Dec. 14, 1965 E. K. HANSEN 3,223,265

CARTON GRAB ASSEMBLY FOR LIFT VEHICLES

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FIG. 1

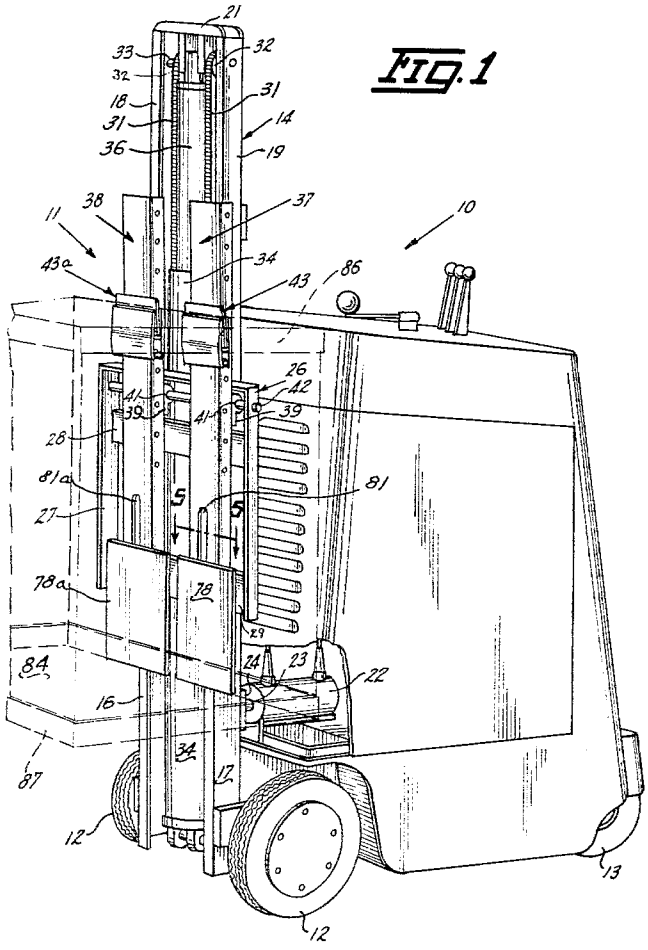


FIG. 7

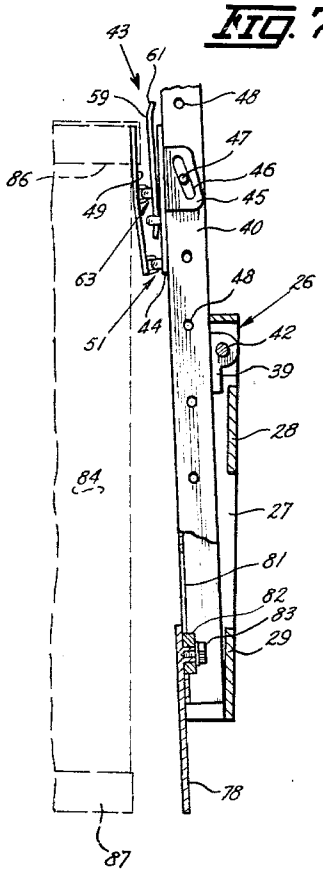


FIG. 3

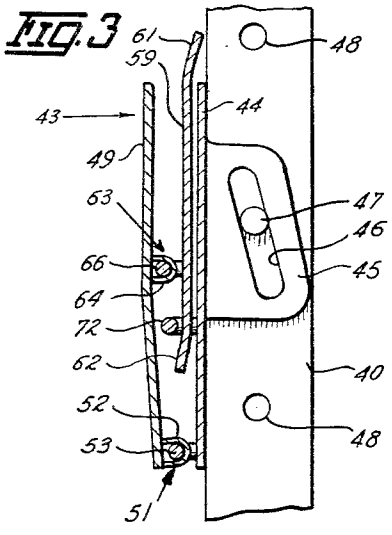
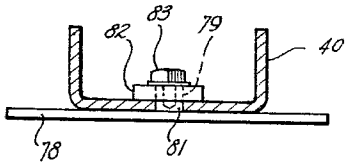


