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ARTICLE TRANSFER MECHANISM

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2 Sheets-Sheet 1

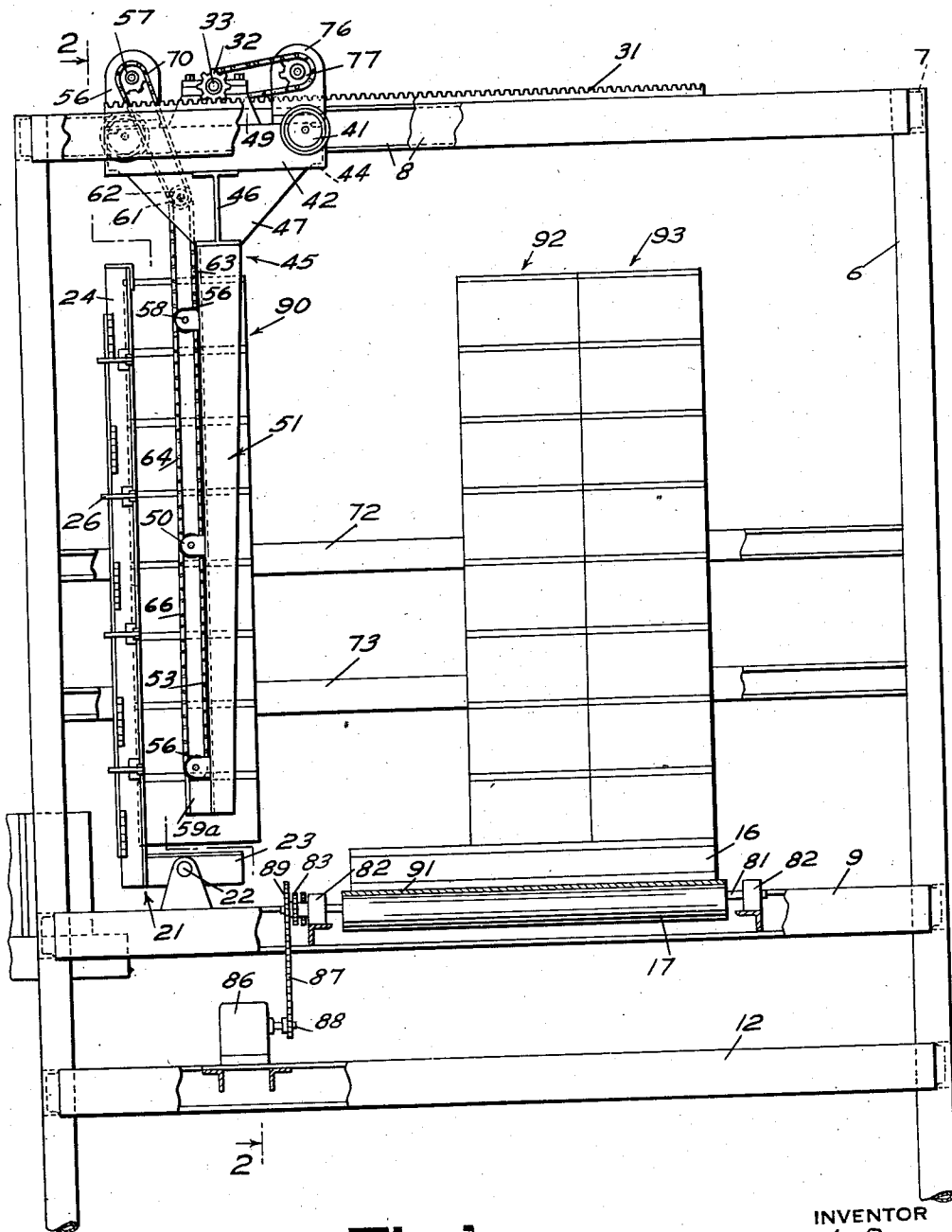


Fig. 1.

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Fig. 2.

