Feb. 22, 1955 W. L. VAN DOREN 2,702,646

BOX HANDLING TRUCK

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Fig. 8

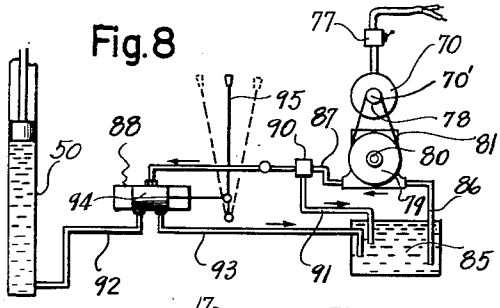


Fig. 1

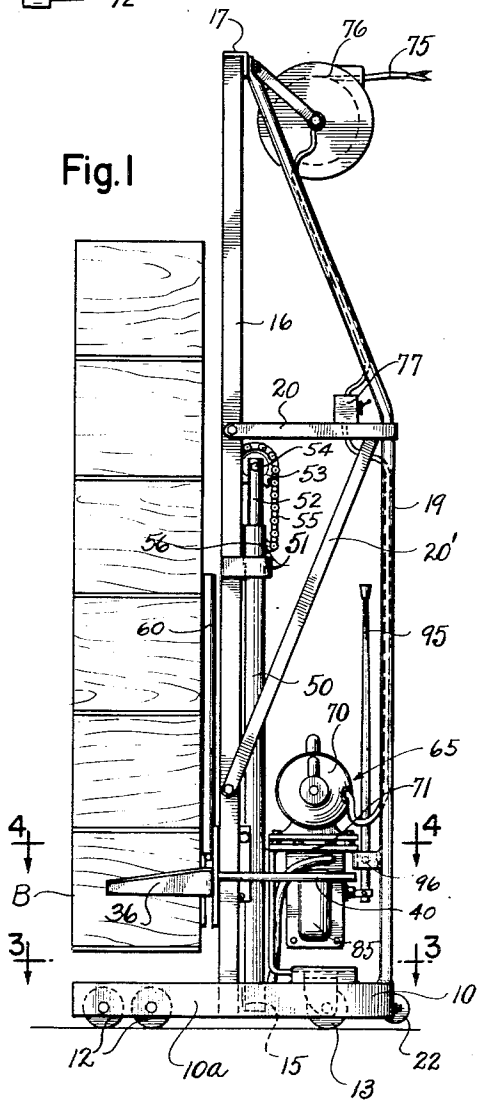
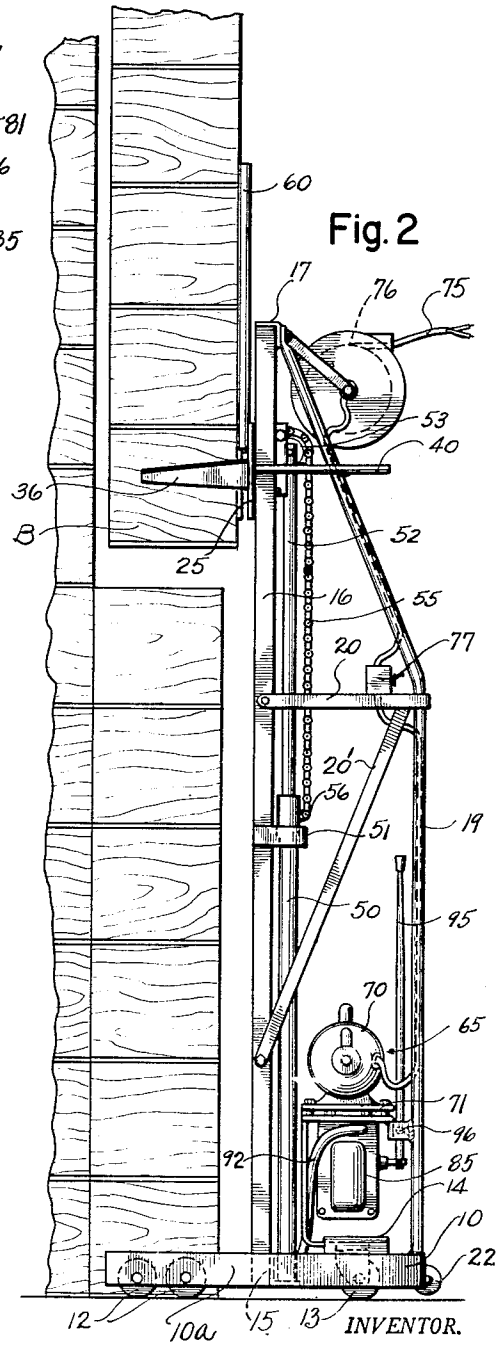