FIG. 5



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FIG. 2

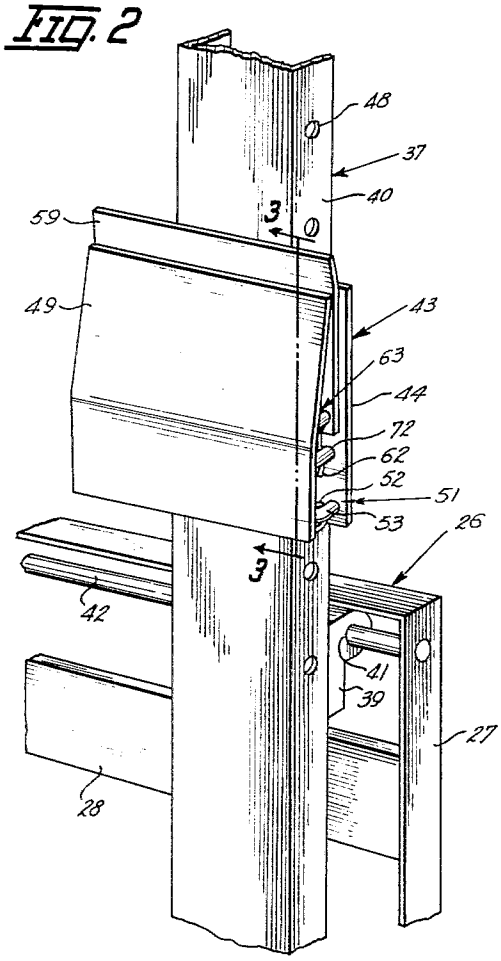
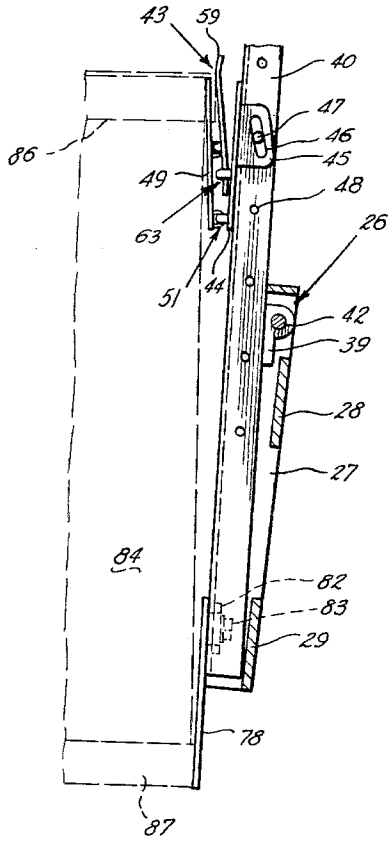


