Sept. 19, 1967 M. D. SAWDEY 3,342,359

ARTICULATED LOAD HANDLING ATTACHMENT

Filed Dec. 27, 1963 3 Sheets-Sheet 1

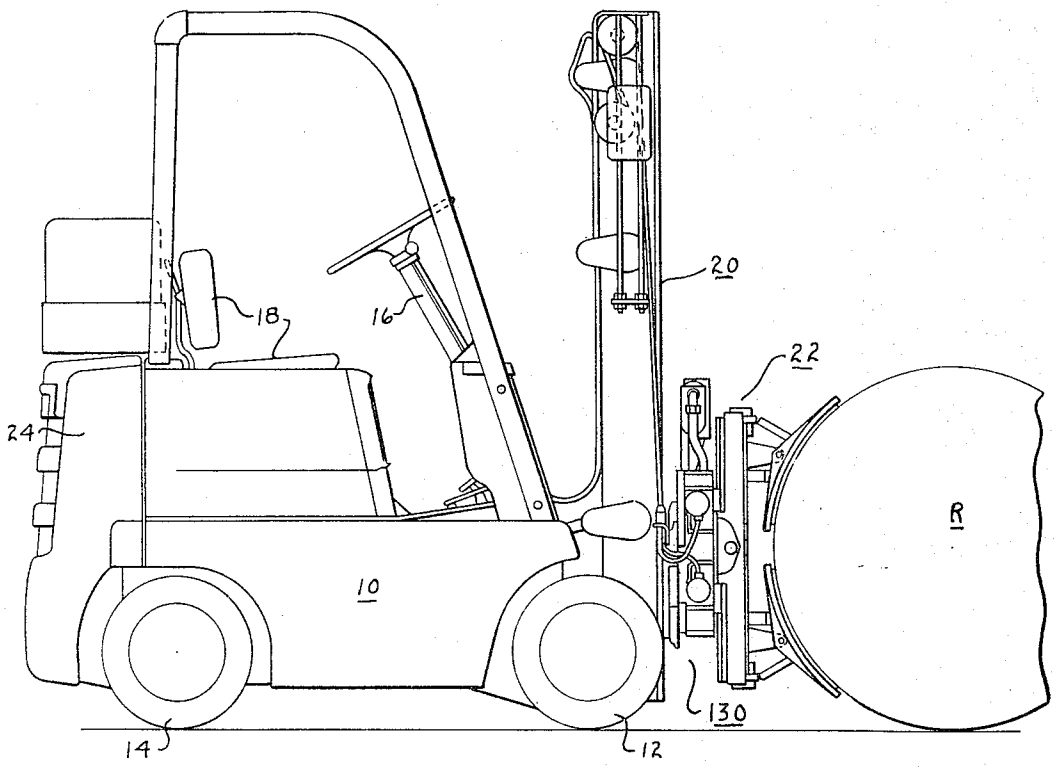


FIG. 1

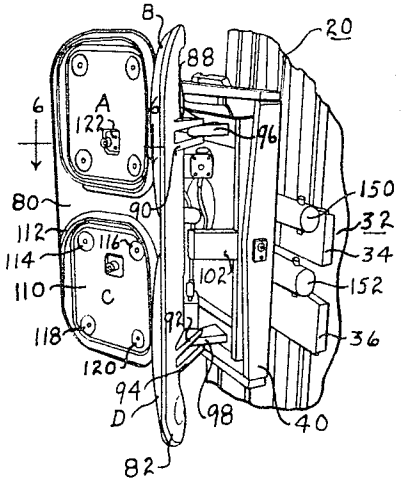


FIG. 2

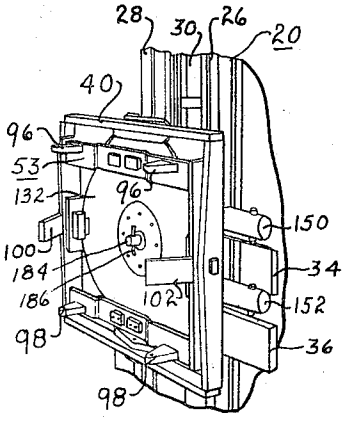


FIG. 3

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Filed Dec. 27, 1963 3 Sheets-Sheet 2