Fig. 2



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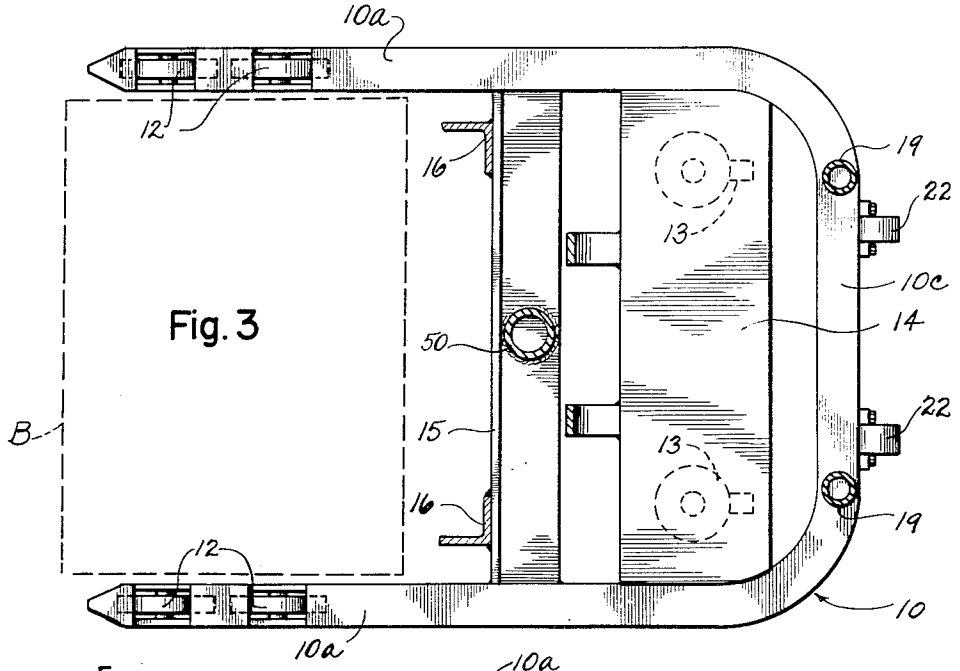


