Nov. 2, 1954 B. I. ULINSKI 2,693,289

LOAD GRIPPER ATTACHMENT FOR INDUSTRIAL TRUCKS

Filed July 5, 1950 2 Sheets-Sheet 1

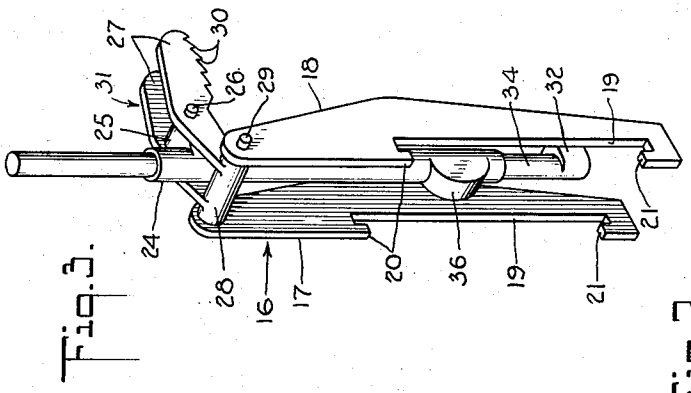


Fig. 3.

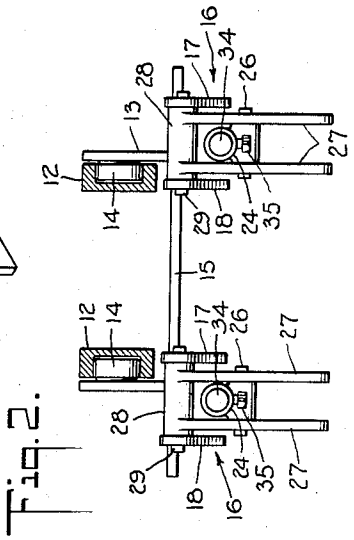


Fig. 2.

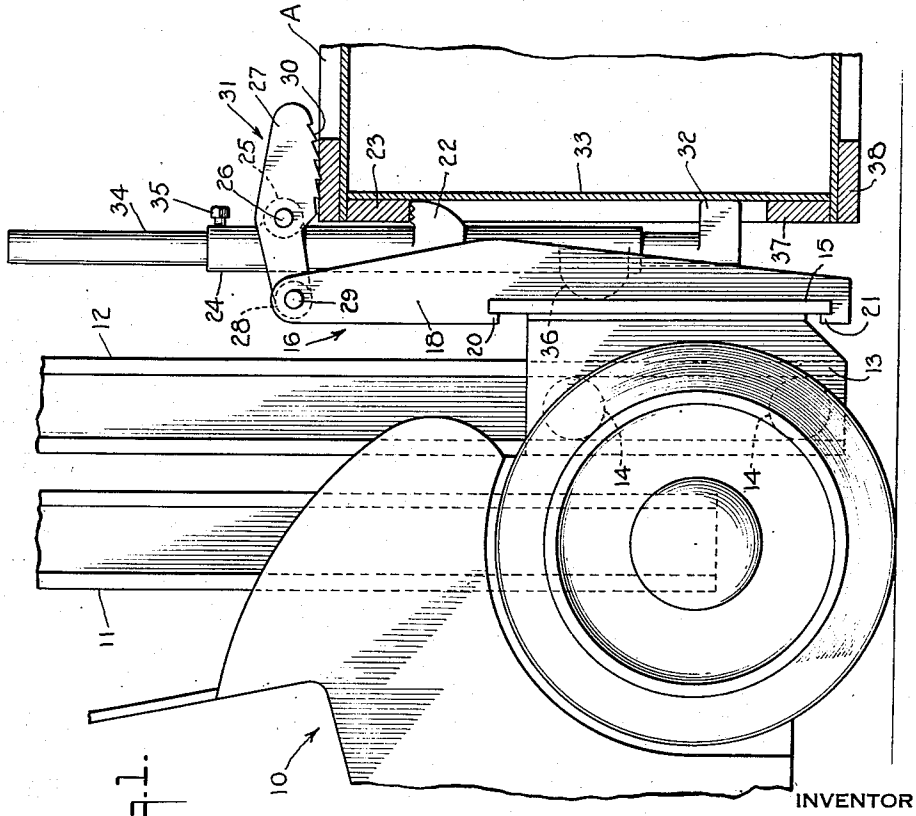


Fig. 1.