FIG. 8



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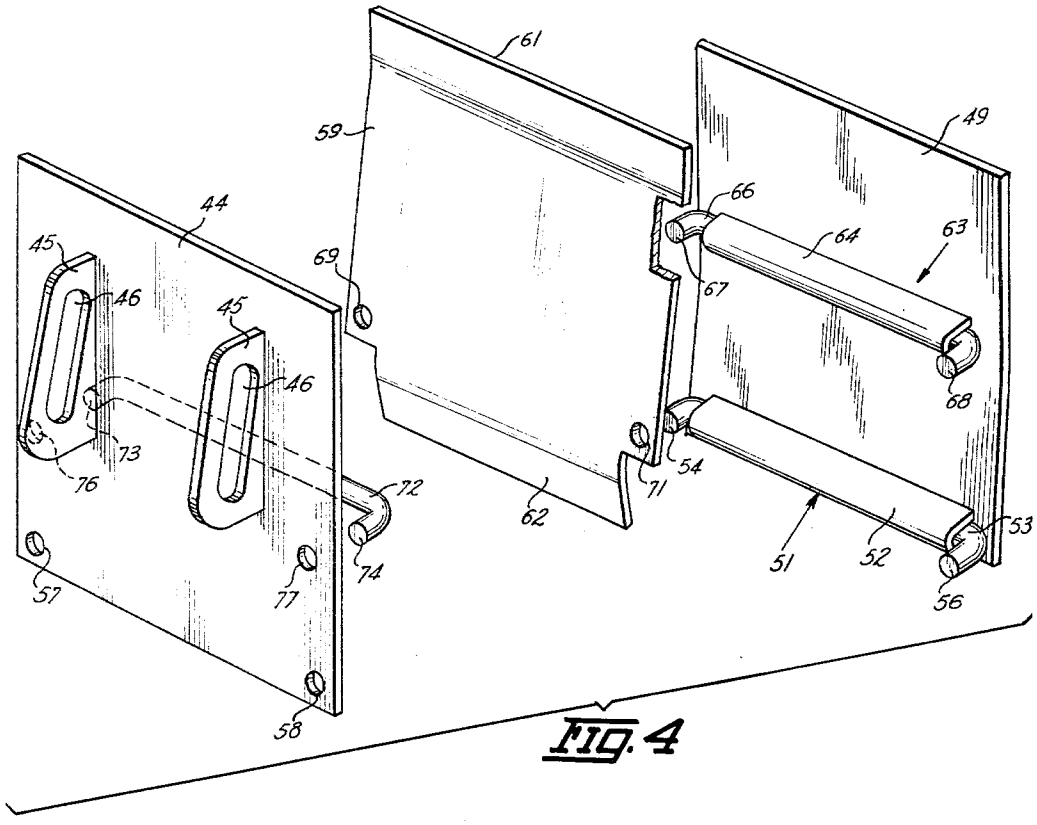
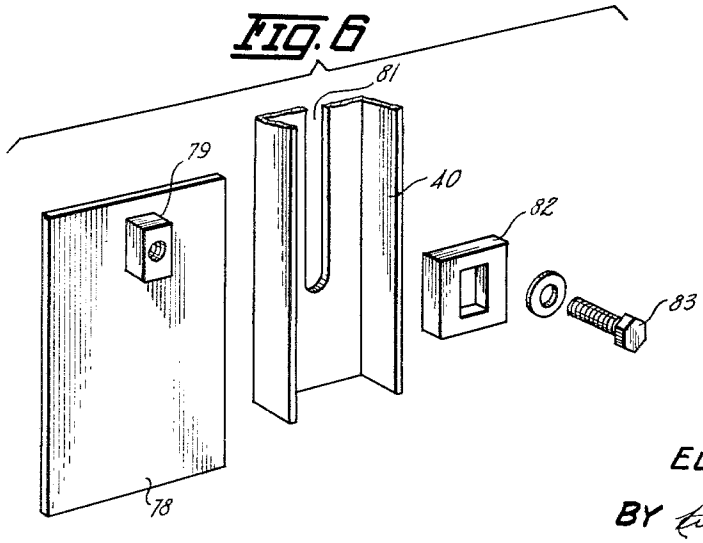


FIG. 4

FIG. 6



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CARTON GRAB ASSEMBLY FOR LIFT VEHICLES

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This invention relates to a carton handling attachment for use on a fork lift vehicle; more particularly, the invention relates to a carton grab assembly mountable on the carriage of a fork lift vehicle and operable to grip packing cartons having a turned down flange around the top thereof.

It is the object of the invention to provide an improved carton handling apparatus for a fork lift vehicle which is used in place of the usual fork and is mounted on the carriage portion of a lift vehicle and functions to lift, carry, and stack a carton without the use of auxiliary handling structure.