Fig. 3

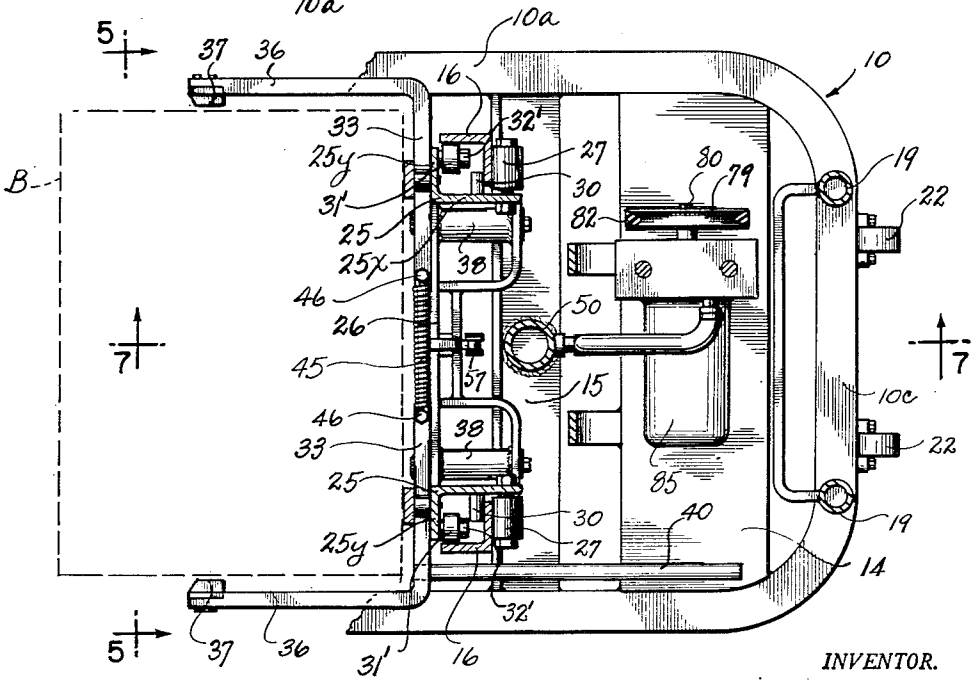


Fig. 4

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BOX HANDLING TRUCK

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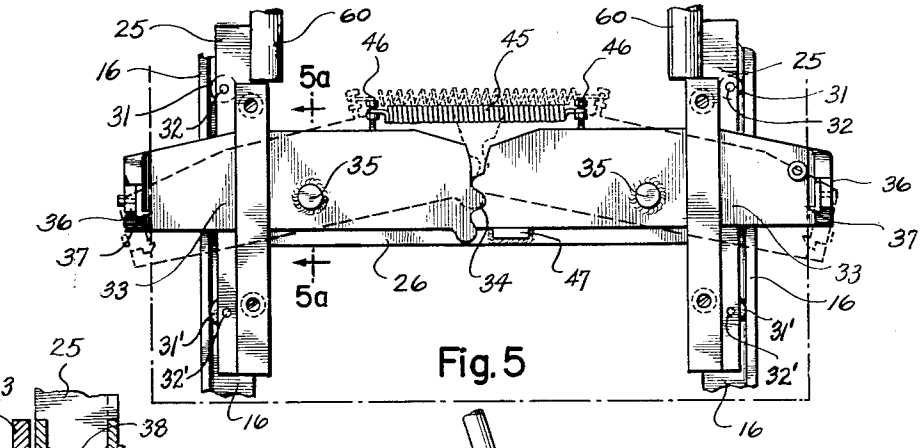