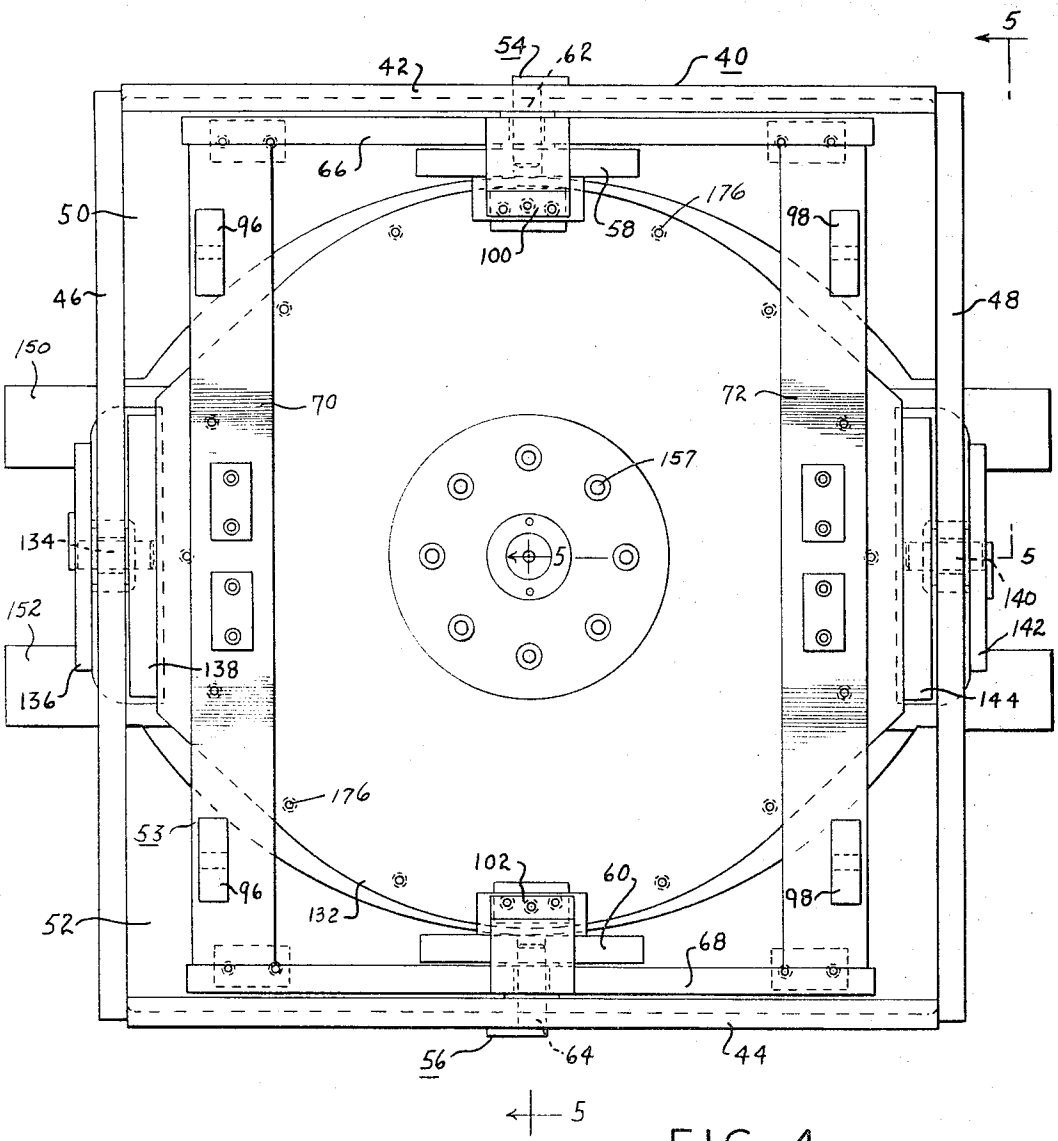


FIG. 4

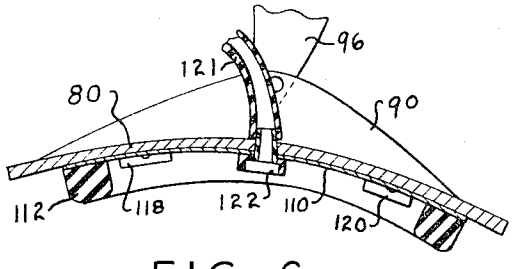


FIG. 6

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ARTICULATED LOAD HANDLING ATTACHMENT

