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H. G. MEISTER, JR

2,959,310

STRADDLE CARRIER HAVING GRAPPLES

Filed May 7, 1957

3 Sheets-Sheet 1

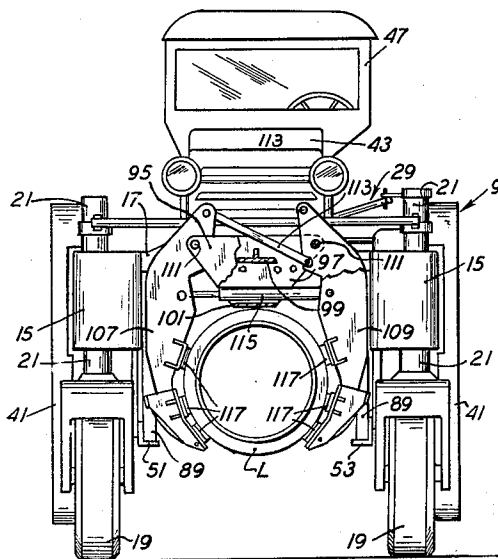
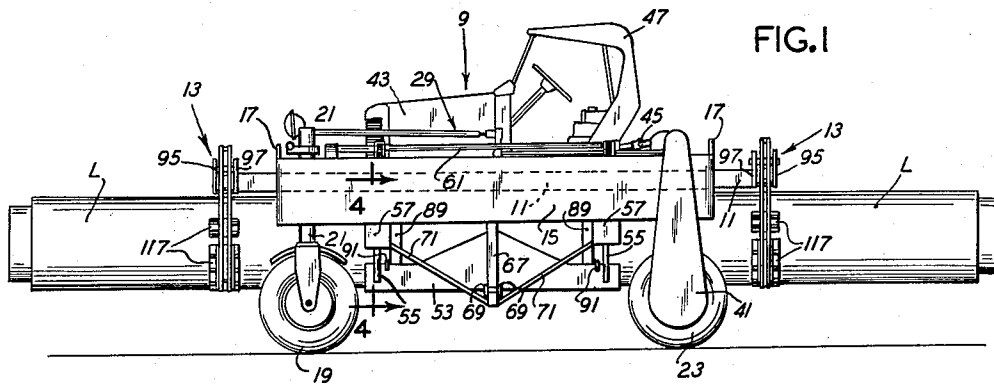


FIG. 2

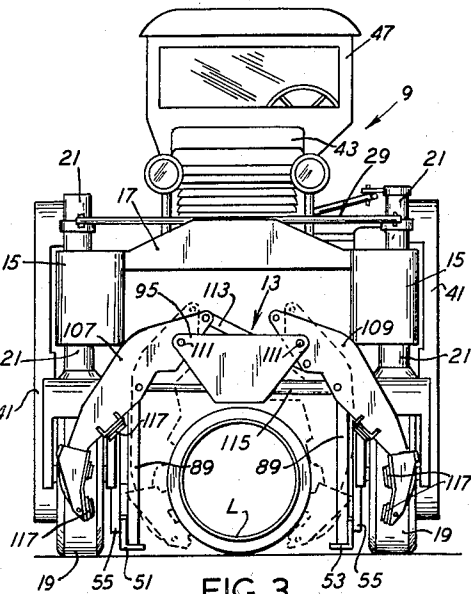


FIG.3

INVENTOR.
HARRY G. MEISTER JR.