Another object of the invention is to provide a carton handling apparatus which engages and clamps the overhanging flange formed on the upper portion of a carton and engages the lower portion of the carton to prevent damage to the carton and its contents while it is being handle.

Another object of the invention is to provide a carton handling apparatus which is adjustable to accommodate cartons of various sizes.

A further object of the invention is to provide a compact carton handling apparatus so as not to interfere with the maneuverability of the lift vehicle.

An additional object of the invention is to provide a relatively low cost carton grab assembly which is economical and sturdy in construction and efficient and versatile in use.

The exact nature of the invention, as well as other objects and advantages thereof, will be readily apparent from the consideration of the following specification relating to the annexed drawing in which:

FIG. 1 is a perspective view of a fork lift vehicle equipped with the carton grab assembly of the invention;

FIG. 2 is an enlarged perspective view of one of the units of the carton grab assembly of FIG. 1;

FIG. 3 is an enlarged sectional view taken along the line 3—3 of FIG. 2;

FIG. 4 is an enlarged exploded perspective view of the grab mechanism shown in FIG. 3;

FIG. 5 is an enlarged sectional view taken along the line 5—5 of FIG. 1;

FIG. 6 is a fragmentary exploded perspective view showing the relationship between the shoe and the upright channel member of one of the units of the grab assembly;

FIG. 7 is a fragmentary side view of a fork lift vehicle equipped with the carton grab assembly, as illustrated in FIG. 1, showing the initial position of the grab assembly for picking up a carton having a turned down top flange; and

FIG. 8 is a view similar to FIG. 7 showing the position of the grab assembly for carrying the carton.

Referring to the drawing, there is shown in FIG. 1, a fork lift vehicle 10 in assembled relation with the carton grab assembly 11 of this invention. The vehicle 10 has a motor (not shown) which drives a pair of front drive wheels 12. A steering caster wheel 13 is rotatably mounted on the bottom of the rear end of the vehicle.

Extended in an upward direction from the drive wheels 12 is a mast 14 comprising a pair of outer channel beams 16 and 17. The lower ends of the channel beams 16 and 17 are pivotally mounted on the vehicle frame adjacent the drive wheels 12. Telescoped within the beams 16 and 17 are a pair of inner channel beams 18 and 19

which are connected at their upper ends by a cross member 21. The mast 14 is maintained in an upright position and tilted about the axis of the drive wheels 12 by a double acting cylinder assembly 22 which is mounted on the vehicle frame. The cylinder assembly 22 has a piston rod 23 connected to the outer beams 16 and 17 by a transverse member 24.

An elevatable carriage 26 extends transversely across the front side of the mast 14 and is guided by the inner beams 18 and 19 by rollers (not shown) which are rotatably mounted on the carriage and positioned in the channels of the inner beams 18 and 19. The carriage 26 has an inverted U-shaped peripheral frame 27 and a pair of parallel vertically spaced plates 28 and 29 which extend between and are secured to the legs of the frame 27.

The carriage 26 is connected to the vehicle frame by a pair of lift chains 31 which are secured at one end to the carriage 26. From the carriage 26, the lift chains 31 extend in an upward direction over sprockets 32 which are rotatably mounted between the inner beams 18 and 19 immediately below the cross member 21 by a transverse shaft 33. The opposite ends of the lift chains 31 extend in a downward direction and are connected to the vehicle's frame.

The inner beams 18 and 19 are moved relative to the outer beams 16 and 17 by an upwardly positioned cylinder assembly 34. The lower end of the cylinder assembly 34 is positioned between the drive wheels 12 and is pivotally mounted to the vehicle frame. The upper end of the cylinder assembly 34 includes a piston 36 connected at its upper portion to a shaft 33. When hydraulic fluid under pressure is supplied to the bottom of the cylinder assembly 34, the piston 36 is moved in an upward direction carrying the inner beams 18 and 19 and carriage 26 to an elevated position. The carriage 26 will move in a downward direction when the hydraulic fluid in the cylinder assembly 34 is permitted to flow back into a reservoir (not shown).