Fig. 5

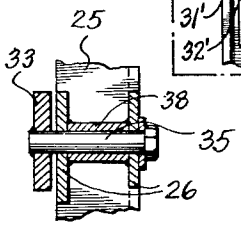


Fig. 5a

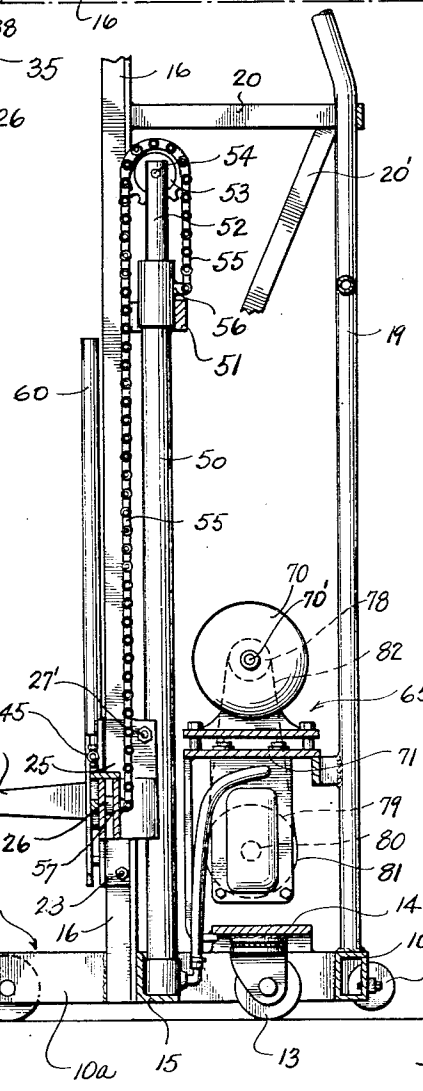


Fig. 7

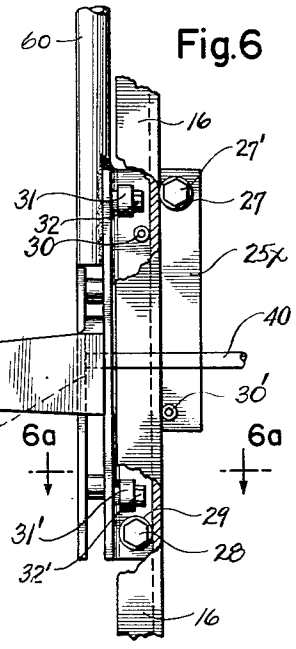


Fig. 6

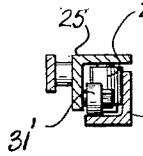


Fig. 6a

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2,702,646

BOX HANDLING TRUCK

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Application September 26, 1952, Serial No. 311,663

5 Claims. (Cl. 214—653)

This invention relates to box handling tracks and it has reference more particularly to a wheel supported hand truck that is equipped with a load gripping clamp and power operated means for the lifting and lowering of stacked boxes as held by the clamp arms; the truck being especially useful in apple packing plants and the like for the easy lifting, lowering and conveying of single or stacked boxes, either when filled or empty.

It is the principal object of this invention to provide a novel form of wheel supported truck, that may be easily pushed by hand over the floor of the box storage or handling area and with which truck there is associated a vertically movable box gripping or box clamping mechanism in connection with a power operated load elevating and lowering unit whereby a box or a stack of boxes, as held by the clamping mechanism may be raised or lowered as may be required for conveying, stacking or de-stacking.

It is also an object of the present invention to provide a box handling truck of the above character having a box gripping or clamping mechanism that, upon being properly engaged with the opposite end walls of a box and then elevated, will automatically retain its clamping and supporting function under the weight of the box or stack of boxes to which it is applied. Furthermore, it will automatically release its hold on the engaged box upon bringing the latter to a position of rest upon a support.

Still further objects of the invention reside in the details of construction of the various parts embodied in the present truck and in the clamp mechanism applied thereto, and in their combination and mode of operation as will hereinafter be fully described.

In accomplishing these and other objects of the invention, I have provided the improved details of construction, the preferred forms of which are illustrated in the accompanying drawings, wherein—

Fig. 1 is a side view of a truck embodying the improvements of the present invention therein and showing a stack of boxes as lifted and supported for transportation by the coacting arms of the box gripping or clamping mechanism.

Fig. 2 is a side view of the present truck, illustrating a box stacking operation or what might also be a de-stacking operation.

Fig. 3 is a horizontal section, taken on line 3—3 in Fig. 1, showing the wheel supported base structure of the truck.

Fig. 4 is a horizontal cross-section taken on line 4—4 in Fig. 1 showing the coacting arms of the box gripping clamp and the base structure beneath it.

Fig. 5 is a front view of parts of the clamping mechanism as applied to the vertical guideways.

Fig. 5*a* is a cross-section on line 5*a*—5*a* in Fig. 5.

Fig. 6 is a side view of the clamping mechanism as seen from the right hand side of Fig. 5, parts being broken away for better illustration.

Fig. 6*a* is a cross-section on line 6*a*—6*a* in Fig. 6.

Fig. 7 is a central vertical section of the truck taken on line 7—7 in Fig. 4 especially showing the elevating and lowering mechanism for the box clamping devices.

Fig. 8 is a diagrammatic illustration of the hydraulic system used for the elevating and lowering of the clamping mechanism.