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LOAD GRIPPER ATTACHMENT FOR INDUSTRIAL TRUCKS

Filed July 5, 1950 2 Sheets-Sheet 2

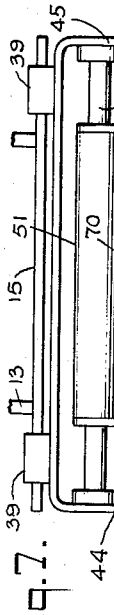


Fig. 7.

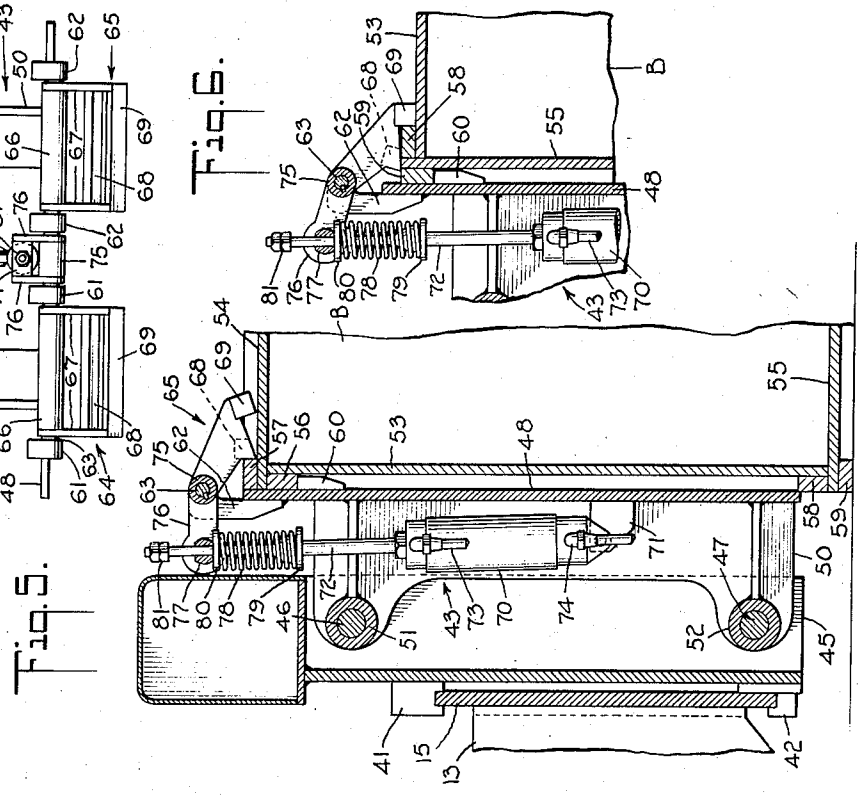


Fig. 5.

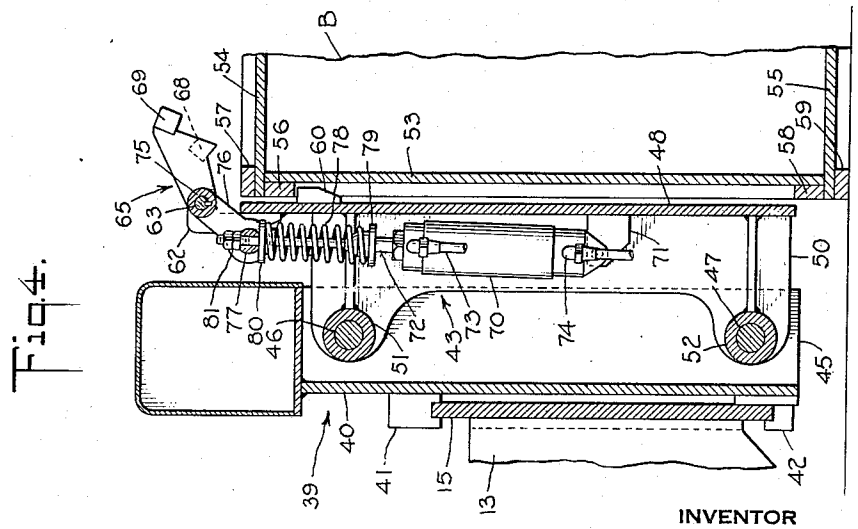


Fig. 4.

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2,693,289

# LOAD GRIPPER ATTACHMENT FOR INDUSTRIAL TRUCKS

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Application July 5, 1950, Serial No. 172,112

16 Claims. (Cl. 214—653)

This invention relates to load gripping apparatus for industrial trucks, and more particularly to a gripper attachment which is adapted to be applied to a load lifting carriage of an industrial truck for gripping and holding the load while it is transported by the truck.

