

July 8, 1952

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2,602,554

MECHANISM FOR ALIGNING BOXES IN A STACK

Filed Nov. 27, 1948

3 Sheets-Sheet 1

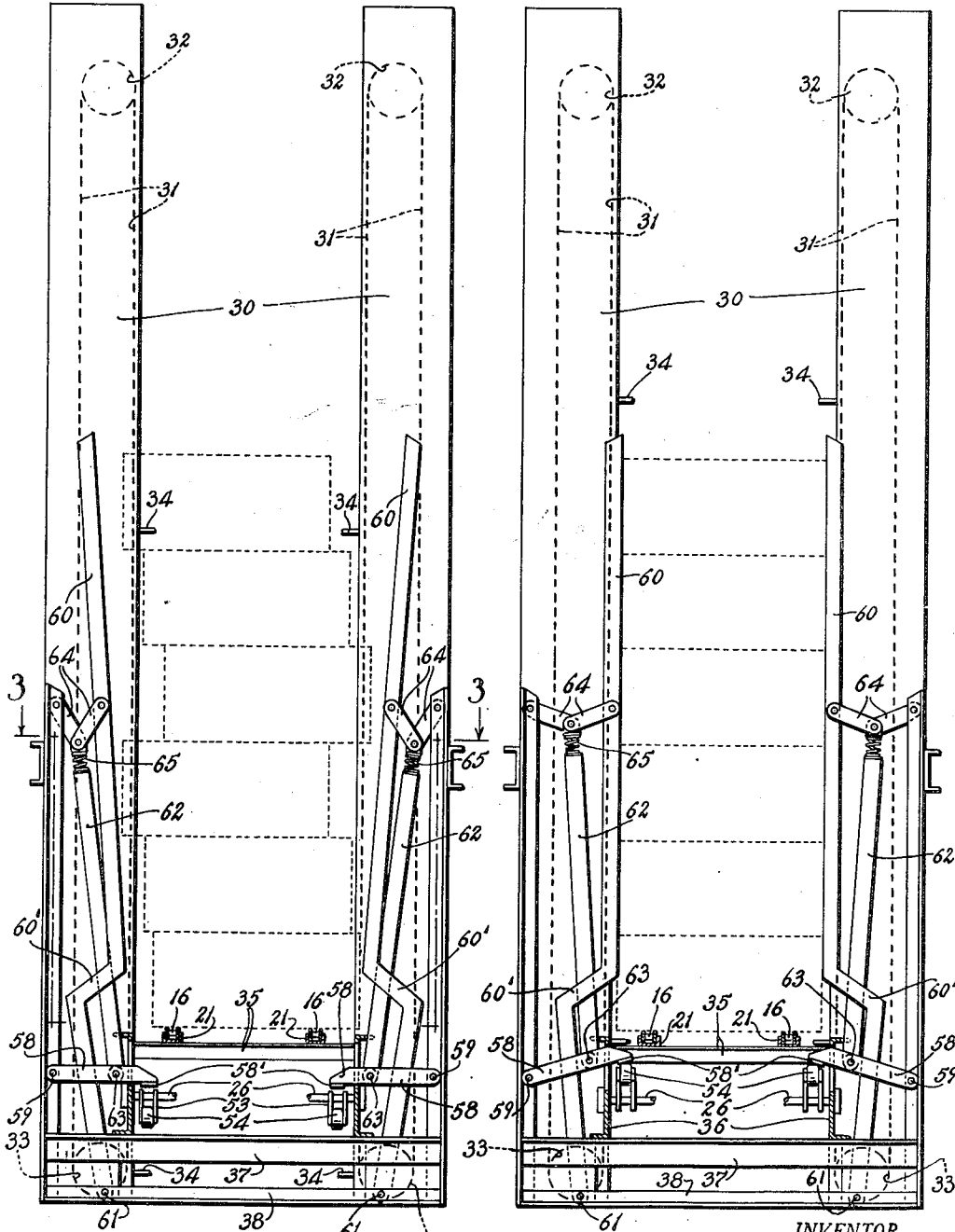


Fig. 1

Fig. 2

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3 Sheets-Sheet 2

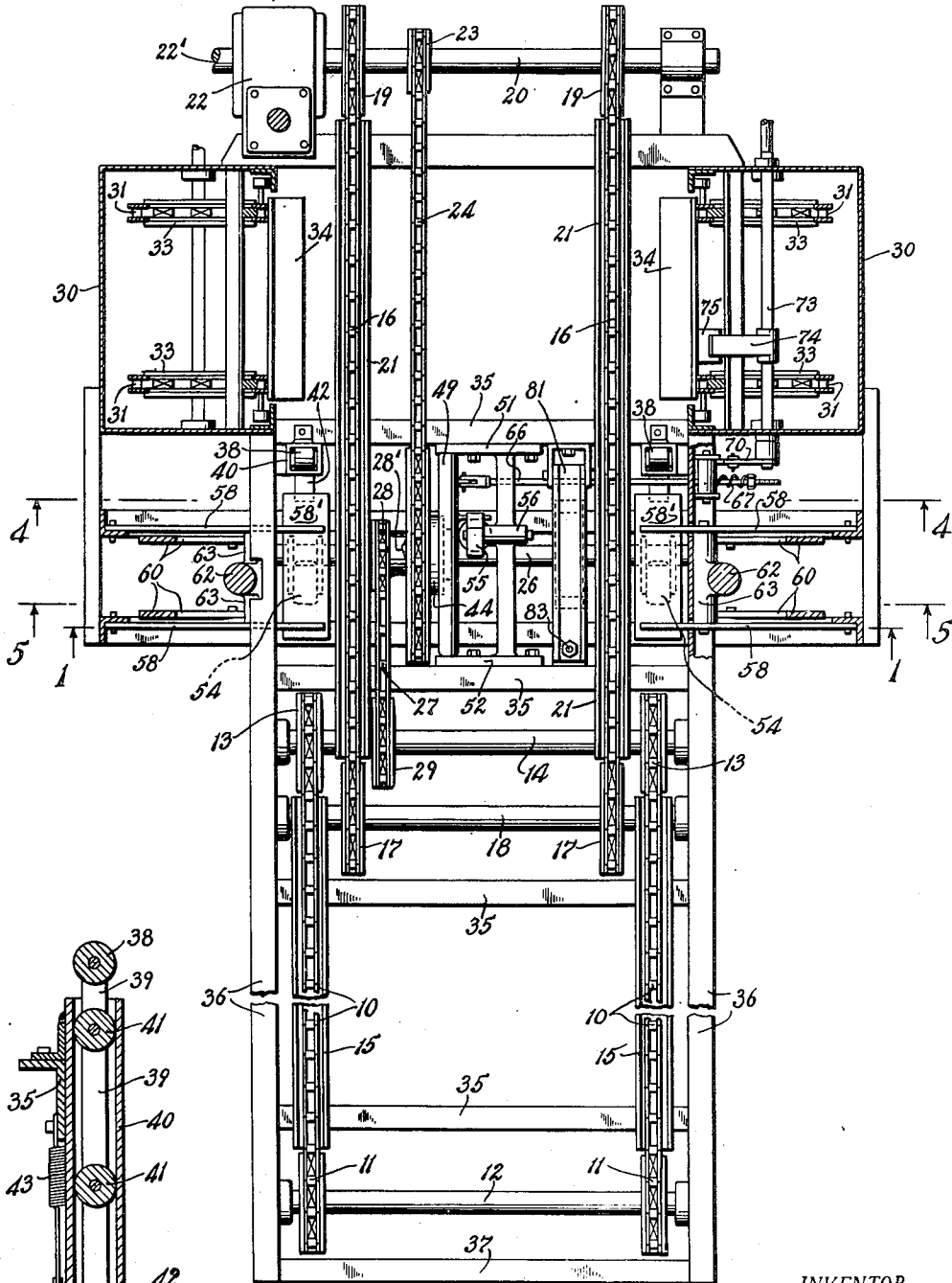


Fig. 9

Fig. 3

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3 Sheets-Sheet 3

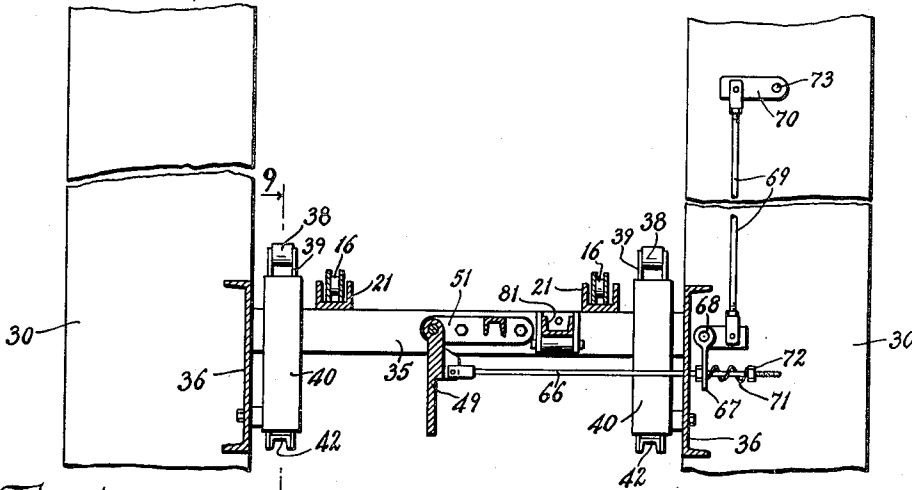


Fig. 4

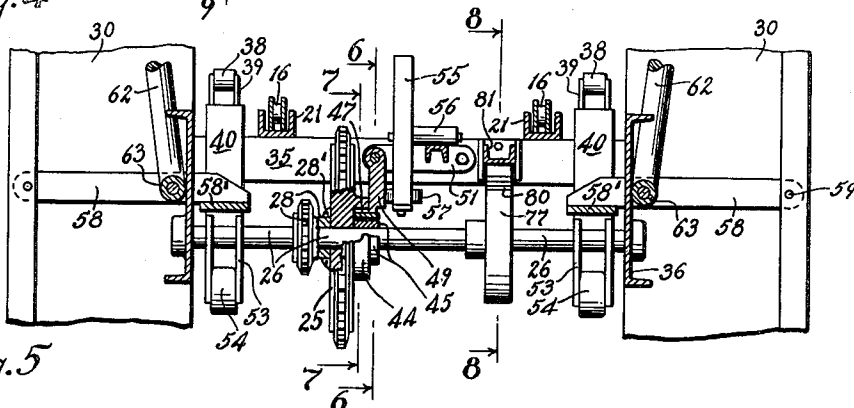


Fig. 5

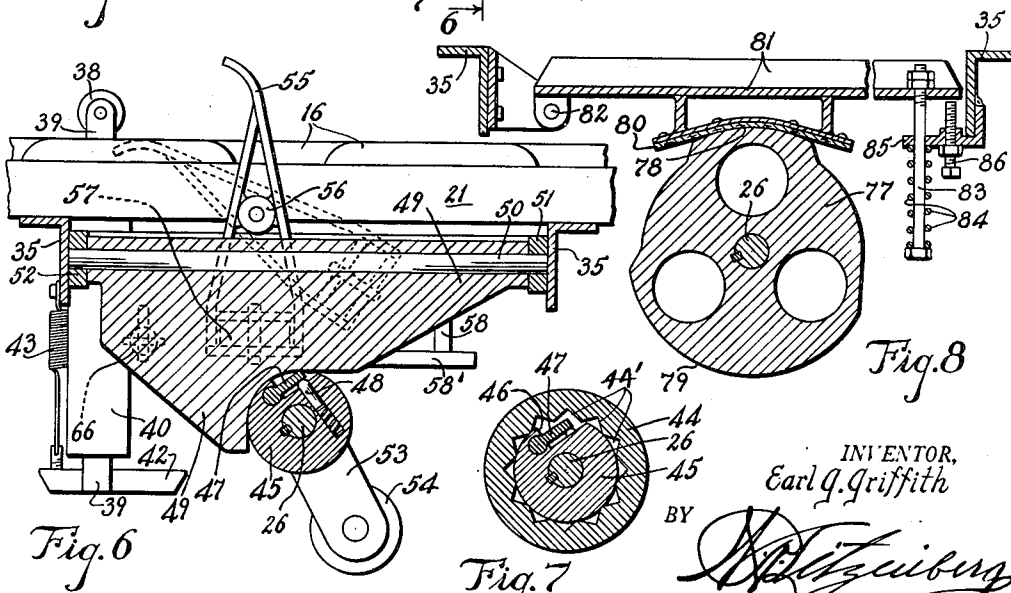


Fig. 6

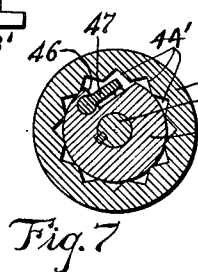


Fig. 7

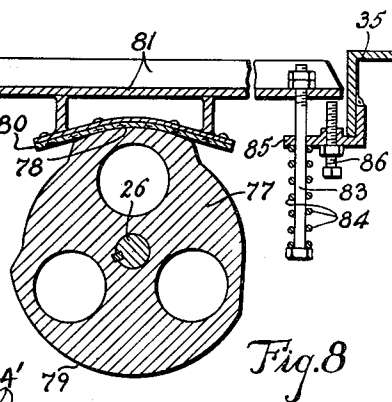


Fig. 8

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MECHANISM FOR ALIGNING BOXES IN A STACK

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11 Claims. (Cl. 214—1.1)