Filed Dec. 27, 1963 3 Sheets-Sheet 3

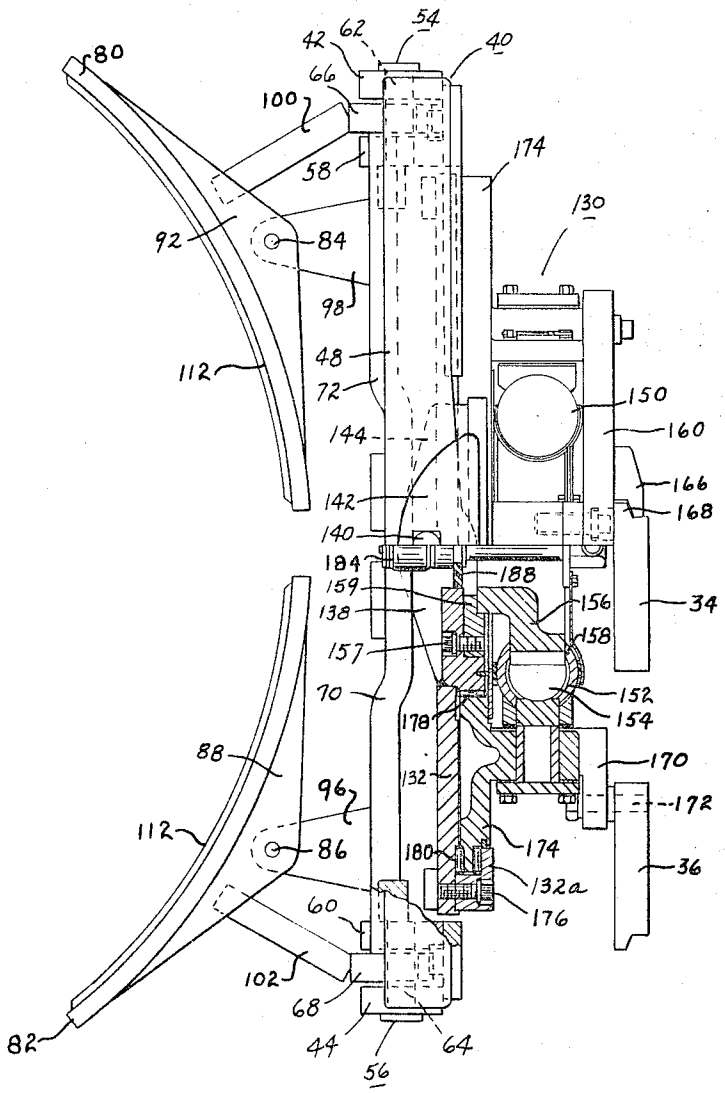


FIG. 5

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United States Patent Office 3,342,359
Patented Sept. 19, 1967

3,342,359

ARTICULATED LOAD HANDLING ATTACHMENT

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Filed Dec. 27, 1963, Ser. No. 333,870
2 Claims. (Cl. 214—652)

The present invention relates to a load handling attachment for vehicles, and more particularly to an articulated load handling attachment for industrial trucks, especially for handling paper rolls, such as printing paper rolls and similarly shaped objects.

The conventional attachment used in conjunction with industrial trucks and the like for handling paper rolls consists of one or more pairs of jaws projecting forwardly from the upright on the front of the truck, and in lifting, transporting and stacking paper rolls, such as newspaper rolls, the jaws engage the cylindrical sides of a paper roll and positively clamp and hold the roll firmly while the roll is being lifted and moved. These attachments usually are constructed to rotate so that the roll can be shifted from a position lying on its side to an up-ended position. This type of manipulation often requires the roll to be gripped tightly by the jaws to prevent the roll from slipping endwise while the roll is up-ended and is being lifted or removed from the upper tiers of stacked rolls. Further, in order to provide an effective gripping action on the larger rolls, the jaws are necessarily relatively long, and hence project forwardly from the truck upright to an extent where they often interfere with the maneuverability of the truck, particularly in box cars and on loading platforms in the operation of loading and unloading the rolls.