Briefly described, the present truck comprises a wheel and caster supported base member upon which an upright frame structure is rigidly secured; the said frame structure comprising two laterally spaced, vertical guides of substantial height on which a frame structure for support of a box clamping mechanism is mounted for vertical travel. A motor powered hydraulic lift mechanism is carried on the base member for the controlled raising and lowering of the clamping mechanism along the guideways; the motor being under manual control. The box clamping mechanism is adapted to be engaged with a single box that is to be lifted or likewise engaged with the lowermost box of a stack of boxes either for lifting or for lowering the stack, and this mechanism is automatically operable under the weight of the boxes held thereby, to maintain its holding contact therewith, and to automatically disengage the gripped box when it, or a stack of supported boxes is lowered to rest onto a support.

Referring more in detail to the drawings—

The base structure of the present truck comprises a forwardly opening U-shaped yoke **10** of a predetermined size and of the required strength and rigidity. As seen in Fig. 3, the yoke **10** is horizontally disposed and comprises parallel, opposite side rails **10***a*—**10***a*, rigidly joined in laterally spaced relationship by a cross bar **10***c*, that is formed as a part of the yoke and connects the rails across their rearward ends. The lateral spacing of the side rails is such that a box of a selected standardized length can be easily received between them with some clearance as has been indicated by the dotted line showing of a box at B in Figs. 3 and 4.

Within the forward ends of the side rails **10***a*—**10***a*, supporting wheels **12** are mounted in tandem as shown, and a pair of laterally spaced casters **13**—**13** are mounted just forwardly of the cross rail **10***c* on the under side of a horizontal cross plate **14** for support and easy steering; the plate **14** being fixed at its ends to the side rails **10***a*—**10***a* of the base structure.

Rigidly fixed to the opposite side rails **10***a*—**10***a* at a substantial distance rearwardly of their forward ends, is a connecting cross bar **15** of angle iron form. Fixed rigidly to this cross bar equally inwardly spaced from the side rails **10***a*—**10***a*, are vertical angle bars **16**—**16**, serving as guideways for the vertically movable box clamping mechanism; these bars being rigidly joined across their upper ends by a cross bar **17**. Preferably the vertical guide bars **16**—**16** comprise angle iron rails disposed as in Fig. 3 with outside flanges in parallel vertical planes and their other flanges disposed flatly against the front face of the vertical flange of the cross bar **15** and welded or otherwise rigidly fixed thereto. To give strength and rigidity to the vertical guide bars **16**—**16**, I provide the truss-like bracing structures comprising the two vertical rods **19** that have their lower ends fixed in laterally spaced relationship to the cross rail **10***c* of the base member **10** and which extend upwardly from the member **10***c* in parallel relationship to a substantial height, then are inclined forwardly and upwardly and are rigidly fixed at their upper ends to the upper ends of the bars **16**—**16** and opposite ends of cross bar **17**. Horizontal struts **20** join the vertical guide bars **16**—**16** with the corresponding rods **19** at the level of the bends in the latter as seen in Figs. 1 and 2, and diagonal straps **20'** extend from the rearward ends of the struts **20** to the lower end portions of the vertical guides **16**—**16** and are secured thereto. In the moving of the truck over a floor, the operator can very conveniently grasp the rods **19** as handle members and can push or pull the truck from place to place. Rollers **22** are mounted on the cross bar **10***c*, which may be employed to support the truck by tipping it rearwardly for hand wheeling on these rollers.

Mounted for vertical travel on the vertical guide bars **16**—**16** is the box clamping mechanism, best shown in Figs. 4, 5 and 6. This mechanism comprises a frame structure that extends horizontally between and is mounted for guided vertical travel at its opposite ends along the guide bars **16**—**16**. It is shown in Fig. 4 that this horizontal frame is equipped at its opposite ends with vertically directed pieces of angle iron, **25**—**25**, rigidly joined in spaced relationship by a fabricated horizontal cross member which is designated in its entirety by numeral **26**. Each of the vertically directed angle iron

members 25 comprises a vertical flange 25*x* that is parallel with the outside flange of the corresponding guide bar 16 and inwardly disposed therefrom, and a coextensive flange 25*y* that is outturned from the forward vertical edge of flange 25*x*. The relationship of the angle iron pieces 25—25 to the guide ways 16—16 is best shown in Figs. 4 and 5.

