the numeral 38 and is pivoted at its lower end adjacent the bottom of the casing on pivot pin 39 and is limited in its swinging movement about this pivot by means of a rod 40 which extends through a slot 41 in the jaw and has its opposite ends anchored in the side walls of the casing. Spacer sleeves 42 are mounted on the pin 40 and serve to maintain the jaw 38 against lateral movement. Coil springs 43 having their lower ends fixed to the base of the casing 26 and their upper ends secured to a pin 44 fixed to the jaw 38 serve to bias this jaw into its forward position so as to project outwardly through the open front of the casing 26. The ends of the legs 18 of the pivoted arm 8 are each provided with a cradle 45 adjacent the pivoted ends 9 of these legs and serve as rests for the lower ends of oil drums when they are lifted from vertical position by means of the gripper jaws 32 and 38 just referred to.

To operatively engage the opposite end of an oil drum or the like, a hook 50 is provided for each of the legs 18 and they are positioned on these legs adjacent the pivot points 9. These hooks 50 are mounted in casings 51 having side walls 52 and are slidably mounted within the casing by means of pivot pins 53 which have their ends positioned in vertically extending slots 54 in the casing walls 52. These walls are also provided with arcuate slots 55 and the ends of the hooks remote from

the hook portion carry pins 56 which are positioned within the arcuate slots 55 and serve to swing the hook about its pivot 53 as a hook is raised and lowered by a hydraulic mechanism including cylinder 57 and piston rod 58 which is associated with the cylinder. This cylinder is pivotally suspended between the channel bars 19 by means of a bracket 57'. A pressure spring 59 mounted on a rod 60 fixed in a base member 61 secured to the side walls 52 has its lower end in engagement with the pivot pin 53 of the hook 50 and normally serves to force the hook into its lowermost position as shown in FIGURE 6, but is, of course, also under control of the piston rod 58 and its cylinder 57. By the manipulation of these two elements, that is the spring 59 and piston rod 58, the hook 50 may be withdrawn into the interior of the casing 51 as shown in several of the FIGURES 7 to 14 inclusive or projected longitudinally outwardly of the casing 51 and then swung through an angle of 90° as shown in other of the FIGURES 7 to 14 inclusive so as to grasp the bead on the opposite end of the oil drum to that which is engaged by the grippers 32 and 38. Fluid under pressure enters the opposite ends of cylinders 57 and is, of course, incorporated in a conventional fluid pressure system with the other cylinders, namely 14 and 31.

While the attachment is intended to handle two oil drums simultaneously, a description of the operation of one will of course suffice. Considering first the four FIGURES 7 to 10 inclusive, the vehicle is brought forwardly with the arm 8 in upright position as shown in FIGURES 1 and 2 and the lower jaw 38 of the gripper is caused to engage under the upper bead of the drum as indicated in FIGURE 7. Fluid pressure is then applied to the cylinder 31 so as to cause the upper jaw 32 to be brought into engagement with the inner edge of the bead as shown in FIGURE 8. The lift mechanism for the forklift truck is then operated to slightly raise the drum above the ground and the cylinder 57 is then energized to force the hook 50 out of its casing 51 and then swing it around into horizontal position as shown in FIGURE 9 so as to engage the inner face of the lower bead. Thus the drum is securely grasped at both ends, and by energizing the cylinders 14 the arm 8 is swung into horizontal position if it is desired to stack the drums on their sides as is sometimes done in warehouses and the like. Or, if it is desired to stack the drums on end as they were at the place of origin, the hook 50 may be swung back into the casing 51 without moving the arm 8 to horizontal position, and the drum lowered after the truck has taken it to the place of deposit. The cylinder 31 is then operated to lift the upper jaw 32 of the gripper, the carriage may then be lowered slightly to release the jaw 38 and the truck is backed away from the drum.