The positive and firm gripping action required by the conventional paper roll attachments ofter results in damage to the roll, particularly to the external layers by tearing, wrinkling the scuffing, and occasionally to the entire roll by the compressing effect of the jaws. The compressing effect may distort the roll, making it out of round or otherwise rendering it unbalanced and hence unusable on the high speed reels of the standard printing presses. The damage to the external layers and distortion to the entire roll may not be discernible until the roll has been mounted on the reel and is ready to be fed into the press, thus resulting in substantial loss in transportation and handling of the defective and unusable roll, and materially increased downtime of the printing press required to replace the defective roll with a new roll. It is therefore one of the principal objects of the present invention to provide a paper roll handling attachment for industrial trucks, which does not employ any clamping or compressing action for engaging and lifting the rolls and which can lift and hold the rolls effectively without regard for the position of the rolls, i.e., in either their side or their up-ended position.

Another object is to provide an attachment for a load handling and transporting vehicle, which can effectively engage and lift a load without accurate alignment between the load and the attachment load engaging elements, and which can be operated with less skill and care than similar conventional or standard attachments of the same general type.

Still another object of the present invention is to provide a compact vehicle of the industrial truck type for lifting and transporting paper rolls and similar cylindrically shaped objects, which has greater maneuverability in limited areas than the conventional paper roll handling trucks with a jaw-type roll engaging mechanism, and which can engage and lift a roll from a stack of closely spaced rolls by merely engaging the roll along a portion of one

side without any interference from the adjacent rolls in the stack.

A further object of the invention is to provide an attachment for a paper roll handling and transporting vehicle which will not compress or distort the roll or cut or tear or otherwise mar the outer layers of the roll, and which is so constructed that it can adapt itself to a roll and the position of the roll without accurate alignment of the roll engaging mechanism with the side of the roll.

Another object is to provide a highly versatile, easily controlled and operated attachment for industrial trucks and the like, which can be readily adapted to various types of standard truck uprights without substantial modification, and which will effectively adapt itself automatically to various size rolls of paper and similar cylindrical objects over a relatively wide range.

Additional objects and advantages of the invention will become apparent from the following description and accompanying drawings, wherein:

FIGURE 1 is a side elevational view of an industrial truck having the present paper roll handling attachment mounted on the upright thereof and showing the attachment prepared to lift a roll of paper or other cylindrical object;

FIGURE 2 is a perspective view of the paper roll handling attachment and a fragmentary perspective view of the upright of the industrial truck.

FIGURE 3 is a fragmentary perspective view of a portion of the articulated mechanism of the present load handling attachment;

FIGURE 4 is a front elevational view of the articulated mechanism of the present attachment with the load engagement elements removed therefrom to better show the operating mechanism;

FIGURE 5 is an enlarged partial cross sectional view of the present articulated attachment for handling paper rolls and other objects, the section being taken on line 5—5 of FIGURE 4 with the paper roll engagement attachment elements shown positioned 90 degrees from the position shown in FIGURE 2; and

FIGURE 6 is a cross sectional view of one paper roll gripper element, taken on line 6—6 of FIGURE 2.

Referring more specifically to the drawings and to FIGURE 1 in particular, numeral 10 designates an industrial truck having a pair of front wheels 12 and a pair of rear wheels 14, a steering mechanism 16 for the front wheels, seat 18 and an upright 20 on the front of the truck having mounted thereon the present load handling attachment 22. The truck is driven by a motor enclosed in housing 24 beneath the driver's seat 18. The industrial truck on which the present load handling attachment is mounted may be considered conventional for the purpose of the present description and may be of any one of a number of well known suitable types, including those powered by a battery driven electric motor or by gasoline engine. Hence, the details of the industrial truck will not be described herein.

The upright 20 mounted on the front of the truck likewise may be considered conventional for the purpose of the present description, the one shown briefly consisting of an inner vertical frame 26, an outer vertical frame 28 in which the inner vertical frame reciprocates, and a hydraulic cylinder 30 for moving the inner frame to various elevated positions in the outer frame. Mounted on the inner frame is a conventional carriage 32 which moves upwardly and downwardly relative to both the inner and outer frames and is provided with a pair of cross beams 34 and 36 for receiving and supporting the present paper roll attachment 22. Since the present upright is considered conventional and since a number of different types may be used satisfactorily for lifting and lowering the present

attachment, the one shown in the drawings will not be further described herein.

The present articulated load handling attachment, which as illustrated in the drawings is adapted to handle paper rolls, consists of an outer frame **40** having side members **42**, **44**, **46** and **48** connected to one another and forming a rigid structure therewith. The side members are rigidly joined to one another by arcuate plates **50** and **52** at the upper and lower edges of the outer frame, as viewed in FIGURE 4. An inner frame **53** is pivotally mounted in the outer frame by pivot means **54** and **56** disposed on opposite sides of the frame, each consisting of brackets **58** and **60** secured to plates **50** and **52** and pivot pins **62** and **64**, respectively, extending through side members **42** and **44** of the outer frame and side members **66** and **68** of the inner frame. Inner frame members **66** and **68** are connected to one another by cross members **70** and **72** to form a rigid frame structure.