Mounted as in Fig. 6, on the outer faces of the flanges 25*x*, by pivot bolts 27' that extend outwardly therefrom near their upper ends, are rollers 27, and likewise mounted on these flanges near their lower ends by studs 28 are rollers 29. The rollers 26 and 29 on the member 25 at the opposite ends of the clamp mounting frame 26 are adapted to engage in rolling contact, respectively, with the inner and outer faces of the parallel flanges of the vertical guides 16—16 as has been shown in Fig. 6 for easy vertical travel thereon. Coacting with these rollers, 27 and 29 at the opposite face of the flange are retaining studs 30 and 30'.

Also there are upper and lower rollers 31 and 31' mounted by pivot bolts 32 and 32' on the base flanges 25*y* of the angle iron members 25—25 to engage in rolling contact with the front and rear faces of the base flanges of the vertical guide rails 16—16. These various rollers and studs result in easy vertical, guided travel of the clamp carrier frame along the guide ways 16—16.

Disposed to extend horizontally along the forward face of the horizontal cross member 26, are paired clamp levers 33—33. The inner ends of these levers terminate mid-way of the vertical guides 16—16 and they have a geared connection, one with the other, as at 34 in Fig. 5. The outer end portions of these two levers extend equally beyond the corresponding opposite vertical guides 16—16 and medially of its ends each lever is pivotally mounted on the cross member 26 by a horizontal pivot pin 35 for vertical oscillation in a transverse vertical plane. At their outer ends, the two levers 33—33 have forwardly turned arms 36—36. These arms are so spaced apart that, when the supporting levers are horizontally extended, as seen in full lines in Fig. 5, a standard box B can be easily received between them. In box receiving position, the levers 33—33 are horizontally extended and bear the relationship to the box as shown in Fig. 4. To cause the clamping arms 36—36 to engage the opposite ends of the interposed box for a box or stack lifting and supporting operation, the two levers 33—33 are caused to be swung downwardly at their outer ends, thus bringing the paired arms 36—36 thereof closer together. Each of the arms is equipped at its outer end and at the level of its lower edge with an inwardly turned, horizontal blade 37 adapted to be pressed to more or less extent into the wooden end of the box. With the blades so engaged with the opposite ends of a box disposed between them, it is apparent that the lifting of the clamp frame will place the entire weight of the box, and stack that may be supported thereon, upon the clamping arms thus causing the outer ends of the levers to be swung downwardly with a consequent increase in the clamping action as effected by the arms. This clamping action will be retained as long as the weight of the box or stack is sustained by the clamping levers.

As a detail of construction shown in Fig. 5*a*, the pivot pins 35 have their outer ends welded in the levers 33. The pins are rotatably contained in tubular bearings 38 welded in the horizontal cross member 26, as seen in Fig. 5*a*.

For the purpose of manually actuating the paired lever arms, 36—36, which normally extend horizontally, into holding contact with the opposite ends of a box, so as to make possible the automatic clamping action with the upward adjustment of the clamping mechanism, I provide a foot actuated press rod 40 that is fixed to the outer end of one of the levers 33, as seen in Fig. 4, to extend rearwardly therefrom to a position convenient to the truck operator who ordinarily works at the rear of the truck. With the clamping arms extended along the ends of a box, as in Fig. 4, it will be apparent that by stepping on and pressing downwardly against this rod 40, both levers 33 by reason of their geared connection at 34, can be caused to swing downwardly at their outer ends, thus to cause the blades 37 at the ends of the clamping arms 36—36 to be holdingly engaged with the box ends. The blades 37 will automatically dig into the box ends with the lifting action of the clamp frame and will retain their hold as long as the load is thus supported.

To automatically release the clamping arms from a held box or stack when it has been lowered onto a support, I employ a coiled spring 45, the opposite ends of which are attached by pins 46—46 to the top edges of the levers 33—33 as seen in Fig. 5. The tension of the spring 45 is sufficient to swing the outer ends of the box when the box is resting on a support. When in horizontal position, the inner end of one lever 33 engages against a stop lug 47 on the cross member 26 to stop further upward movement of the clamp arms.