One object of this invention is to provide an attachment of the above nature whereby a load may be effectively gripped and lifted even though the bottom surface of the load may rest upon the floor and thus be inaccessible.

Another object is to provide an attachment of the above nature which is particularly adapted for use in transporting crates and other objects having laterally extending outer members.

Another object is to provide an attachment of the above nature whereby an object having a projection on its side may be safely transported by an industrial truck without engaging the bottom of the object.

A further object of this invention is to provide an attachment of the above nature which will be durable, dependable and efficient in operation, not likely to get out of adjustment, and economical to manufacture.

As a feature of my invention, I utilize a lower gripper adapted to engage beneath an upper rail of a crate or the like, with means through which the lower gripper acts, when supporting the crate, to move an upper gripper for clamping the crate relatively to the lower gripper. More particularly, I mount the lower gripper on a vertical member so arranged as to apply the weight of the crate at least in part to the upper gripper. I mount the upper gripper preferably to rotate on a pivot toward and away from the lower gripper, and I prefer also to mount the vertical member on the upper gripper through a pivot. Thereby the vertical member, when supporting the crate through the lower gripper, swings the upper gripper toward the lower gripper to clamp the crate rail between both grippers.

As a further feature of my invention, I equip the vertical member with means for stabilizing a crate when the upper rail of the crate is clamped between the grippers. Thus, I provide upon the vertical member, in a position below the lower gripper, an abutment surface adapted to engage the lower portion of the crate to prevent the crate from swinging rearwardly upon the lower gripper. Further, I form a portion of the vertical member for sliding engagement with a part on the lifting carriage of the truck. Thereby the carriage maintains the vertical member in proper alignment when stabilizing the crate, but does not nevertheless allow the vertical member to move for actuating the upper gripper.

As another feature, I so mount and construct the upper gripper that this gripper when actuated by the vertical member presses the crate rail inwardly upon the lower gripper, and while thus pressing the crate rail also clamps the rail against the upper surface of the lower gripper. To accomplish this, I position the pivot mounting of the upper gripper a considerable distance above the lower gripper, with the upper gripper moving actually inwardly toward a position below the pivot when clamping the crate. Moreover, I equip the upper gripper with a series of spaced load engaging surfaces so positioned that at least one surface will be effective to clamp the rail of the crate notwithstanding differences in the width of the rail. Thereby the upper gripper can clamp crate rails of different sizes upon the lower gripper, while simultaneously pressing the rails inwardly on the lower gripper.

I have thus outlined rather broadly the more important



features of my invention in order that the detailed description thereof that follows may be better understood, and in order that my contribution 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 hereto. Those skilled in the art will appreciate that the conception on which my disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of my invention. It is important, therefore, that the claims be granted me shall be of sufficient breadth to prevent the appropriation of my invention by those skilled in the art.

In the drawings,

Fig. 1 is a side elevation showing one form of the gripper attachment as it would appear when supporting a crate upon a load carriage at the front of an industrial truck, the crate being shown in section.

Fig. 2 is a plan view showing a pair of the attachments applied to the load carriage, the secondary uprights of the truck being shown in section.

Fig. 3 is a perspective view of the first form of the attachment.

Fig. 4 is a cross sectional view of a second form of the attachment and a portion of a load carriage upon which it is mounted, showing the grippers in open position and in readiness to grip the corner strips of a crate.

Fig. 5 is a view similar to Fig. 4, but showing the grippers engaged with the corner strips of the crate.

Fig. 6 is a fragmentary view similar to a portion of Fig. 5, but showing the grippers as they would appear when engaged with the corner strips in an alternative relationship.

Fig. 7 is a plan view of the second form of the attachment and a portion of the load carriage upon which it is mounted.

Referring now more particularly to the drawings, reference numeral **10** indicates an industrial truck of the type having primary uprights **11** and secondary uprights **12**. The secondary uprights **12** are in the form of oppositely facing channel members, and serve as guides for a vertically moving load lifting carriage **13** having a plurality of rollers **14** engaged in said secondary uprights. The carriage **13** comprises a vertical front plate **15** and may be operated by any suitable power-driven means on the truck **10**, so that the front plate **15** and any load or attachment applied thereto may be lifted or lowered as desired by the operator.

The first form of the improved load gripper attachment is designated generally by the numeral **16** and comprises a pair of bracket plates **17**, **18**, that are elongated in a vertical direction and are adapted to be mounted in forwardly extending parallel planes upon the load carriage plate **15**. In order to attach the bracket plates **17**, **18** to the carriage plate **15**, the rear edges of said bracket plates are preferably cut away to form slots **19** of suitable dimensions to receive the carriage plate **15**, the ends of said slots being undercut to form upper and lower hooks **20**, **21**, engageable behind the respective top and bottom edges of said carriage plate.