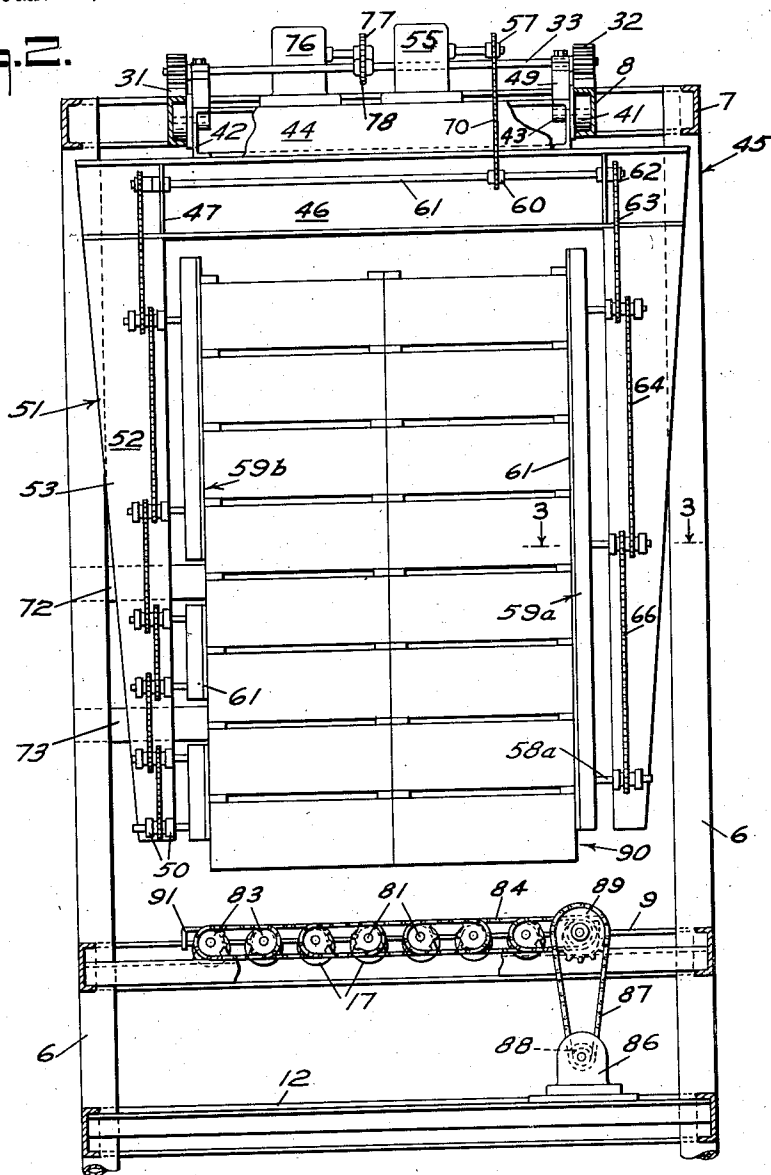
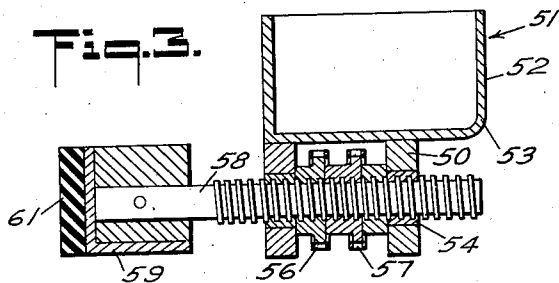


Fig. 3.



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ARTICLE TRANSFER MECHANISM

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7 Claims. (Cl. 214—1)

This invention relates to apparatus for transferring articles between two positions, and is more specifically directed towards a mechanism for transferring selected stacks of boxes or the like from and to a pallet.

In numerous instances it is necessary or desirable to transfer stacks of boxes from a pallet onto the ground or to some other mechanism for further operation on the boxes or their contents. By way of example, reference may be had to the copending application of Rollie B. Nawman, Serial No. 41,828, filed July 31, 1948, now Patent No. 2,707,060, in which apparatus was disclosed for handling stacks of boxes and for dumping the contents therefrom. In said application, a pusher member was disclosed for urging a stack or a pair of stacks of boxes from a pallet onto a box dumping apparatus. It will be appreciated, however, that numerous problems are attendant in attempting to slide a stack of boxes along a pallet, and irrespective of what safety precautions are taken, the stacks will have a tendency to tilt or otherwise become misaligned during the transfer process.