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This invention relates to mechanism for aligning boxes in a stack, and it is particularly designed for aligning boxes of fruit and the like which are to be moved to and delivered in a stack to an elevator mechanism designed to receive and elevate said stack to a higher level.

It is necessary in delivering stacks of boxes into an elevator mechanism, to be carried up to a higher level, that said boxes be in alignment with each other in order to prevent projecting parts of the boxes in a stack from catching on fixed parts of the elevator mechanism and causing damage to the boxes and possible breakage and damage to the elevator mechanism.

It is an object of this invention to provide such a mechanism, with means for operating it, which will automatically engage and align the boxes in a stack as the stack of boxes is approaching the elevator mechanism, whereby said stack of boxes can be lifted as a stack by said elevator mechanism without any danger of any of the boxes in the stack catching on other parts of said elevator mechanism and being damaged.

Another object of this invention is to provide means, automatically operated, whereby boxes being moved along upon a carrier or conveyor mechanism, can be automatically stopped momentarily and then released, as may be required, in order to insure perfect working of said aligning mechanism, said aligning mechanism being operated during the stopped period of said stack of boxes.

In order to fully explain my invention, I have illustrated on the accompanying three sheets of drawings one practical embodiment thereof, which I will now describe.

Figure 1 is a vertical front elevation of an elevator mechanism, with many parts omitted for clearness, showing how a stack of boxes, shown in light broken lines, is delivered into an elevator mechanism, and showing the aligning members or levers in open or inoperative positions to receive a stack of boxes therebetween;

Figure 2 is a similar view, showing the aligning members or arms in operated positions, with the boxes in alignment;

Figure 3 is a horizontal sectional view, taken on the irregular broken line 3—3 of Fig. 1;

Figure 4 is a fragmentary vertical sectional view taken on the line 4—4 of Fig. 3;

Figure 5 is a fragmentary vertical sectional view taken on the line 5—5 of Fig. 3;

Figure 6 is an enlarged view, taken on the line 6—6 of Fig. 5;

Figure 7 is a sectional view of a clutch and is taken on the line 7—7 of Fig. 5;

Figure 8 is a sectional view of a brake mechanism, taken on the line 8—8 of Fig. 5; and

Figure 9 is a detail in section, taken on line 9—9 of Fig. 4.