The gripper attachment **16** further comprises a forwardly projecting and upwardly facing toothed jaw or gripper **22** which is adapted to be engaged under a horizontal corner strip **23** of a crate A so as to support said crate. The gripper **22** is formed upon a front central portion of a tubular column **24** which is located in a vertically extending position intermediate the bracket plates **17** and **18**, and which has a horizontally apertured lug **25** adjacent its upper end, said lug being disposed directly above gripper **22**.

The tubular column **24** and the gripper **22** thereon are supported by means of a cross pin **26** which is inserted through the lug **25** and is engaged at its ends in central portions of a pair of parallel forwardly extending gripper arms **27** at opposite sides of the tubular member **24**. The rear ends of the arms **27** are rigidly attached to a sleeve base portion **28** which is supported between the upper ends of the bracket plates **17**, **18** by means of a horizontal pivot shaft **29**. The arms **27** and the base portion **28** together form a swingable unitary upper gripper **31**.

Each of the forwardly extending gripper arms **27** is

provided upon its lower front edge portion with a series of teeth **30** which are rearwardly directed in a sawtooth formation. Further, each series of teeth **30** is arranged in a curved line which is eccentric with respect to the cross pin **26**, the rear end of said line of teeth being closer to said cross pin than is the front end of said line. The purpose of this arrangement is to permit the gripper attachment to operate effectively and automatically without regard to variations which may occur in the thicknesses and widths of the corner strips. Thus, if the gripper **31** is required to swing downwardly an unusual degree in order to clamp properly the corner strip or the upper surface of the crate, the teeth **30** that are adjacent the end of said gripper will be suitably disposed to hold the crate firmly.

In view of the above, it will be seen that the truck **10** may be maneuvered so as to bring the lower gripper **22** to a position below the corner strip **23** of the crate A, and, when the load carriage **13** is raised, the lower gripper **22** will engage the corner strip **23** and accept the weight of said crate. This will cause the tubular column with which gripper **22** is integral, to swing upper gripper **31** downwardly so as to carry teeth **30** into clamping engagement with the crate. Crate A is now clamped between the lower gripper **22** and upper gripper **31**.

Inasmuch as the center of gravity of the crate A will normally be located a substantial distance forwardly of the supporting grippers **22** and **30**, the lower portion of said crate will tend to swing rearwardly toward the truck **10**, and provision is therefore made of an abutment **32** for holding the crate in an upright position. The abutment **32** is adapted to be engaged by a rear side panel **33** of the crate A at a point below the forward edge of the lower gripper **22**, and projects forwardly from the lower end of a vertical shaft **34** which is adjustably held in the tubular column **24** by suitable means such as a set screw **35**. In order to maintain the tubular column **24** in a substantially vertical position without interfering with the operation of the upper gripper **31** upon which it is supported, the lower end portion of said column is provided with a rearward projection **36** which is slidably engaged with the front plate **15** of the load carriage **13**.

While the abutment **32** has been described as being engageable with the rear panel **33** of the crate A, it will be understood that the shaft **34** may be adjusted vertically so that said abutment will engage other parts of the crate such as the lower corner strips **37**, **38**. Further, when the object to be picked up has a bottom surface portion which is spaced from the floor and therefore accessible, the abutment **32** may be so adjusted as to be engaged under said bottom surface portion, in which case said abutment will serve as a lower gripper for clamping the crate or other object in conjunction with the upper gripper **31**.

In use, the truck **10** and the load carriage **13** thereon will first be maneuvered to bring the lower gripper **22** beneath the corner strip **23** of the crate A, after which the load carriage **13** will be raised to engage said corner strip and lift the crate. Inasmuch as the weight will be carried upon the vertical column **24**, which is supported at a mid-point of the upper gripper **31**, the resulting reaction will cause the teeth **30** to bite into the upper surface of the crate and prevent the strip **23** from slipping off from the lower gripper **22**.

After the truck **10** has transported the crate A to the desired location, said crate will be deposited upon the floor and released merely by lowering the load carriage **13** sufficiently to disengage the lower gripper **22** from the corner strip **23**, and then backing the truck **10** away from the crate. However, if it should be found that the upper gripper **31** remains engaged with the crate because of the embedment of the teeth **30** therein, disengagement of said gripper may be obtained merely by a small upward movement of the load carriage **13**.