BY

BY
Buckhorn, Cheatham & Bloor

ATTORNEYS

Nov. 8, 1960

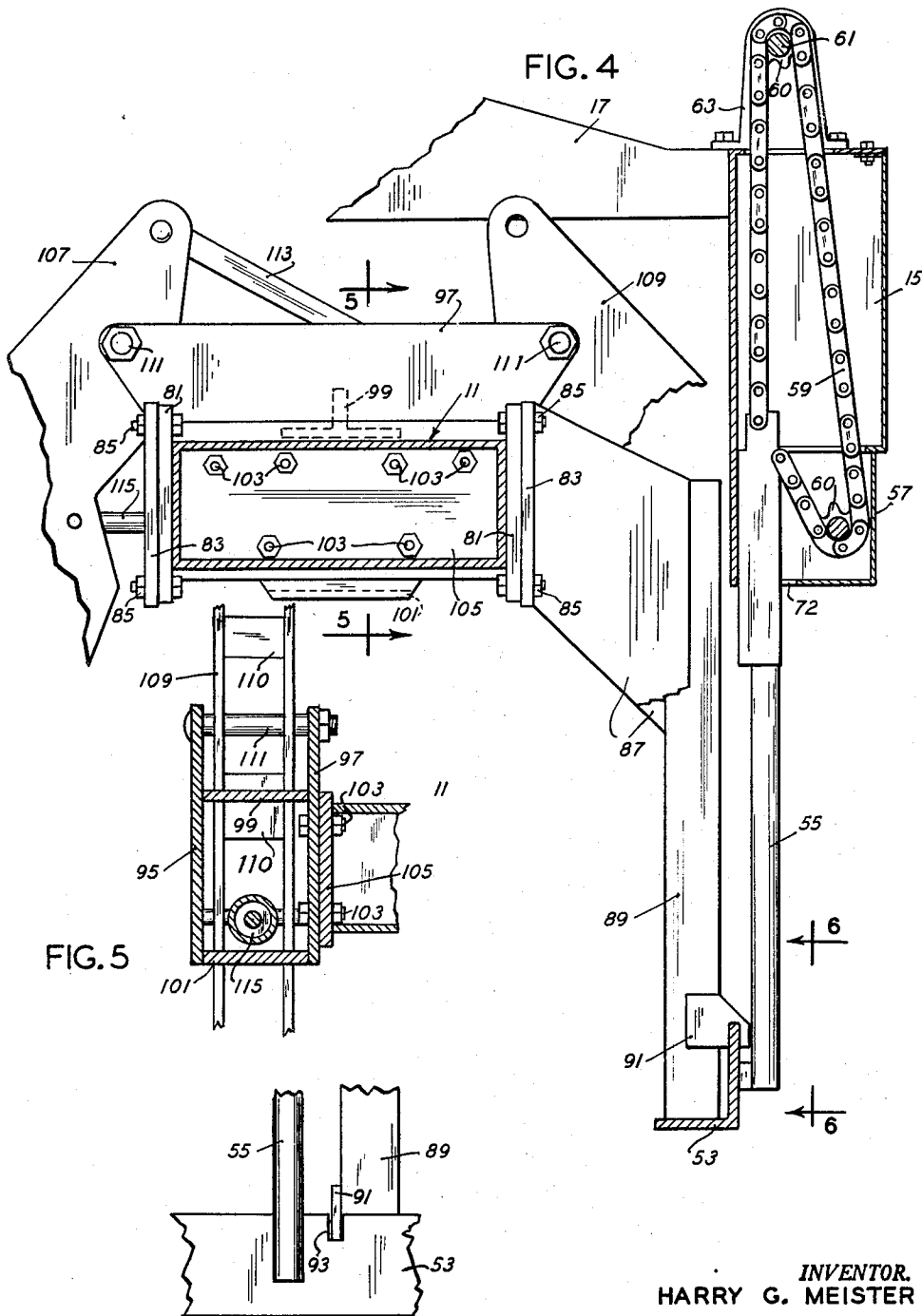
H. G. MEISTER, JR

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INVENTOR.
HARRY G. MEISTER JR.