Accordingly, it is an object of the present invention to provide apparatus which will simply and effectively transfer a selected stack or stacks of boxes from a pallet to a position remote therefrom.

Another object of the invention is to provide apparatus of the character described in which the stack or stacks are engaged from the outermost sides thereof and carried from the pallet to an unloading station.

A further object of the present invention is to provide apparatus of the aforementioned character in which means are provided for insuring separation of the lowermost box in a stack from the pallet during the forward movement of the stack.

A still further object of the invention is to provide apparatus of the aforementioned character which permits the stack carrying pallets to be loaded thereon from either side or from an end thereof.

Still another object of the invention is to provide a pallet unloader which can be alternately and selectively used to load stacks of boxes onto a pallet or to unload stacks from the pallet.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawings:

Figure 1 is a side elevational view of the pallet unloading mechanism of the present invention, the parts being shown: after the mechanism has transferred one stack of boxes from a pallet onto a stack tilting mechanism.

Figure 2 is a cross-sectional view taken substantially in the plane indicated by the line 2—2 of Figure 1.

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Figure 3 is a cross-sectional view illustrating a detail of the stack engaging clamps.

Broadly speaking, the apparatus of the present invention is arranged to work in conjunction with a pallet having stacks of boxes resting thereon and is designed to carry a stack or a pair of adjacent stacks from the pallet to an unloading station remotely positioned therefrom, and deposit the same at such station. In the drawings, the transfer position or unloading station is shown as including a stack tilting mechanism by means of which the boxes, containing fruit or the like, may be tilted downwardly and deposited upon a conveyor for subsequent inversion of the boxes and dumping of the product therefrom. However, the tilting or dumping apparatus is shown and discussed primarily for the purpose of establishing an example of an environment for the transfer mechanism of the present invention, and the invention is not to be deemed limited to its combination with such apparatus. The mechanism includes a generally horizontally disposed and longitudinally extending rail member positioned above the level of the uppermost box in a stack and includes a pair of side clamps depending therefrom. The spacing between the clamps will depend on whether a single or double row of stacks are to be removed. In view of the fact that a double row has been illustrated in the drawing, the mechanism will be described in connection therewith but it will be appreciated that if the pallet is arranged with single stacks thereon, the spacing of the clamps would be correspondingly decreased. In operation, the apparatus is moved until the side clamps are generally aligned with side portions of the stack at which time the clamps are caused to move inwardly and firmly engage the stack. By moving the apparatus along the rail members it will be appreciated that the stacks are then carried forwardly along the pallet and moved from the adjacent row thereof. Furthermore, means are provided to insure the separation of the lowermost box in the stack so that the same will not be dragged along the pallet during the forward movement of the unloader. Upon reaching the terminal or unloading position, the clamps are released and the stack gravitally deposited on the tilting or other mechanism which is to carry on any further operations necessary in the handling of the stack. The unloader may then return to pick up the next succeeding stack or stacks of boxes remaining on the pallet.

Referring now to the drawings, it will be seen that the apparatus includes a frame having a plurality of vertical post support members 6 which are adapted to carry at the upper end thereof suitable structural frame members 7 to which a pair of longitudinally extending parallel substantially horizontal rails 8 are secured. A working platform 9 is suitably connected to the posts 6 at a desired elevation above the ground or other supporting surface, and additional bracing 12 may be provided as may be required. Means are provided on the platform 9 for receiving a pallet 16, and as here shown, such means includes a plurality of rollers 17 extending longitudinally of the mechanism, or from left to right as viewed in Figure 1, such rollers lying subjacent at least a portion of the rails 8. The particular construction and function of the rollers 17 will be hereinafter discussed in detail. Adjacent the front end of the unit, there is illustrated a stack tilting mechanism generally indicated by the numeral 21, such tilting apparatus constituting no independent part of the instant invention, but incorporated in the drawing in order to set forth an environment for the pallet unloading arrangement. The tilter 21 may be suitably pivoted as indicated at 22 to the platform 9 and includes a transversely extending platform 23 arranged to support the lowermost box in a stack and a pair of channel shaped members 24 adapted to engage the forward