Mounted on inner frame **53** are paper roll gripping pads **80** and **82** pivotally secured to cross members **70** and **72** by pivot pins **84** and **86** extending through rearwardly projecting arms **88** and **90** on one end of each pad and arms **92** and **94** on the other end of each pad. Arms **88** and **90**, and **92** and **94** embrace arms **96** and **98** secured to cross members **70** and **72**, respectively. It is thus seen that each pad is pivoted for angular movement toward and away from the other on the respective pivot pins, the outward movement of the pads being limited by projections **100** and **102**, respectively, which are secured to side members **66** and **68** of inner frame **53**.

Each pad consists of an elongated arcuate plate having gripper elements A, B, C and D, each of the elements being secured to one end of the respective plate and being identical in construction and operation, and each consisting of a rectangularly shaped panel **110** completely surrounded at its peripheral edge by a flexible gasket **112** and disc-shaped pressure pads **114**, **116**, **118** and **120** secured to panel **110** by rivets, screws or other suitable securing means. The area defined by gasket **112** is recessed, forming in effect a vacuum chamber which is connected to a vacuum pump or other source of vacuum on the industrial truck, by a flexible hose **121** joined to connection **122** near the center of panel **110**. The four gripper elements A, B, C and D are adapted to engage the external surface of a paper roll indicated by the letter R in FIGURE 1 and, when the elements are firmly seated on the external surface of the roll, the area defined by the gaskets **112** is connected to a source of vacuum, which creates a suction in the area, firmly seating the gaskets and discs **114**, **116**, **118** and **120** on the external surface of the roll, thereby firmly holding the gripper elements on the surface of the roll with sufficient force to permit the attachment to lift and hold the roll while it is being transported by the truck. The pivoted mounting of the two pads on arms **96** and **98** permits the pads to adjust themselves to various diameter rolls and to form an effective vacuum and gripping action between elements A, B, C and D on the external surface of the roll without careful or precise initial seating of the elements on the roll surface.

In order to permit the operator to lift and rotate the roll between its horizontal and up-ended positions, a mechanism indicated by numeral **130** for rotating the apparatus through at least 180 degrees is interposed between outer frame **40** and upright **20**. A suitable mechanism for performing the rotating operation is described and claimed in patent application Serial No. 170,879, common assignee with the present application, consisting of a rotatable front plate **132** to which outer frame **40** is pivoted by a pin **134** extending through brackets **136** nad **138** on one edge of plate **132** and through frame member **46**, and a pin **140** extending through brackets **142** and **144** on the opposite edge of plate **132** and through frame member **48**. Plate **132** is rotated by a pair of operating cylinders **150** and **152**, each having a piston **154** therein with a rack on the inner edge for engaging the teeth on pinion **156**, the teeth on said pinion projecting through a longitudinal slot **158** in said cylinders to engage the rack. Movement of the piston in cylinder **150** in one direction and the piston in cylinder **152** in the opposite direction rotates pinion **156** which is rigidly secured to plate **132** by a ring of bolts **157** secured to a flange **159** of the pinion, and thus rotates the plate to the various angular positions required for positioning the paper roll. The cylinders are rigidly secured to backing plate **160**, which in turn is mounted on and secured to cross beams **34** and **36** on carriage **32** of upright **20** by a plurality of lugs **166** secured to backing plate **160** and seating over a shoulder **168** on cross beam **34**. The lower portion of the rotating mechanism is secured to the lower cross beam by an arm **170** secured to cross beam **36** by a bolt **172**, arm **170** being rigidly joined to base plate **174**, which in conjunction with backing plate **160**, holds the cylinders firmly in place while the attachment is being rotated to various positions. Plate **132**, which includes an annular L-section retainer member **132***a* connected to the outer peripheral portion of the plate by a ring of bolts **176**, is rotatably secured to base plate **174** by bearings **178** and **180** at the inner and outer edges, respectively, of the base plate. Plate **132** rotates around base plate **174** as pinion **156** is rotated by the pistons in cylinders **150** and **152**, thus also rotating with plate **132** the outer frame assembly **40** and assemblies connected thereto. A vacuum conduit **184** extends through an axial opening in the attachment and rotator assemblies, as shown in FIGURE 4, for evacuating the closed chambers formed between roll R and the gripper elements A, B, C and D by way of flexible lines **186** (FIGURE 3) which connect conduit **184** to hoses **121** of each gripper element. An annular sealing member **188** is mounted between an annular recess in conduit **184** and the inner peripheral surface of plate **132**.