BY

Buckhorn, Chatham & Bloor
ATTORNEYS

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3 Sheets-Sheet 3

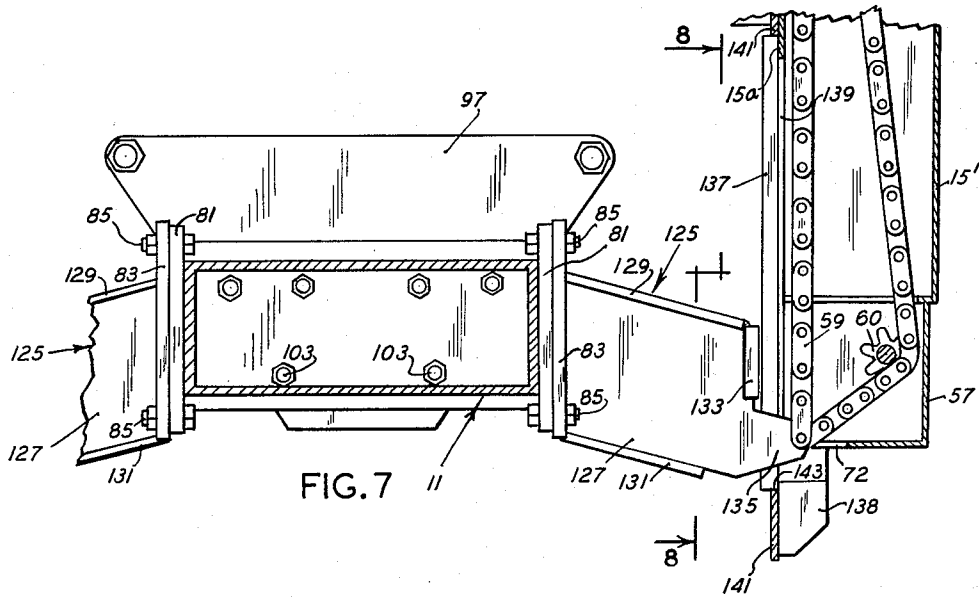


FIG. 7

FIG. 9

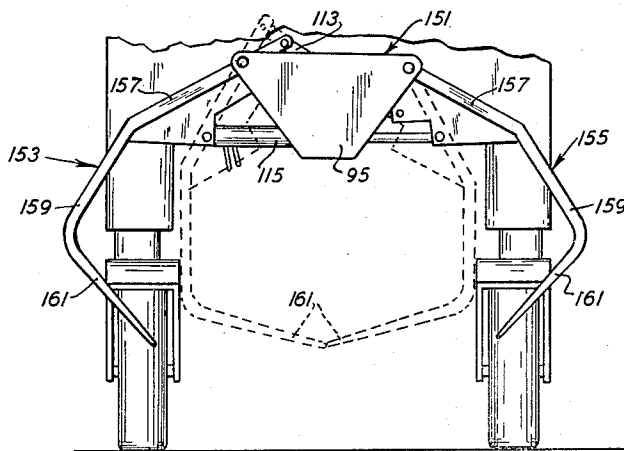
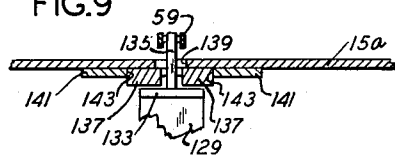


FIG. 10

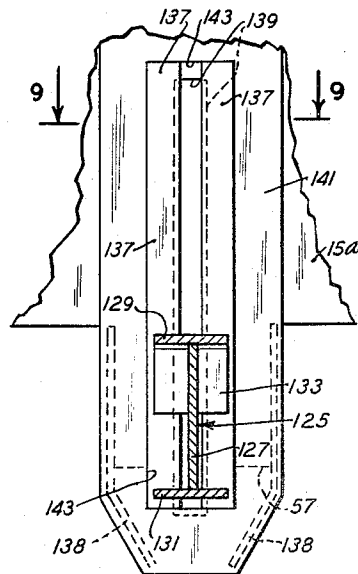


FIG. 8

INVENTOR.

HARRY G. MEISTER JR.