To pick up a box or stack of boxes, the truck is moved into position so that the box, or lower box of the stack is received between the two arms 10*a*—10*a* of the base structure as indicated by the dotted line showing of the box B in Fig. 3. Assuming that the truck has thus been properly positioned relative to the box, the operator then pushes downward on rod 40 and causes the two clamp arms 36—36 to be swung downwardly and the knives 37—37 thereon pressed into holding contact with the box ends, as in Fig. 4. Then the power mechanism is then set in motion for the mechanical lifting of the clamping mechanism, the supporting frame structure of which is mounted for vertical travel along the guide rods 16—16 and is adapted to be raised and lowered therealong by a connection with a hydraulic lift including a power cylinder into and from which a hydraulic pressure medium may be admitted and released under valve control to effect and control the lifting and lowering movement, as will now be described.

The hydraulic mechanism comprised an elongated, and vertically disposed power cylinder 50 that is fixed at its lower and upper ends respectively as seen in Fig. 7, to the cross bar 15 of the base frame, and a cross bar 51 extended between the upper portions of the guideways 16—16. A piston rod 52 is fitted in and extends from the upper end of the cylinder, and this rod mounts a sprocket wheel 53 at its upper end on a horizontal pivot shaft 54. A sprocket chain 55 extends over the sprocket wheel 53 and downwardly therefrom and this is fixed at one end to a lug 56 on the upper end of the cylinder and at its other end to a lug 57 on the clamp frame member 26 as seen in Fig. 7. This arrangement of parts is such that when the piston rod is fully lowered, the box clamping mechanism is fully lowered and the two clamping arms 36—36 thereof will overlie with required clearance, the legs 10*a*—10*a* of the base member 10. When the piston rod is actuated upwardly from a lowered position, the clamp frame will be lifted; the rate and extent of lift being twice that of the upward movement of the piston rod. When the piston rod is fully extended, the clamp frame will be at its upper limit of travel, for example, in the position shown in Fig. 2.

It is desirable, especially when a stack of boxes of substantial height is to be lifted, to steady the stack. For this purpose, I have fixed a pair of sectional stack steadying rods 60—60 to the parts 25—25 of the clamp frame to extend vertically upward therefrom, and these may be extended to any practical height. When not required they may be removed.

The power unit of the truck, whereby the employed hydraulic medium is pumped into the hydraulic cylinder 50 is designated generally by reference numeral 65 in Fig. 7 and the hydraulic system is shown diagrammatically in Fig. 8. It comprises an electric motor 70 preferably supported on a horizontal platform or plate 71 that is fixed in the frame structure somewhat above the plate 14. Electric current is supplied to the motor through a cable 75 shown in Figs. 1 and 2, that leads from a source of energy to an automatic reel 76 carried on the cross bar 17 at the upper end of the frame structure. From the reel, the circuit connections led to the motor through a control switch 77 which, for convenience, is mounted on one of the cross members 20 as seen in Figs. 1 and 2. The drive shaft 70' of the electric motor mounts and drives a belt pulley 78. This is aligned with a larger pulley 79 on the drive shaft 80 of a pump 81 that is operable to deliver hydraulic medium to the cylinder 50. A belt 82 operates about the aligned pulleys to drive the pump which is fixed to the under side of plate 71 as is also the storage tank 85 for a hydraulic pressure medium; this preferably being oil. It is to be observed by reference to Fig. 8 that the pump 81 has its intake side connected by pipe 86 with the tank 85 to draw oil therefrom. A pipe 87 leads from the discharge side of the pump to a control valve 88. A pressure relief valve 90 is interposed in pipe line 87 and from this a return

pipe 91 leads back to the tank. The control valve 88 also has a pipe connection 92 leading to the lower end of cylinder 50 and a return pipe 93 from the valve to the tank.