An effective articulated load engaging mechanism is created by the pivotal mounting of inner frame **53** on outer frame **40** and the pivotal mounting of outer frame **40** on plate **132** on an axis disposed at right angles to the axis of the pivotal mounting of the inner and outer frames. The pivotal mounting of the two frames and plate **132** permits the load engaging elements readily and effectively to adapt themselves to the load, such as a paper roll, regardless of any small misalignment between the load and load engaging elements.

In the operation of the present load handling apparatus, assuming that the paper roll is lying on its side, as illustrated in FIGURE 1, the attachment is operated to place the gripping pads horizontally and is then adjusted vertically until the center axis of the roll is on a line approximately midway between the two pads. The operator then moves the truck forwardly until the two gripper elements engage the external surface of the roll. As the elements engage the roll, the gripping pads automatically adjust themselves to the size and exact roll position by pivoting on pins **84** and **86** between the pads and the inner frame **53** and on pins **62** and **64** between the inner and outer frames, and on pins **134** and **140** between the outer frame and plate **132**. These three pivot points provide an articulated structure which facilitates optimum adaptation of the pads to the external surface of the paper roll without requiring any special skill or care in maneuvering the truck as the roll is being approached by the attachment. After the elements have been seated on the external surface of the roll, they are connected to a source of vacuum by the operator, thus creating sufficient suction in the area or recess defined by gaskets **112** to seat the elements firmly on the external surface of the roll, with pressure pads **114**, **116**, **118** and **120** firmly engaging the surface. Thereafter, the attachment is raised by the truck upright to lift the roll and, if the axial position of the roll is to be changed, the two hydraulic cylinders **150** and **152** are operated to rotate plate **132** and thus to rotate the attachment and roll to any desired position. After

the roll has been moved to the desired location, the operator shuts off the source of vacuum to the elements, thereby relieving the suction in the recess and releasing the roll.

It is seen that the vacuum-type gripper elements used in the present construction permit the roll to be engaged and carried without applying any substantial pressure to the roll and without gripping the roll from opposite sides, as is normally required by the conventional paper roll handling apparatus. The present type of mechanism does not apply sufficient pressure to the roll to cause it to become distorted or otherwise to be damaged by the roll engaging elements.

While the present articulated attachment has been illustrated in connection with paper rolls, it may be used equally satisfactorily in handling any cylindrical objects of substantially the same size and shape as paper rolls, and other types of load engaging elements may be used in combination with the articulated mechanism. Only one embodiment of the present load handling apparatus has been described in detail herein; however, various changes and modifications may be made without departing from the scope of the invention.

I claim:

1. An articulated load handling attachment for an industrial truck having an upright with a vertically movable carriage on the front end thereof, said attachment comprising a plate rotatable on a vertical plane, a base for rotatably supporting said plate on said carriage, means for mounting said base on said carriage, a plurality of hydraulic cylinder units mounted on said base for rotating said plate through at least ninety degrees, a first rectangular frame pivoted at opposite sides to said rotatable plate and being on and limited to a plane substantially parallel with the plane of said plate, a second rectangular frame pivoted at right angles and at opposite sides to said first frame and being on and limited to a plane substantially parallel with the plane of said base,

and load engaging elements mounted on said second frame and projecting forwardly therefrom.

2. An articulated load handling attachment for an industrial truck, said truck having a vacuum creating means therein and an upright with a vertically movable carriage on the front end thereof, said attachment comprising a plate rotatable on a vertical plane, a base for rotatably supporting said plate on said carriage, means for mounting said base on said carriage, power means mounted on said base for rotating said plate, a first rectangular frame pivoted at opposite sides to said rotatable plate and being on and limited to a plane substantially parallel with the plane of said plate, a second rectangular frame pivoted at right angles and at opposite sides to said first frame and being on and limited to a plane substantially parallel with the plane of said first frame, and a load engaging element mounted on said second frame and having two load contact members pivoted on an axis parallel to said plane.

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