corners of the stack. When the tilting unit is in its vertical or stack-receiving position, the channels are in their normally closed position so as to intercept a stack of boxes being brought thereto. The channels are arranged to remain in such position until the unit 21 is tilted to overlie a suitable conveyor, at which time the channels are caused to pivot and release the stack of boxes so as to deposit the stack on the conveyor for dumping or the like, and in this connection, latch members 26 are provided in order to permit the selective opening and closing of the channels 24.

Mounted on the upper surface of the rails 8, which are preferably of channel form, are suitable rack gears 31 which are adapted to mesh with pinion gears 32 mounted on a transversely disposed shaft 33. As will be understood, by providing the rack and pinion arrangement as disclosed, the shaft 33 and other elements which may be operatively associated therewith will move in unison between the front and rear end of the apparatus.

Slidably carried in each of the channel shaped rail members 8 is a pair of rollers 41 suitably attached to longitudinally extending channel members 42 by means of journal pins 43. The channels 42 are interconnected by a pair of similar transversely disposed channels 44 and secured to the lower surfaces of the channels is a transversely extending I beam 46 which may be braced and reinforced by plates 47. The channels 42 and 44 are operatively connected to the shaft 33 by means of suitable brackets 49 whereby, as hereinabove mentioned, the entire unloading mechanism moves as a unit. From the foregoing, it will be understood that the beam 46 is mounted to travel longitudinally of the apparatus, and it is to this beam that the previously mentioned side clamps are secured.

The side clamps define with the beam 46 a generally U-shaped frame 45 having downwardly directed legs 51 carried at the distal ends of the beam. Each leg 51 preferably is constructed as a rearwardly directed open channel 52, which may be larger at the upper portions thereof for increased structural rigidity. The leading edge 53 of the leg is provided with a pair of bearing blocks 50 in which are rotatably mounted bearings 54. An axially threaded bore is provided in the bearings to receive a threaded shaft 58, the latter carrying at its distal end an angle member 59 to which a suitable pad or cushion 61 of rubber or the like may be attached in any convenient manner. Threadedly engaged with the shaft and interposed between bearings 54 are a pair of sprockets 56 and 57. In this manner, by rotation of the sprockets, the shaft 58 will be caused to move transversely inwardly or outwardly of the unit and thereby cause the actual stack-clamping members 59 and their associated pads 61 to engage or be separated from a box positioned adjacent thereto. As illustrated in Figure 2, the right hand clamp 59a comprises but a single vertical element with three vertically spaced threaded shafts designated as 58a. A reversible motor 55 provides power for rotating the sprockets by means of a drive sprocket 57 imparting rotary movement through a chain 70 to a sprocket 60 which is secured to a transversely extending shaft 61. The right hand end of said shaft (as viewed in Figure 2) is provided with a sprocket 62 which is engaged by a chain 63 to the uppermost of the sprockets 56. The uppermost sprocket 57 will drive the corresponding subjacent sprocket by a chain 64, another chain 66 being utilized between the second and third sprockets. In this manner, all of the sprockets will be rotated in unison and correspondingly all of the screws or threaded shafts 58 will be moved together to advance or retract the clamp 59. The left hand clamp, generally indicated by the numeral 59b is preferably divided into three separate units in order to accommodate rail members 72 and 73, the latter being hereinafter discussed. However, the construction is substantially identical to that previously discussed in connection with clamp 59a but a larger number of sprockets of the type dis-

closed are provided and are naturally mounted in opposed relation to the latter so that the clamps will be moved inward or outward upon appropriate rotative movement of the sprockets 56 and 57. A pair of screws 58 are utilized on each section or length of the clamp. Thus, clamps 59a and 59b are arranged for unitary inward and outward movement, the clamp sections 59b being likewise driven from the shaft 61. Any suitable means, not shown, may be arranged to start and stop the motor 55 so as to control the action of the clamps, and the motor will be provided with a conventional overload arrangement so as to prevent crushing of the boxes in the event the operator continued the inward clamp movement. It is also important to note that by using a plurality of screws 58, or other clamp moving means, the pressure exerted on the stack will be equal for the height of the stack, and actually tend to align the stack rather than misalign the same as might happen if a single force was used to move the clamps.