While the gripper attachment **16** has been found to operate very efficiently, it may be found desirable under some circumstances to employ a plurality of said attachments mounted in side-by-side relationship upon the front plate **15**, as shown in Fig. 2. For example, when the crates to be handled are unwieldy because of their dimensions, a plurality of the attachments **16** upon the front plate **15** will increase the number of points at which a crate may be supported and will therefore resist accidental swinging and possible dislodgment of the crate. Further, such an increased number of points of support will provide better load distribution when carrying exceptionally heavy crates, and will also aid in maintaining erect crates in which the center of gravity of the contents may be disposed eccentrically with respect to the crate.

The second form of the invention is embodied in an attachment **39** (Figs. 4, 5, 6, and 7), which comprises a transverse vertical bracket plate **40** adapted to be mounted upon the front plate **15** of the lifting carriage **13** by means of upper and lower pairs of slotted hook members **41**, **42** on the rear face of said bracket plate.

In order to support a gripper frame **43** in front of the bracket plate **40**, said bracket plate is provided with forwardly extending side flanges **44**, **45** which carry horizontal upper and lower mounting shafts **46**, **47**. The gripper frame **43** comprises a vertical face plate **48** having parallel vertical flanges **49**, **50** extending rearwardly therefrom, said flanges being located between the bracket plate flanges **44**, **45**, and being joined by horizontal upper and lower bearing sleeves **51**, **52** slidably embracing the respective mounting shafts **46**, **47**.

The face plate **48** is provided with mechanism constructed especially for use in handling a type of crate which is exemplified by the crate B, and which comprises a side panel **53** and top and bottom panels **54**, **55**, provision being made of pairs of exterior corner strips **56**, **57** and **58**, **59** for joining and reinforcing said panels at the corners of the crate. The corner strips may all be of approximately equal width, but because of the fact that one of the strips of each pair overlaps the other strip of said pair, and also because one of the panels usually extends between the strips of each pair, it will be observed that the respective strips present inner edges which are located different distances from the outermost corner of the crate.

Thus, for example, the inner or lower edge of the strip **56**, as seen in Fig. 4, is located farther from the outermost corner of the crate B than is the inner or right-hand edge of the overlapping strip **57**. It will also be seen that this relationship of the corner strips may, in effect, become reversed if the crate B is turned so that a different side is uppermost. Such a reversed relationship is shown in Fig. 6, in which the crate panel **53** is uppermost and the overlapping corner strip **59** is presented toward the face plate **48**.

In order to grip the corner strips at an upper corner of the crate in a positive manner without regard to the specific disposition of said strips, the front of the face plate **48** is provided with means comprising an upwardly facing lower gripper or jaw **60**. The gripper **60** is adapted to engage under the lower edge of the corner strip **56** or other strip presented toward the face plate **48**, and preferably is located below the top of said face plate by a distance which is at least equal to the width of said corner strips.

The upper edge portion of the face plate **48** is also provided with two pairs of spaced upwardly extending brackets **61**, **62** having aligned apertures for rotatably supporting a horizontal pivot shaft **63**. Between each of the pairs of brackets **61**, **62** the pivot shaft **63** carries respective forwardly extending upper grippers **64**, **65**, each of which comprises a tubular base portion **66** keyed on said pivot shaft, and a pair of parallel arms **67** attached to the ends of said base portion.

When the crate B is so disposed that the corner strip **57** is uppermost (Figs. 4 and 5), the inner edge of said strip is adapted to be engaged by crossbars **68** which are secured to lower intermediate portions of each pair of the gripper arms **67**, thus holding the upper corner of the crate firmly against the face plate **48** and holding the corner strip **56** against the upper surface of the lower gripper **60**. In the event that the crate B should be so disposed as to present the corner strip **59** rearwardly (Fig. 6), the inner or forward edge of the strip **58** is adapted to be engaged by crossbars **69** secured to front end portions of each pair of the gripper arms **67**.

It will be noted that this mode of operation of the grippers **64**, **65**, is rendered effective by a sawtooth formation of the lower edges of said grippers, in which the crossbars **68**, **69** provide rearwardly facing clamping surfaces. Further, the crossbars of each gripper are located on different radii passing through the pivot shaft **63**, the end cross bar **69** being on the upward radius, so that neither of the crossbars **68**, **69** will prevent the proper action of the other crossbar in gripping a cornerstrip.