As shown in FIG. 1, the carton grab assembly 11 is mounted on the front of the carriage 26 and comprises two identical separate units indicated generally as 37 and 38. Each unit is separately mounted on the carriage 26 and has a rearwardly extended projection 39 formed with a transverse bore 41. A transverse rod 42 mounted on the upper ends of the legs of the carriage frame 27, runs through the bores 41 in the projections 39 connecting each unit 37 and 38 to the carriage 26. In order to accommodate cartons of varying widths, the relative spacing between the units 37 and 38 may be adjusted by sliding the projections 39 axially of the rod 42.

Since the units 37 and 38 are identical in construction, the following detailed description is limited to unit 37. Corresponding structure of unit 38 is indicated with the same reference number having a suffix "*a*."

As shown in FIG. 2, the unit 37 comprises an upright channel member 40 having the open side thereof facing the carriage 26. The sides of the channel member 40 engage the bottom carriage plate 29 and the top of the carriage frame 27. The bottom section of the member 40 terminates adjacent the plate 29 and the top section thereof projects upwardly above the carriage in a direction which is substantially parallel to the mast 14. The projection 39 is secured by welds to the legs of the channel member 40 and coact with the transvere rod 42 to hold the channel member in an upright position.

Secured to the mid-section of the channel member 40 is a carton-grab mechanism 43 which is operable to grip the top turned down flange of a carton. The grab mechanism 43 comprises a base plate 44 which has a flat substantially rectangular shape. As shown in FIG. 4, a pair of tongues 45 are secured to and project laterally from

the rear surface of the plate 44. The tongues 45 extend in a substantially parallel direction and are transversely spaced from each other. Each tongue 45 has a downwardly and rearwardly directed slot 46. The slots 46 in the respective tongues are in transverse alignment. As shown in FIG. 3, when the grab mechanism 43 is assembled on the channel shaped member 40 the tongues 45 are positioned adjacent the opposite sides of the channel member 40 and a pin 47 projects through the slots 46 and holes 48 in the sides of the channel shaped member. The walls of the tongues 45 defining the slots 46 function as inclined wedge surfaces which coact with the transverse pin 47 to positively retain the grab mechanism 43 on the upright channel member 40.

As shown in FIG. 2, the sides of the channel member 40 are provided with a plurality of vertically spaced holes 48 for the purpose of connecting the grab mechanism 43 to the channel member 40 in a plurality of vertical positions. These positions may be changed by moving the grab mechanism 43 in an upward direction and removing the transverse pin 47. The grab mechanism 43 may then be moved to the desired position and retained there by inserting the transverse pin 47 through the holes 48.

Forward of the base plate 44 is positioned an outer jaw member 49 which comprises a rectangular shaped plate having a size substantially equal to the size of the base plate 44. As shown in FIG. 3, the jaw member 49 projects in an upward direction and has a slight bend in the mid-section thereof. A hinge connection 51 comprises a U-shaped member 52 which is secured at its free ends to the bottom section of the jaw member 49. Positioned in the channel of the U-shaped member 52 is a rod 53 having right angle bent ends 54 and 56. The opposite bottom corners of the base plate 44 have holes 57 and 58. The rod ends 54 and 56 are positioned in the holes 57 and 58 and secured thereto by welds.

Interposed between the outer jaw member 49 and the base plate 44 is an inner jaw member 59 which is a rectangular shaped plate. The top section of the jaw member 59 projects above the top edge of the outer jaw member 49 and is turned or bent toward the base plate 44 to provide a convex curved surface which functions to guide the turned down top flange of a carton into the space between the inner and outer jaw members. The bottom section 62 of the jaw member 59 projects downwardly and is curved away from the base plate 44. The opposite sides of the bottom section 62 terminate inwardly from the corresponding sides of the remainder of the jaw member with a result that the width or transverse dimension of the bottom section 62 is less than the width of the top section 61.