Another reversible motor 76 is utilized to control the longitudinal movement of the frame 45 along the rails 8 and as here shown such motor is provided with a gear 77 which is in operative engagement with a gear 78 provided on the shaft 33 which carries the pinion gears 32. Thus, by rotation of the gear 77 in its selected direction of rotation, the entire unit may be moved along the rails in either of the two directions, this motor being likewise provided with an overload cut-out.

It will also be noted that the rack 31 is preferably inclined upwardly from the rear towards the front of the apparatus so that as the clamps 59 engage the stack of boxes, they will be raised slightly from the pallet as they are moved forwardly along the unit. However, to prevent any dragging of the conveyed stack on the pallet, the rollers 17 which support the pallet are arranged for vertical reciprocation to permit a lowering of the pallet upon longitudinal movement of frame 45.

As shown in Figures 1 and 2 of the drawing, the rollers 17 are carried on eccentric shafts 81 so that upon rotation of the latter, a pallet supported on the rollers will be caused to be raised and lowered. The shaft 81 is journaled in suitable bearings 82 and one end of the shafts is provided with sprockets 83 whereby a chain 84 may drive all of the shafts in unison. A motor 86 is provided for rotation of the rollers through a chain 87 operatively engaged with a motor sprocket 88 and a sprocket 89 mounted on the end roller. As will be presently described, the eccentric mounting of the rollers provides a two-fold function. Not only is the pallet platform 91 which may be disposed on the upper surface of the rollers raised and lowered, but the eccentric rotation of the rollers will also cause a sideward movement to a pallet placed on the platform, so that after the respective rows of stacks have been removed the pallet will move to a position adjacent one side of the platform and either gravitally fall therefrom or be in a position to be readily withdrawn therefrom.

With the foregoing structure in mind, the operation of the apparatus may now be discussed. To commence operation, a pallet 16 provided with, for example, three rows of boxes designated as 91, 92 and 93 respectively, is placed on the platform 90 by a fork lift truck or the like. As previously mentioned, the truck may approach the platform from the side adjacent the clamps 59a or from the rear end of the apparatus in view of the fact that there are no rear obstructions as in the case of a pusher type of pallet unloader. The respective rows as here shown comprise a pair of stacks but as previously explained, the apparatus will work with either a single or pair of stacks depending on the spacing between the clamp members. The rollers 17 are rotated to assume their uppermost position, so that the pallet will be raised to its uppermost extent on the platform, the frame is moved until the clamps 59 are adjacent the first stack 91 and the motor 56 is then energized causing the screws 58 to be extended

inwardly until the pads 61 of each set of clamps engage the outer opposed side surfaces of the boxes and securely clamp the same therebetween. The rollers 17 are then rotated approximately 180 degrees by action of motor 86, causing the platform 91, pallet, and remaining stack of boxes to be lowered while the clamped stack will remain in its original position and thereby be spaced from the pallet platform. The motor 76 is then actuated to cause the frame unit 45 to travel forwardly along the rails 8 until the boxes engage the dumping mechanism 21, at which time the motor 56 is actuated in its opposite direction causing an outward movement of the screws 58 and consequent release of the stack, the latter then being deposited on the tilter or rocker platform 23. The frame unit may then be returned to place the clamps 59a and 59b in adjacent relationship to the next succeeding stack 92 and the same cycle of operation is repeated.

In view of the fact that the rollers 17 may be caused to rotate in a single direction, it will be appreciated that there will be a side thrust developed onto the pallet on the roller platform. Thus, the pallet and the succeeding stacks of boxes thereon will move towards the right, the member 72 and 73 preventing movement of the stack past the outer limits of the roller platform. However, after the stack 93 has been clamped and removed, the pallet 16 will be adjacent the left hand edge of the platform as viewed in Figure 2 and easily removed.