As a means for operating the upper grippers **64**, **65**,

the attachment 39 is provided with a hydraulic ram 70 which occupies an upright position behind the face plate 48, the lower end of said ram being pivotally attached to a bracket 71 on a lower central portion of said face plate. The hydraulic ram 70 comprises an upwardly extending reciprocable piston rod 72, and has upper and lower hose connections 73, 74, for connecting said ram to a suitable controlled source of fluid under pressure upon the truck 10, whereby the piston rod 72 may be extended and retracted.

In order to connect the piston rod 72 operatively to the grippers 64, 65, provision is made of a U-shaped lever 75 which is keyed on the pivot shaft 63 between the pairs of supporting brackets 61, 62, and which comprises a pair of parallel rearwardly extending arms 76. A horizontal cross pin 77 is pivotally attached between the rear end portions of the lever arms 76, the middle portion of said cross pin having a diametrical aperture which slidably receives the upper portion of the piston rod 72.

The ram 70 is adapted to exert a force for closing the grippers 64, 65 through a coil spring 78, the latter being engaged between a spring seat in the form of a flange 79 on the piston rod 72, and a washer 80 engaging the lower surface of the cross pin 77. The clamping force of the grippers 64, 65, will therefore be resilient, so that variations in the widths of the corner strips to be gripped will not materially affect the operation of the grippers. It will also be seen that the coil springs 78 will limit the force which can be transmitted to the grippers from the ram 70, thus avoiding undesirable crushing of the corner strips or other objects gripped.

The upper end of the piston rod 72 has lock nuts 81 threaded thereon above the cross pin 77, so that downward movement of the piston rod 72 will result in raising and releasing the grippers 64, 65 from the crate B.

In using the second form of gripper attachment 39, the truck 10 and the carriage 13 thereon will be operated in such a manner as to bring the lower gripper 60 immediately below the corner strip 56 or 59, as the case may be. The ram 70 will then be actuated so as to swing the upper grippers 64, 65, downwardly for clamping the upper corner of the crate B against the lower gripper 60 and the front of the face plate 48.

Inasmuch as one of the corner strips 56, 57, 58, and 59 will always be in the correct position to be engaged by either the inner cross bars 68 or the outer cross bars 69, the different positions in which the crate B may present itself to the truck will not require the operator to direct his attention toward the performance of any selective operations or adjustments of the grippers.

The lower portion of the face plate 48 will, of course, serve as an abutment for maintaining the crate B in a substantially erect position during transportation.

While there have been disclosed in this specification two forms in which the invention may be embodied, it is to be understood that the invention may be modified and embodied in various other forms without departing from its spirit.

I now claim:

1. In a gripper attachment for load lifting carriages of industrial trucks, a vertically extending column having an integral lower gripper adapted to be engaged under a portion of a crate, a forwardly extending upper gripper, means pivotally mounting said upper gripper on a part of said column above said lower gripper for pivotal movement relatively to said column, means swingably mounting said upper gripper on said load lifting carriage rearwardly of its mounting on said column whereby the weight of a crate applied to said lower gripper causes said column to swing said upper gripper on its mounting relatively to said carriage to clamp and retain the crate upon said lower gripper and between both said grippers, and means on said column in sliding contact with said carriage.

2. In a gripper attachment for load lifting carriages of industrial trucks, a carriage supported member, a vertically extending column having an integral lower gripper adapted to be engaged under a portion of a crate, a forwardly extending upper gripper, a pivot on a part of said column above said lower gripper mounting said column on said upper gripper, means mounting said upper gripper on said carriage supported member to rotate on an axis rearward of said pivot mounting said column whereby the weight of a crate applied to said lower gripper causes said column to swing said upper gripper on its mounting relatively to said carriage supported member to clamp and retain the crate upon said lower gripper and between both said grippers, and an abutment on said column below said lower gripper for preventing rearward swinging of the crate when the crate is clamped between said upper and lower grippers.

3. In a gripper attachment for load lifting carriages of industrial trucks, a carriage supported member, a vertically extending column having an integral lower gripper adapted to be engaged under a portion of a crate, a forwardly extending upper gripper, a pivot on a part of said column above said lower gripper mounting said column on said upper gripper, means mounting said upper gripper on said carriage supported member to rotate on an axis rearward of said pivot mounting said column whereby the weight of a crate applied to said lower gripper causes said column to swing said upper gripper on its mounting relatively to said carriage supported member to clamp and retain the crate upon said lower gripper and between both said grippers, means on said column sliding relatively to the lifting carriage, and an abutment adjustably fixed on said column below said lower gripper for preventing rearward swinging of the crate when the crate is clamped between said upper and lower grippers.