On the other hand, if the drums to be transported are lying on their sides as indicated in FIGURE 11, the arm 8 is swung into horizontal position as shown in FIGURE 11 and the jaw 38 is brought into engagement with the edge of the particular bead of the drum. Thereafter, cylinder 31 is energized to swing the upper jaw 32 into engagement with the outer end of the drum and into engagement with the bead. Thereafter, the cylinder 57 is energized to swing the hook 50 into operative position as shown in FIGURE 12 so as to engage the bead at the opposite end of the drum. Then if the drum is to be set up on end after being transported to its destination, the arm 8 is swung upwardly into vertical position through the medium of the cylinders 14; the hook 50 swung into inoperative position and the drum lowered to the ground. Thereafter, the upper jaw 32 is swung into inoperative position through the medium of the cylinder 31 and the truck may be backed away so as to disengage the jaw 38 from the bead. Or, as stated in connection with FIGURES 7 to 10, inclusive, if the drum is to be stacked in the same angular position as that in which it was removed from its point of storage, the arm 8 will remain

in horizontal position; the hook 50 will be swung to inoperative position as well as the jaw 32, and the arm 8 swung upwardly to remove the jaw 38 from the bead, or the lift mechanism of the truck may be operated to bodily raise the arm away from the drum.

If drums of different heights are to be operated upon, this may be readily accomplished by manipulating the nuts 25 to raise or lower the carriage 21 so that the casing 26 and its grippers 32—28 may be spaced from the hook 50 a distance corresponding to the distance between the ends of the particular drum.

From the foregoing description taken in connection with the accompanying drawings, it will be apparent to those skilled in the art that we have devised a rather simple construction of a forklift truck attachment which is readily operable through the medium of a conventional hydraulic system to grasp both ends of a drum without tilting the same, which would ordinarily be impossible where the drums are stacked close together, that the drums may also be grasped by the ends if lying on their sides, and in either case the drums may be rotated, if desired, through an angle of 90° so as to transport them to a new location with their position different or the same as the position in which they were originally grasped, and that the attachment is readily adjustable to drums of different heights.

In accordance with the patent statutes, we have described what we now consider to be the preferred form of construction, but inasmuch as various minor changes may be made in structural details without departing from the spirit of the invention, it is intended that all such details be included within the scope of the appended claims.

We claim:

1. A drum-handling attachment for forklift trucks, comprising a base plate for association with the lift mechanism of the truck, an arm pivoted at one end to the lower end of the base plate, a trackway mounted at the free end of the arm, a wheeled carriage mounted in the trackway for reciprocal adjustment, a casing secured to the carriage and having an open front, a pair of movably-mounted jaws in said casing with their operative portions extending through the opening, means for operating the jaws, and screw-threaded means for adjusting the carriage along the trackway.

2. A drum handling attachment for forklift trucks having a mast comprising base structure carried by and operatively connected to be driven along said mast, an arm pivoted to said base structure, means for positively swinging said arm vertically, opposed means on said arm to grip the beads on the opposite ends of a drum or the like therebetween and means for positively driving said bead gripping means into and fixedly holding the same in gripping engagement with the said opposite end beads thereby to hold the said drum in fixed relation to said arm throughout the range of swinging movement of the said arm.

3. A drum handling attachment for forklift trucks having a mast comprising base structure carried by and operatively connected to be driven along said mast, an arm pivoted to said base structure, means for positively swinging said arm vertically, opposed means on said arm to grip the beads on the opposite ends of a drum or the like therebetween and means for positively driving said bead gripping means into and fixedly holding the same in gripping engagement with the said opposite end beads thereby to hold the said drum in fixed relation to said arm throughout the range of swinging movement of the said arm, said driving means being operable positively to retract said gripping means from bead engaging position.

4. A drum handling attachment for forklift trucks as defined in claim 3 wherein individual drive means are provided individually and sequentially to drive the said opposed gripping means into gripping engagement with the beads on the opposite ends of a drum or out of such engagement.