BY

Buckhorn, Chatham & Blane
ATTORNEYS

1

2,959,310

STRADDLE CARRIER HAVING GRAPPLES

Harry G. Meister, Jr., Portland, Oreg., assignor, by mesne assignments, to Hyster Company, a corporation of Nevada

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1 Claim. (Cl. 214—392)

This invention relates to straddle carriers and particularly to improvements in the load-handling mechanism thereof.

One defect of prior carriers is that they have not been able to pick up a load from the ground or similar surface on which the load rests. Thus it has been necessary to provide bolsters or other devices for positioning the load in an elevated condition.

It is a main object of the present invention to provide a straddle carrier having a load-handling mechanism capable of picking up loads directly from a supporting surface without the aid of bolsters or other devices, and without substantially decreasing the load space and thus the capacity of the carrier.

Another defect of the conventional straddle carrier is that it is not ideally suited to handling long loads, and by that is meant loads substantially exceeding the length of the carrier. The reason for this is that the load-supporting mechanism of the conventional carrier is located within the confines of the front and the back wheels thereof and thus a long load is engaged by the load-handling mechanism along only a short length thereof. Thus during acceleration and deceleration of the carrier, the load tends to dip down in the front or in the back depending on the direction of acceleration or deceleration. Rearrangement of the load is frequently required under such circumstances and this, of course, is time consuming and expensive.

A further important object of the present invention is to provide a straddle carrier which may readily handle long loads with the desired stability.

A further object of the invention is to provide a carrier having a load-supporting mechanism in the form of a pair of grapples spaced fore and aft of the frame of the vehicle and mounted for raising and lowering movement for proper engagement with and proper support of a load.

A still further object is to provide a carrier of the type just described in which the ends of the grapple jaws are disposed outwardly of the confines of the load space of the carrier when the jaws are fully open so that the carrier may readily be driven over a load without concern on the part of the operator as to whether the jaws will strike the load during such operation.

A further defect of prior carriers is that the load-handling means has been positioned within the confines of the load space and the load-engaging elements have been disposed within the confines of the load space in both their open and closed positions, thus decreasing the capacity of the truck in a direction laterally of the truck.

Another object of the invention is to provide a carrier in which the load-engaging means are so located that they may be opened to positions outside the confines of the load space so that the lateral capacity of the truck is determined only by the width of the load space.

Another object of the invention is to provide a carrier having a pair of grapples for engaging a load, in which the grapples are mounted so that the ends of the jaws have

2

a flat arc of travel relative to a horizontal plane so that they do not tend to dig into the ground when picking up a load therefrom.

Various other objects of the invention will be apparent from the following description taken in connection with the accompanying drawings wherein:

Fig. 1 is a side view in elevation of a carrier embodying the concepts of the present invention;

Fig. 2 is a front view on an enlarged scale of the carrier disclosed in Fig. 1, with parts broken away;

Fig. 3 is a view similar to Fig. 2 but showing the load in position to be picked up and showing the jaws open;

Fig. 4 is a partial vertical transverse sectional view taken along line 4—4 of Fig. 1 on a further enlarged scale showing certain details of the load-handling mechanism, the mechanism being shown in a somewhat lowered position for convenience in disclosure;

Fig. 5 is a fragmentary vertical section taken along line 5—5 of Fig. 4;

Fig. 6 is a fragmentary elevational view taken in the direction of the arrows 6—6 of Fig. 4;

Fig. 7 is similar to Fig. 4, but showing a modified form of the invention;

Fig. 8 is a vertical section taken along line 8—8 of Fig. 7;

Fig. 9 is a horizontal section taken along line 9—9 of Fig. 8; and

Fig. 10 is a view of a modified form of grapple shown mounted on a straddle carrier, the latter being disclosed schematically.

Referring particularly to Figs. 1 and 2, the drawings show a straddle carrier 9 which is of conventional form except for the load-handling mechanism thereof, the latter including a long beam 11 extending freely through the load space of the machine and having a grapple unit 13 on each end thereof. A load L, in the form of a long large diameter pipe is shown as supported by the grapple units.

Certain conventional parts of the carrier will be described to enable the present invention to be fully understood.