4. In a gripper attachment for load lifting carriages of industrial trucks, a vertically moving carriage supported member, a forwardly extending upper gripper pivoted to said carriage supported member, a vertical member extending downwardly relatively to said upper gripper, a pivot mounting said vertical member on said upper gripper forwardly of the pivot mounting of said upper gripper, a lower gripper on said vertical member below the upper gripper for supporting a crate or the like on said vertical member, and the vertical member when supporting a crate through said lower gripper swinging the upper gripper on its pivot mounting relatively to said carriage supported member to clamp the crate to said lower gripper.

5. In a gripper attachment for load lifting carriages of industrial trucks, a vertically moving carriage supported member, a forwardly extending upper gripper pivoted to said carriage supported member, a vertical member extending downwardly relatively to said upper gripper, a pivot mounting said vertical member on said upper gripper forwardly of the pivot mounting of said upper gripper, a lower gripper on said vertical member below the upper gripper for supporting a crate or the like on said vertical member, said vertical member when supporting a crate through said lower gripper swinging the upper gripper on its pivot mounting to clamp the crate between said upper gripper and lower grippers, and a surface on said vertical member below said lower gripper against which rests the lower portion of the crate to stabilize said crate clamped between said grippers.

6. In a gripper attachment for load lifting carriages of industrial trucks, a vertically moving carriage supported member, an upper gripper, a pivot mounting said upper gripper for vertical swinging movement relatively to said carriage supported member, a vertical member extending downwardly relatively to said upper gripper, a pivot mounting said vertical member on said upper gripper, a lower gripper fixed on said vertical member below the upper gripper for supporting a crate or the like on said vertical member, said vertical member when supporting a crate through said lower gripper swinging the upper gripper on its pivot mounting to clamp the crate between said upper and lower grippers, and an abutment on said vertical member below said lower gripper against which rests the lower portion of the crate clamped between said grippers whereby to stabilize said crate.

7. In a gripper attachment for load lifting carriages of industrial trucks, a vertically moving carriage supported member, a forwardly extending upper gripper pivoted to said carriage supported member, a vertical member extending downwardly relatively to said upper gripper, a pivot mounting said vertical member on said upper gripper, a lower gripper fixed on said vertical member below the upper gripper for supporting a crate or the like on said vertical member, said vertical member when supporting a crate through said lower gripper swinging the upper gripper on its pivot mounting to clamp the crate between said upper and lower grippers, a bearing surface on said vertical member sliding on the lifting carriage as said vertical member moves with the upper gripper where-

by to hold said member vertical, and a surface on said vertical member below said lower gripper against which rests the lower portion of the crate clamped between said grippers whereby to stabilize said crate.

8. In a gripper attachment for load lifting carriages of industrial trucks, a vertically moving carriage supported member, a forwardly extending upper gripper pivoted to said carriage supported member to swing in a vertical plane, a vertical member extending downwardly relatively to said upper gripper, a pivot mounting said vertical member on said upper gripper forwardly of the pivot mounting of said upper gripper, a lower gripper on said vertical member below the upper gripper for supporting a crate or the like on said vertical member, said vertical member when supporting a crate through said lower gripper swinging the upper gripper on its pivot mounting toward said lower gripper, and tooth portions on said upper gripper moving rearwardly as the upper gripper swings toward the lower gripper whereby to press the crate or the like inwardly upon the lower gripper.

9. In a gripper attachment for load lifting carriages of industrial trucks, a vertically moving carriage supported member, an upper gripper, a pivot mounting said upper gripper on said carriage supported member to swing in a vertical plane, a vertical member extending downwardly relatively to said upper gripper, a pivot mounting said vertical member on said upper gripper forwardly of the pivot mounting of the upper gripper, a lower gripper fixed on said vertical member below the upper gripper for supporting a crate or the like on said vertical member, and the vertical member when supporting a crate or the like through said lower gripper swinging the upper gripper downwardly on its pivot to grip the crate between said grippers.

10. In a gripper attachment for load lifting carriages of industrial trucks, a vertically moving carriage supported member, a forwardly extending upper gripper pivoted to said carriage supported member, a lower gripper for supporting a crate or the like below said upper gripper, a vertical member mounting said lower gripper relatively to said upper gripper, means whereby said vertical member when supporting a crate through said lower gripper swings the upper gripper to clamp the crate between said upper and lower grippers, a bearing on a lower portion of said vertical member holding said member vertical as it moves with said upper gripper, and a surface on said vertical member against which rests the lower portion of the crate clamped between said grippers whereby to stabilize the crate.