The inner jaw member 59 is pivotally mounted on the mid-section of the outer jaw member 49 by a hinge connection 63. The axis of the hinge connection 63 is substantially parallel to the axis of the hinge connection 51. The hinge connection 63 comprises a U-shaped member 64 which is secured at its free ends to the inside wall of the mid-section of the jaw member 49 and a rod 66 having right angle bent ends 67 and 68. The inner jaw member 59 is provided with transversely spaced holes 69 and 71 which receive the rod ends 67 and 68. The rod ends 67 and 68 are secured to the jaw member 59 by welds.

Extended substantially parallel to the hinge connections 51 and 63 is a fulcrum rod 72 having right angle turned ends 73 and 74. The rod 72 extends in a transverse direction and is positioned between the hinge connections 51 and 63. The rod ends 73 and 74 are positioned in holes 76 and 77 in the opposite sides of the base plate 44 and are secured thereto by welds. As shown in FIG. 3, the bottom section 62 of the jaw member 59 projects through the space between the rod 72 and the base member 44. The hinge connections 51 and 63 retain the inner jaw member 59 in this position. During pivotal movement of the inner jaw member 59, the rod 72 functions as a fulcrum for the outer jaw member 49.

The jaw members 49 and 59 pivot about separate axes which are defined by the transverse rods 53 and 72. The relative translatory movement resulting from the pivoting of the jaw members 49 and 59 about spaced parallel axes in a forward direction, which in FIG. 3 is counter-clockwise, provides the grab mechanism 43 with a biting or clamping action the effect of which will be described in detail.

As shown in FIG. 1, a flat elongated shoe 78 is slidably mounted on the lower section of the channel member 40. The shoe 78 has a limited amount of movement in the vertical direction and is adapted to contact the vehicle support surface when the carriage 26 is in the down position. The shoe 78 functions as a stationary bumper which bears against the bottom edge of a carton.

As illustrated in FIGS. 5 and 6, the shoe 78 has a rearwardly projected rectangular boss 79 on the mid-section of the upper portion thereof. The boss 79 passed through a longitudinal slot 81 in the web of the channel member 40. The slot 81 has a width slightly larger than the width of the boss 79 and has a limited length which determines the amount of vertical movement of the shoe 78. The back side of the shoe 78 is maintained in a bearing relation with the web of the channel member 40 by a washer 82 which is held on the boss 79 by a bolt 83 threaded into the boss 79.

As shown in FIG. 1, the grab assembly 11 is used to pick up and transport a material packaging carton 84 which has a turned down flange 86 along the top periphery of the side walls. The flange 86 is maintained in a turned down position by a steel band (not shown) circumscribed about the carton. The carton 84 has a reinforced bottom peripheral edge 87.

As shown in FIG. 7, the carriage 26 is tilted in a slightly forward direction and the vehicle 10 moves forward until the outer jaw member 49 engages the side wall of the carton 84 below the turned down flange 86. The shoe 78 is in engagement with the carton supporting surface and is spaced from the bottom peripheral edge 87 of the carton.

With the outer jaw member 49 in engagement with the side wall of the carton 84, the carriage 26 is moved in an upward direction in response to actuation of the cylinder assembly 34. The moving carriage 26 carries the grab mechanisms 43 and 43*a* in an upward direction until the turned down top flange 86 is positioned between the outer jaw member 49 and the inner jaw member 59 of each grab mechanism.