The carrier is of the type having a frame including two spaced hollow side members 15 connected at their upper ends by a number of cross members indicated by the reference numeral 17 and not necessary to mention individually. The cross members may be considered as forming a top structure.

The carrier is supported at its front end by wheels 19 having vertical mounting shafts 21 extending through and journaled in the side members 15. The carrier is supported at its rear end by wheels 23 which have mounting shafts, not shown, also extending through and journaled in the side members 15. A steering mechanism generally indicated by the reference numeral 29 turns all four mounting shafts to steer the vehicle. The frame of the vehicle and the wheels and their supporting devices define a tunnel-like load space extending longitudinally through the machine to accommodate a load.

The rear wheels 23 are driven by chain and sprocket drives, not shown, covered by guards 41, which are best shown in Figs. 1 and 2, power being furnished by an engine, not shown, under a hood 43 through a conventional drive mechanism 45. A cab 47 for the driver is provided on the carrier frame behind the hood 43.

The carrier is provided with a pair of shoes 51 and 53, as best shown in Figs. 1 and 2, which in the conventional carrier are employed for supporting and lifting a pallet upon which a load is placed. These shoes are utilized in the present invention for a different purpose, presently to be explained.

Referring to Figs. 1 and 4, each shoe is provided with

3

a pair of upwardly extending lift rods 55 extending into depending housings 57 on the associated hollow side member of the carrier frame. The lift rods, and thus the shoes, are elevated by a conventional lift chain arrangement including a chain 59 for each rod, one chain being shown in Fig. 4. Each chain is in the form of a loop trained about spaced sprockets 60 and having a vertical lift portion connected to the upper end of the associated rod 55, and a take-up portion also connected to the rod.

The chains are driven simultaneously by a drive shaft arrangement generally entitled 61 which is driven from the front end of the engine through a clutch mechanism, not shown. A bracket 63 is shown in Fig. 4 as supporting a part of the drive shaft arrangement.

Each shoe is guided by a vertical guide bar 67, which is shown in Fig. 1 but not in Fig. 4, and which fits between a pair of rollers 69, one of which is shown in Fig. 1, the rollers being supported by the shoe. Suitable bracing stays 71 connect the guide bars to the housings 57.

Conventionally, the guide bars 67 are mounted for limited swinging movement so that the shoes may be swung outwardly to allow the machine readily to be given over a pallet to be picked up and then swung inwardly to engage under the side edges of the pallet. The stays 71 permit this swinging movement. Also slots 72 in the housings 57 allow the lift rods 55 to swing outwardly about their upper ends from the position shown in Fig. 4, to enable the shoes to swing outwardly.

This swinging mechanism may be eliminated in the present machine, or may be left in place and simply not utilized. Since the load-handling mechanism shown is specially adapted to be detachably applied to the conventional straddle carrier, it would follow that the swinging mechanism for the guide bars 67 would be left unaltered so that the least number of modifications of the carrier would be required.

All the mechanism described up to this point, except the beam 11 and grapple units 13, is found in a conventional straddle carrier.

The load-handling mechanism of the present invention includes an attachment supported from the shoes in the following manner. Referring to Fig. 1, the attachment includes the beam 11 which, as previously mentioned, extends completely through the load space of the machine. The beam has two pairs of mounting plates 81 permanently secured to the sides thereof, one pair being located adjacent the front of the machine, these being shown in Fig. 4, and the other pair being located near the rear of the machine, and not being shown. A post unit is provided for each mounting plate and includes a plate 83 bolted by bolts 85 to the associated mounting plate and a pair of bracket arms 87 secured to the opposite sides of a square post or leg 89. The post 89 rests on and is supported by the horizontal flange of the associated shoe, as shown in the case of a post 89 and the shoe 53 in Fig. 4.