5. A drum handling attachment for forklift trucks hav-

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ing a mast comprising base structure carried by and operatively connected to be driven along said mast, an arm pivoted to said base structure, means for positively swinging said arm vertically, opposed means on said arm to grip the beads on the opposite ends of a drum or the like therebetween, means for positively driving said bead gripping means into and fixedly holding the same in gripping engagement with the said opposite end beads thereby to hold the said drum in fixed relation to said arm throughout the range of swinging movement of the said arm and means for adjusting the gripping means lengthwise of said arm to vary the distance between the opposed gripping means and thereby adapt said attachment for handling drums of different end-to-end lengths.

6. A drum handling attachment for forklift trucks having a mast comprising base structure carried by and operatively connected to be driven along said mast, an arm pivoted adjacent to one end thereof on said base structure so as to be swingable vertically, a casing open along at least a portion of one side thereof, means to mount said casing for movement lengthwise of said arm adjacent to the free end thereof and with said open side exposed, means for gripping the beads on opposite ends of a drum or the like thereby to hold said drum in fixed relation to said arm including opposed jaws having parts projecting outwardly from the open side of said casing, drive means for positively moving the projecting portions of said opposed jaws relatively into and out of gripping engagement with the bead on one end of said drum and means for rigidly but releasably fixing said casing and the mounting means therefor at preselected positions along said arm including means for adjusting the same lengthwise of said arm to adapt the attachment for handling drums of various sizes.

7. A drum handling attachment for forklift trucks as defined in claim 6 wherein one of said jaws is biased to a position when the jaws are inoperative at which it may be hooked against one side of the bead on one end of said drum by relative movement between said arm and drum in a direction axially of the latter and the second jaw is closed against the said bead and released from closed position by positive drive means.

8. A drum handling attachment for forklift trucks having a mast comprising base structure carried by and operatively connected to be driven along said mast, an arm pivoted to said base structure, means for positively swinging said arm between horizontal and vertical positions, opposed jaws adjacent one end of said arm, means for closing said jaws against the opposite sides of the bead on one end of a drum or the like, a hook movably mounted on said arm adjacent the pivoted end thereof and means for positively driving said hook into hooking engagement with the bead on the opposite end of said drum thereby fixedly to secure said drum to said pivoted arm.

9. A drum handling attachment for forklift trucks having a mast comprising base structure carried by and

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operatively connected to be driven along said mast, an arm pivoted adjacent to one end thereof on said base structure so as to be swingable between horizontal and vertical positions, gripping means adjacent the free end of said arm including a part positively drivable into and out of gripping engagement with the bead on one end of a drum or the like, means forming a cradle adjacent the pivoted end of said arm, a drum bead engaging hook and means for positively moving said hook into and out of hooking engagement with the bead on said drum opposite that engaged by said gripping means when said arm is disposed to bring said cradle next to the side of the said drum.

10. A drum handling attachment for forklift trucks having a mast comprising base structure carried by and operatively connected to be driven along said mast, an arm pivoted adjacent to one end thereof on said base structure so as to be swingable between horizontal and vertical positions, gripping means adjacent the free end of said arm including a part positively drivable into and out of gripping engagement with the bead on one end of a drum or the like, means forming a cradle adjacent the pivoted end of said arm including a central portion defining a housing, a drum bead engaging hook and means for positively moving said hook through a cycle effective to carry the hook between a retracted position within said housing and an operative position at which the bead on the end of said drum opposite that gripped by said gripping means is engaged by said hook and the said drum is held thereby next to said cradle.

11. A drum handling attachment for forklift trucks as defined in claim 10 wherein the means for positively moving said hook between operative and retracted positions includes a spring and power driven means conjointly to apply force to said hook effective to move the said hook between operative and retracted positions.

12. A drum handling attachment for forklift trucks as defined in claim 10 wherein the means for positively moving said hook between operative and retracted positions comprises a spring to bias said hook in one direction, power driven means to move the hook in opposition to said spring and pin and slot connections between said housing and hook to guide movement of the hook under the influence of the said spring and power operated means.

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