While the foregoing description of the apparatus indicates that the same is relatively simple in construction and easy in operation, it will be appreciated that the same is well able to fulfil a long needed demand, particularly in the canning industry where tremendously large volumes of filled boxes originally placed on a pallet must be removed therefrom and placed on dumping or other mechanisms. It will likewise be appreciated that the apparatus could be utilized to place empty boxes onto a pallet by substantially reversing the operation. Once the empty boxes were stacked in a suitable place, the stacks could be engaged by the clamps 59 as hereinabove described and transferred to a pallet at which time the clamps would be released. This feature is so obvious that no showing in the drawing is deemed necessary as to how such an operation could be consummated.

What is claimed is:

1. Apparatus for moving articles from a first position to a second position comprising: a generally U-shaped rigid frame having the legs thereof downwardly directed and being open at the front and rear thereof for receiving and discharging an article from both sides thereof, means for supporting said frame and for moving said frame along a defined path in a direction generally normal to the plane thereof, and means on said legs selectively movable inwardly and outwardly for clamping and releasing an article positioned therebetween, said means including a plurality of pads each having a screw operatively connected thereto, and drive means for rotating all of said screws in unison.

2. Pallet unloading mechanism comprising: means for supporting a pallet having stacks of boxes thereon, a pair of vertically extending clamp members positioned in parallel spaced relationship on adjacent sides of said pallet supporting means and open on the ends thereof, means for moving said leg members in unison longitudinally of said supporting means along a horizontal path, clamps carried by said leg members, means for selectively moving said clamps transversely of said supporting means for selectively clamping and releasing a stack of boxes, and means permitting vertical separation of the lowermost box in a stack from said pallet upon longitudinal movement of said leg members.

3. Apparatus of the character described comprising: means for supporting a pallet including a plurality of horizontally disposed rollers, each of said rollers having an eccentric mounting, means for rotating said mountings whereby a pallet placed on said rollers will be selectively raised and lowered, vertically extending leg members positioned adjacent the endmost rollers, each of said members having clamp plates thereon, means for selectively moving said clamp plates towards and from each other so as to selectively clamp and release a stack of boxes positioned therebetween, and means for moving said clamp plates in unison along a horizontal path over said rollers.

4. Apparatus as set forth in claim 3 in which said clamp plates are provided with resilient material on the surface thereof.

5. Pallet unloading mechanism comprising a frame, means for supporting a pallet having a stack of boxes thereon on said frame, a longitudinally extending horizontal rail disposed in vertically spaced relation over said supporting means, clamp mechanism depending from said rail, means for moving said clamp mechanism along said rail, said clamp mechanism including a plurality of pads, means for selectively moving said pads from and towards each other so as to selectively engage and release a stack of boxes positioned therebetween, and means for selectively raising and lowering said supporting means whereby when said pads clamp a stack of boxes said supporting means may be lowered to permit horizontal movement of the lowermost box in said stack.

6. Apparatus of the character described comprising: a generally horizontal pallet receiving platform, a pair of rails mounted in spaced horizontal relationship and overlying said platform, a generally U-shaped frame depending from and slidable along said rails, means for moving said frame along said rails including a rack gear extending along the rails and pinion gears slidably engaged therewith, said U-shaped frame having downwardly directed legs movable along the edges of said pallet platform, a plurality of clamps carried on said legs, and means for moving said clamps selectively from and towards each other, said means including a screw-like element connected to said pads, and means for effecting axial movement of a screw on each of said legs in unison, said means including sprockets mounted on a member in which said screw is threadedly engaged, and a power source for synchronizing rotation of said block in either direction of rotation.

7. Apparatus for loading and unloading a stack of boxes from and to a pallet comprising: a longitudinally extending pallet receiving platform, a downwardly directed U-shaped frame member overlying said platform, means for supporting said U-shaped member, means for moving said U-shaped frame longitudinally of said platform along a prescribed generally horizontal path, clamp elements carried on the legs of said U-shaped frame, means for moving said clamps selectively from and towards each other so as to selectively clamp and release a stack of boxes therebetween, and means for selectively raising and lowering said pallet receiving platform.

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