As best shown in Figs. 4 and 6, the lower portion of each post 89 is equipped with an outwardly extending plate-like lug 91 which slidably fits within a slot 93 formed in the vertical flange of the associated shoe. The lugs retain the attachment against longitudinal shifting movement relative to the shoes. The assembly including the beam 11 and the post units is rigid in a lateral direction so that the vertical flanges of the shoes retain the assembly against lateral dislodgment from the horizontal flanges of the shoes. The mechanism for swinging the shoes has insufficient power to move the shoes after the attachment is mounted on the shoes, so there is no danger of dropping the attachment by accidentally tripping the swing control lever.

Referring particularly to Figs. 1, 2, 4, and 5, each grapple unit 13 includes a pair of spaced plates 95 and 97 rigidly secured to suitable connector plates 99 and 101. Each base plate 97 is removably secured by bolts

4

103 to an end plate 105 which is permanently fastened to the adjacent end of the beam 11, as is clearly shown in Fig. 5.

Referring to Figs. 2 and 5, each grapple unit includes a pair of grapple jaws 107 and 109, each comprising two spaced jaw plates. The two jaw plates for each jaw are rigidly held in spaced relation by suitable connector pieces 110, two of which are shown in Fig. 5. The upper end portions of the jaws are pivoted by shafts 111 between the associated plates 95 and 97.

Referring to Fig. 3, the upper end of each jaw 107 is pivotally connected to one end of an equalizer bar 113 which has its other end pivotally connected to the associated jaw 109, at a place located below the pivot shaft 111 thereof. A double acting cylinder and piston unit 115 is pivotally connected at its opposite ends to the jaws 107 and 109, the pivotal connection being located below the pivot shafts 111. Each piston and cylinder unit is positioned between the associated plates 95 and 97, as is shown in Fig. 2. Suitable detachable hoses, not shown, conduct hydraulic fluid to the cylinders from a source on the carrier and from the cylinders to the source.

Each jaw is of generally curved form and is shown as being equipped with a plurality of pads 117, the faces of which are angularly related relative to one another and in fact may be considered as falling generally along an arcuate path.

As best shown in Fig. 3, the jaws may be spread apart to positions where the tips thereof extend laterally outwardly of the confines of the load space of the machine. Thus, the operator does not have to concern himself as to whether or not the jaws will accidentally engage the load to be picked up when the driver is driving the vehicle over a load. After the vehicle is positioned over a load, the operator lowers the jaws, by lowering the shoes 51 and 53, to a position where the jaws are just clear of the ground, and then operates the double-acting cylinders 115 to move the jaws inwardly to grip the load therebetween. The jaws may then be elevated to lift the load.

The fact that the jaws are located forwardly and rearwardly of the frame of the machine means that the jaws may be opened to positions outside the confines of the load space and this means that the lateral capacity of the truck is determined only by the width of the load space. Thus, the jaws do not lessen the capacity of the truck in a lateral or widthwise direction.

It is pointed out that the pivotal axes of the jaws of each unit 13 are considerably spaced from one another, in fact, spaced from one another by a distance approximately equal to one-half the width of the load space. This means that the tip of each jaw moves along a flat arcuate path of travel, reaching a lowermost point directly below the associated pivot shaft 111 and a slightly higher level at the outermost and innermost position of the jaw. Thus, there is little tendency for the jaw tips to dig into the ground.

In order to detach the attachment of the present invention from the carrier, the attachment is lifted to a raised position and several supports are placed under the beam 11. The beam is then lowered, by lowering the shoes 51 and 53, until the beam rests on the supports. The shoes are lowered still farther to separate the lugs 91 from the shoes in a vertical direction. The jaws are moved inwardly, the hydraulic hose disconnected, and the vehicle simply driven away from the attachment. After the attachment is thus separated, the carrier may be used in the conventional fashion for lifting pallets and the like.

Figs. 7, 8, and 9 disclose a modified form of the invention in which the load-handling assembly is permanently mounted in place on the machine. This requires somewhat greater modification of the carrier than does the first form of the invention.