As shown in FIG. 8, the carriage 26 is tilted in a rearward direction moving the shoe 78 into engagement with the bottom peripheral edge 87 of the carton. The weight of the carton 84 on the outer jaw member 49 subjects the jaw member 49 to an outwardly directed force which tends to pivot the jaw member 49 about the hinge connection 51. Movement of the outer jaw member 49 in an outward direction, which is counter-clockwise, as shown in FIG. 8, pivots the inner jaw member 59 about the fulcrum rod 72. Since the jaw members 49 and 59 pivot about separate and spaced parallel axes the complementary ends of each jaw member have relative translatory movement. In other words, the upper end section of the inner jaw member 59 moves toward the upper end section of the outer jaw member 49 and thereby clamps the turned down peripheral flange between the jaw members 49 and 59. The jaw members 49 and 59 coact to bite the turned down peripheral flange 86 preventing relative movement of the carton with respect to the grab mechanisms 43 and 43*a*.

After the carton 84 has been transported to its new location, the grab mechanisms 43 and 43*a* of the grab assembly 11 are released from clamping engagement with the turned down peripheral top flange by lowering the carriage 26 to position the crate on the supporting sur-

face. Continued lowering of the carriage **26** moves the outer jaw member **49** from under the turned down flange **86**. The shoes **78** and **78***a*, being in engagement with the supporting surface, does not inhibit the downward movement of the channel members as the elongated slots **81** and **81***a* permit the channel members to move downward relative to the shoes **78** and **78***a*. The vehicle **10** is then backed away from the carton **84** and the carriage **26** raised until the shoes **78** and **78***a* are above supporting surface. The vehicle **10** is now ready to retrieve a second carton.

In summary, the carton grab assembly **11** includes a pair of identical grab mechanisms **43** and **43***a*. Each grab mechanism has an outer jaw member **49** and an inner jaw member **59** which are pivoted on separate substantially parallel axes. In use these jaw members are positioned about the top turned down flange of a material packaging carton. Pivotal movement of the respective jaw members about their separate pivotal axes results in a relative translatory movement of the upper ends of the respective jaw members so as to bite or clamp the peripheral flange **86** of the carton.

This invention has been described with respect to its preferred embodiment. It is to be understood that it is not to be so limited since changes can be made therein which are within the full intended scope of this invention as defined by the appended claims.

I claim:

1. A carton grab assembly for a lift vehicle having an elevatable carriage usable to handle cartons having a down turned flange around the top thereof, comprising:

(a) upright means having a bottom section mounted on said carriage,

(b) grab means positioned adjacent said upright means,

(c) means for connecting the grab means to the upright means above said bottom section,

(d) said grab means including a base plate having a bottom section, a first jaw member having a top section, a bottom section and a mid-section, first hinge means pivotally connecting the bottom section of the first jaw member to the bottom section of the base plate, a second jaw member having a top section and a bottom section, said second jaw member interposed between said first jaw member and said base plate, second hinge means pivotally connecting the midsection of the first jaw member and the section of the second jaw member adjacent the bottom section thereof, fulcrum means secured to the base plate and extended about the bottom section of the second jaw member whereby upon upward movement of the carriage the first jaw member pivots away from said base plate moving the top section of said second jaw member toward the top section of the first jaw member clamping a portion of the down turned flange therebetween.

2. The carton grab assembly defined in claim **1**, including:

(a) shoe means slidably mounted for upright movement on the bottom section of said upright means.

3. In combination with a lift vehicle having a mast and a carriage mounted for vertical movement on said mast,

(a) means mounted on said carriage for engaging and lifting an article having a downturned top flange upon upward movement of said carriage, said means comprising,

(b) upright means, and

(c) grab means mounted on said upright means, said grab means including a base plate, a first jaw means pivotally connected to said base plate, a second jaw means interposed between said first jaw means and the base plate, fulcrum means secured to said base plate, said second jaw means pivotally connected to said first jaw means and movable about said fulcrum means to clamp a portion of the down-turned top flange between said jaw means.

4. The invention defined in claim **3**, including:

(a) shoe means positioned below said grab means and slidably mounted on said upright means for engaging a portion of said article adjacent a bottom peripheral edge.