The movable member 94 of the control valve is operable by a lever 95 that is pivoted near its lower end on a frame member, as at 96 in Figs. 1 and 2, and extends upwardly to a position easily accessible to the operator. The lever is operatively connected at its lower end to the movable member of the control valve 88. When the lever is set in the vertical or a neutral position as shown in Fig. 8, the valve will be closed and liquid will be retained thereby in the cylinder 50 and the piston rod held at a set position to retain the clamp mechanism at any set position of adjustment along the guides. When the valve control lever is pushed to the left, from that vertical position shown in Fig. 8, the valve is adjusted to permit liquid to be delivered by the pump into the lower end of the cylinder 50 and the clamp to be raised accordingly. Likewise the shifting of the control lever in the other direction allows liquid to flow from the cylinder back to the storage tank and the clamp to be lowered.

Trucks of this kind are especially useful in warehouses for handling of boxes in the manner indicated. The automatic action of the clamping mechanism is especially advantageous.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is:

1. A box handling device of the character described comprising a mobile base, a vertical guide frame fixed thereon, a clamp carrier bar disposed transversely of the base and mounted on the said guide frame for up and down travel therealong, power operated means on the base for raising and lowering the clamp carrier bar along the guide frame and for holding it at set positions, a pair of horizontally directed levers pivotally mounted intermediate their ends on said clamp carrier bar and extended laterally in opposite directions at the same level, said levers having forwardly directed arms at their outer ends serving as jaws between which a box of predetermined length can be received when the levers are horizontally extended, said levers being adapted to be swung downwardly at their outer ends from horizontal alignment to cause the said arms to move toward each other and to holdingly engage with the opposite ends of a box disposed between them, for lifting and lowering the box with upward and downward travel of the clamp carrier bar, said levers, under the weight of a load as clamped for support between the jaws being urged downwardly at their outer ends thus to increase the holding and clamping action of their jaws.

2. A box handling device as recited in claim 1 wherein the said horizontally directed levers have intermeshing gear segments formed thereon at their inner ends, concentric of their pivotal mountings, whereby the levers are caused to swing up and down at their outer ends in unison to move the said arms to and from box clamping positions and wherein said arms have sharpened blades projecting inwardly from their lower edges which are adapted to effect holding connections with the box end walls through which weight of the supported box augments the clamping action of the arms.

3. A box handling device as recited in claim 2 including also an actuating rod fixed to the outer end portion of one of the levers and adapted to be depressed for effecting its manual movement to swing the jaws into clamping contact with a box positioned between them, and spring means acting against the levers and urging them to horizontal positions to give maximum clearance between the jaws.

4. A box handling device of the character described comprising a wheel supported base member, a vertical frame structure rigidly mounted thereon and serving as a means for the hand pushing of the device over a floor surface, a cross-head mounted in the vertical frame structure for up and down travel therein, power operated means on the base member for raising and lowering the crosshead along the frame structure, a pair of clamping levers, horizontally disposed, in end to end alignment, pivoted intermediate their ends on the crosshead; said levers having their inner ends formed with intermeshing gear segments to cause said levers to move pivotally in unison, and said levers having forwardly turned arms at their outer ends, providing clamp jaws adapted to receive a box between them and to be engaged with the box ends by the downward swinging of the said levers, a spring attached under tension to the levers to yieldingly hold them in horizontal positions, and a foot rod fixed to one of said levers for its downward actuation to cause said jaws to move into holding contact with the end walls of the box, said jaws having teeth thereon adapted to be embedded in the box ends, to retain the box supporting grip of the jaws and translate the weight of the box to gripping force; said wheel supported base member comprising a horizontally disposed, forwardly opening U-shaped frame with laterally spaced opposite side legs between which a box to be lifted may be received and said vertical guide frame is rearwardly of the box when contained between said legs and the jaw forming arms of the clamp levers, extend along and overlie the laterally spaced opposite side legs for the pick up of the box.

5. A box handling device as recited in claim 4 wherein the said power operated means comprises a vertically disposed hydraulic jack, having an upwardly extended piston rod, means for controlling the application of a hydraulic pressure medium to the jack cylinder to raise and lower the rod, a sprocket wheel on the upper end of the piston rod, and a sprocket chain passing over the said sprocket wheel and downwardly therefrom and fixed at one end to the clamp carrier bar and at its other end to the jack cylinder.

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