5

6

In this form of the invention, the beam 11 is supported in a slightly different manner. The beam has the same mounting plates 81, but instead of post units, arm units 125 are provided. Each arm unit includes a plate 83, secured to the associated mounting plate by bolts 85, and a single arm plate 127 reinforced by top and bottom plate members 129 and 131 and also by an end slide plate 133, about which more will presently be said. Referring to Figs. 7 and 9, each arm plate 131 has a projecting ear 135 slidably extending between a pair of guide bars 137 and through a vertical slot 139 formed in the inner wall 15a of the associated hollow side frame member 15'. The ear 135 is connected to the associated lift chain 59.

A vertical reinforcing plate 141 is permanently welded to the inner side wall 15a and is provided with a vertical slot 143, as best shown in Fig. 9, within which the guide bars 137 fit and are secured. The slide plates 133 slide against the bars 137 to guide the attachment during its vertical movement. A pair of flanges 138 stiffen each reinforcing plate.

In this form of the invention, the shoes 51 and 53, guide bars 67, the lifting rods 55, the stays 71, and the side swing mechanism need not be provided and in fact are not shown.

Referring to Fig. 10, a somewhat different form of grapple 151 is shown which in the closed position thereof defines a substantially rectangular opening disposed in register with and being slightly smaller than the effective load space provided by the carrier.

The grapple includes a pair of jaws 153 and 155 of identical form except for the upper ends thereof. Each jaw includes an upper portion 157, an intermediate portion 159 at an angle to the upper portion, and a lower portion 161 at an angle to the intermediate portions. The included angle between portions 157 and 159 is somewhat less than 180° while the included angle between portions 159 and 161 is slightly greater than 90°. Thus when the jaw tips are together, as shown in dotted lines, the lower jaw portions define an inwardly and downwardly inclined supporting surface which converges toward the center jaw tips so that a load is urged to occupy a central position where it is stably supported without being gripped. The jaws 153 and 155 are pivotally connected to an equalizer rod 113 and an actuating cylinder 115, both of which may be the same as those described with reference to Figs. 1 to 6.

The present invention has provided a straddle carrier with a load-handling mechanism that may readily pick up loads from the ground, and is so constructed and arranged that it does not interfere with maneuvering the carrier over a load. Also, the mechanism does not substantially decrease the load space of the machine, since the load-engaging structures thereof are disposed fore

and aft of the machine frame. This fore and aft disposition of the grapples is also important because it permits long loads to be supported in a stabilized manner not possible with conventional carriers.

Having described the invention in what is considered to be the preferred embodiment thereof, it is desired that it be understood that the invention is not to be limited other than by the provisions of the following claim.

I claim:

10 In a straddle carrier of the type having a frame providing a top structure and laterally disposed depending side members defining a tunnel-like load space, each side member having a front wheel and a rear wheel in flanking relation to such load space and supporting said frame, a beam extending through said load space and being symmetrically disposed relative to the side members, said beam projecting beyond said load space at the opposite ends of said truck, means for raising and lowering said beam while maintaining the beam symmetrically disposed relative to said side members, a pair of elongate jaws at each end of said beam disposed beyond the ends of said side members, mounting means on said beam pivotally mounting each pair of jaws in depending relation to said beam and adjacent the upper ends of the jaws for pivotal movement in a plane at right angles to said beam and about axes symmetrically spaced on opposite sides of the center line of said beam, the paths of movement of said jaws extending laterally beyond the geometric extension of the load space so as to accommodate large loads without restriction on the part of the jaws, a fluid-operated piston and cylinder unit supported by each pair of jaws and being pivotally connected between each pair of jaws at points below the pivotal axis of said jaws but above the bottom surface of beam, and a link pivotally connecting each pair of jaws, each link being pivotally connected to the upper end of one of its jaws and being pivotally connected to the other jaw at a place below the pivotal axis of the jaw but above the piston and cylinder unit so that said jaws are positively constrained to move in symmetrical relation to said load space and beam to positively center at all times a load being handled.

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