11. In a gripper attachment for load lifting carriages of industrial trucks, a carriage supported member, a lower gripper carried by said carriage supported member and adapted to support a rail of a crate or the like relatively to said carriage supported member, a forwardly extending upper gripper, a load engaging surface on said upper gripper, a pivot mounting said upper gripper on said carriage supported member for vertical swinging movement of said load engaging surface in an axis above said lower gripper, and means for swinging said upper gripper on its pivot to move its load engaging surface downwardly toward a position below the pivot axis whereby to clamp the crate rail against the lower gripper while pressing the crate rail rearwardly upon said lower gripper.

12. In a gripper attachment for load lifting carriages of industrial trucks, a carriage supported member, a lower gripper carried by said carriage supported member and adapted to support a portion of a crate or the like relatively to said carriage supported member, a forwardly extending upper gripper, a pivot mounting said upper gripper on said carriage supported member for vertical swinging movement on an axis above said lower gripper, a series of spaced load engaging surfaces on said upper gripper, means for rotating said upper gripper on its pivot to move said load engaging surfaces downwardly toward positions below the pivot axis of said upper gripper, and one of said load engaging surfaces when so moved by the means for rotating said upper gripper first contacting and engaging a crate portion to clamp the crate portion against the lower gripper while pressing said crate portion rearwardly relatively to said lower gripper.

13. In a gripper attachment for load lifting carriages of industrial trucks, a carriage supported member, a lower gripper carried by said carriage supported member and adapted to support a portion of a crate or the like relatively to said carriage supported member, a forwardly extending upper gripper, a pivot mounting said upper gripper to rotate relatively to said carriage supported member on an axis above said lower gripper, means for rotating said upper gripper on its pivot to move a forward end portion of said gripper toward a position below the pivot axis, a series of load engaging surfaces on the forward end portion of said upper gripper with each surface spaced at a different distance from the pivot axis, and one of said load engaging surfaces first contacting and engaging a crate portion to press said crate portion rearwardly on said lower gripper.

14. In a gripper attachment for load lifting carriages of industrial trucks, a vertically moving carriage supported member, a forwardly extending upper gripper pivoted to said carriage supported member, a lower gripper adapted to underlie an upper rail or the like of a crate, means whereby said lower gripper moves vertically relatively to said carriage supported member and moves said upper gripper through said movement, said means effecting greater movement of said upper gripper than said lower gripper relatively to said member whereby said upper gripper tends to clamp the crate rail or the like between said grippers when said lower gripper supports a crate through said rail or the like, and means secured to said lower gripper against which rests the lower portion of said crate to stabilize the crate clamped between said grippers.

15. In a gripper attachment for load lifting carriages of industrial trucks, a vertically moving carriage supported member a forwardly extending upper gripper movably mounted on said carriage supported member, a lower gripper adapted to underlie an upper rail or the like of a crate, means whereby said lower gripper moves vertically relatively to said carriage supported member and moves said upper gripper relatively to the carriage supported member through said movement, said means effecting greater movement of said upper gripper than said lower gripper relatively to said member whereby said upper gripper clamps the crate rail or the like between said grippers when said lower gripper supports a crate through said rail or the like, and means secured to said lower gripper against which rests the lower portion of the crate clamped between said grippers whereby to stabilize the crate.

16. In a gripper attachment for load lifting carriages of industrial trucks, a vertically moving carriage supported member, a forwardly extending upper gripper pivoted to said carriage supported member, a lower gripper adapted to underlie an upper rail or the like of a crate, means whereby said lower gripper is vertically movable relatively to said carriage supported member while simultaneously moving said upper gripper relatively to said member, said means effecting greater movement of said upper gripper than said lower gripper relatively to said member whereby said upper gripper tends to clamp the crate rail or the like between said grippers when said lower gripper supports a crate through said rail or the like, means on said lower gripper against which rests the lower portion of said crate to stabilize the crate clamped between said grippers, and means through which said lower gripper bears against said carriage supported member.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 1,346,160 | Barlow | July 13, 1920 |
| 2,028,976 | Goff | Jan. 28, 1936 |
| 2,250,577 | Ernst | July 29, 1941 |
| 2,447,300 | Williams | Aug. 17, 1948 |
| 2,473,410 | Bevevino | June 14, 1949 |
| 2,578,802 | Heidrick et al. | Dec. 18, 1951 |
| 2,608,315 | Turner | Aug. 26, 1952 |
| 2,620,937 | Halloran | Dec. 9, 1952 |

FOREIGN PATENTS

| Number | Country | Date |
|---|---|---|
| 582,680 | Great Britain | Nov. 25, 1946 |