5. A grab mechanism for a lift vehicle having an elevatable carriage comprising:

(a) a base plate mounted on said carriage having a bottom section,

(b) a first jaw member having a top section, a bottom section, and a mid-section,

(c) first hinge means pivotally connecting the bottom section of the first jaw member to the bottom section of the base plate,

(d) a second jaw member having an upper end section and a lower end section, said second jaw member interposed between said first jaw member and said plate,

(e) second hinge means pivotally connecting the mid-section of the first jaw member and the section of the second jaw member adjacent the lower end section thereof,

(f) fulcrum means secured to the base plate and extended about the lower end section of the second jaw member whereby upon pivotal movement of the first jaw member away from said base plate the upper end section of said second jaw member moves toward the top section of the first jaw member.

6. A grab mechanism usable with a lift vehicle having an elevatable carriage to handle a carton having a turn down top flange comprising:

(a) base means mounted on said carriage having a bottom section,

(b) first jaw means having a top section, mid-section, and bottom section,

(c) first pivot means connecting the bottom section of the base means with the bottom section of the first jaw means whereby the first jaw means pivots about a first axis,

(d) second jaw means having a top section and a bottom section, said second jaw means positioned between said base means and first jaw means with the top portion thereof projected above the top section of said first jaw means,

(e) second pivot means connecting the mid-section of the first jaw means and the section of the second jaw means immediately above the bottom section thereof for pivotal movement about a second axis extended substantially parallel to said first axis, and

(f) fulcrum means secured to the base means and extended about the bottom section of the second jaw means along a third axis positioned between the first and second axis and projected substantially parallel thereto whereby upon pivotal movement of the first jaw means away from the said base means the top section of said second jaw means moves toward the top section of the first jaw means to clamp a portion of the downturned flange therebetween.

7. A grab mechanism for a lift vehicle having an elevatable carriage usable with a carton having a turn-down top flange comprising:

(a) base means mounted on said carriage having a bottom section,

(b) first means having a top section, mid-section, and bottom section,

(c) first pivot means connecting the bottom section of the base means with the bottom section of the first means whereby the first means pivots about a first axis,

(d) second means having a top section and a bottom section, said second means positioned between said base means and first means,

(e) second pivot means connecting the mid-section of the first means and a section of the second means above the bottom section thereof for pivotal move-

ment about a second axis extended substantially parallel to said first axis, and

(f) fulcrum means secured to the base means and extended about the bottom section of the second means along a third axis positioned between the first and second axis and projected substantially parallel thereto whereby upon pivotal movement of the first means away from the said base means the top section of said second means moves toward the top section of the first means to clamp a portion of the downturned flange therebetween.

8. A grab assembly for use with an elevatable structure comprising:

(a) a base plate mounted on said elevatable structure having fulcrum means secured to one side and adjacent a lower section thereof,

(b) laterally extended tongue means secured to the other side of said base plate,

(c) first jaw means having a mid-section and a bottom section, said bottom section pivotally connected to said base plate,

(d) second jaw means having a bottom portion and a top portion, said bottom portion pivotally movable relative to said fulcrum means, and

(e) said second jaw means pivotally connected to said first jaw means whereby pivotal movement of said first jaw means away from the base plate moves the top portion of said second jaw means toward said first jaw means in a clamping action.

9. A grab mechanism for a lift vehicle having an elevatable carriage comprising:

(a) a base plate mounted on said elevatable carriage having a bottom section and a laterally extended retaining means,

(b) first jaw means having a mid-portion and a bottom portion,

(c) first means pivotally connecting the bottom section of said base plate to the bottom portion of said first jaw means,

(d) second jaw means having a lower section,

(e) second means pivotally connecting the section above the lower section of said second jaw means to the mid-portion of said first jaw means, and

(f) said lower section of the second jaw means surrounded by said retaining means whereby pivotal movement of said first jaw means away from the base plate rotates the second jaw means about the retaining means to move the jaw means together.

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