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Referring now in detail to the drawings, Fig. 3 is a view looking down upon the horizontal, traveling sprocket chains at the floor level, and onto which a stack of boxes is moved by means of a hand truck, or otherwise. Two spaced receiving sprocket chains are shown, designated 10, 10, and running over sprocket wheels 11, 11, on shaft 12 at one end and over sprocket wheels 13, 13, on a shaft 14, at the other end. These two sprocket chains constitute an endless conveyor, preferably at floor level, which makes it easy to move a stack of boxes on to said conveyor, to be carried forwardly as a stack, to an elevator mechanism designed to receive such stack. Said conveyor moves slowly and receives the stacks successively as they are delivered thereto. Said chains are shown moving in U-shaped or channel guide members 15, 15.

Two other endless conveyors 16, 16, running over idler sprockets 17, 17, on shaft 18, at the receiving end, are shown to receive the stacks of boxes from sprocket chains 10, 10, and at their other ends said conveyor chains 16, 16, run over driving sprockets 19, 19, on a drive shaft 20, said sprocket or conveyor chains 16, 16, also run in guide channels, as 21, 21, similar to the channels 15, 15, and seen in Figs. 4 and 5.

The power shaft 20 is connected into a gear reduction box 22, from which power is transmitted to said shaft 20, from any source of power connected to said gear box, as at 22'. A small sprocket 23, on shaft 20, carries a drive sprocket chain 24, running to a large sprocket 25, which has connected with it as a part thereof a clutch ring, referred to as 44 hereafter, and forming a part of a clutch mechanism. This large sprocket 25, with said clutch ring, 44, and also a small sprocket 28, attached to the other side of said large sprocket, run freely on shaft 26, and carry drive chain 27, which runs to sprocket 29, keyed to shaft 14. This will be seen in Figs. 5 and 3. The hub of sprocket 28 is welded to sprocket 25, at 28'.

Thus conveyors 16, 16, receive the stacks of boxes from conveyors 10, 10. Conveyors 16, 16 move faster than do conveyors 10, 10, for the reason that conveyors 16, 16 are driven from the drive sprockets 19, 19, on power shaft 20, while conveyors 10, 10 are driven by shaft 14, which is continuously driven from shaft 20 through sprocket 23, chain 24, sprocket 25, clutch ring 44, sprocket 28, chain 27 and sprocket 29.

Thus stacks of boxes, delivered to conveyors 10, 10, are moved slowly to the receiving ends of conveyors 16, 16, where they are picked up by conveyors 16, 16, and moved a little faster forwardly to a position between two vertical housings 30, 30, seen in Figs. 1 and 2, and also seen in horizontal sectional views in Figs. 3, 4 and 5. Said housings 30, 30, are open on their inner sides

and have their vertical endless conveyor chains 31, 31, running over sprockets 32, 32, in the upper ends of said housings, and under sprockets 33, 33, in the lower ends of said housings, Figs. 1 and 2.

The lower ends of said vertical elevators are extended below the floors, or below the level of the conveyors 10, 10, and 16, 16. Vertical elevator sprocket chains 31, 31, are provided at intervals with angle members, as 34, 34, Fig. 3. These angle members constitute lifting members for the stacks of boxes moved therebetween on conveyors 16. The guides for the conveyors 10 and 16 are secured to angle members 35, 35, which are spaced at intervals across the two vertical frame structure, between the side members 36, 36. At the entrance end of the conveyors 10, 10, said side members 36, 36, are connected by angle members 37 and 38, below the floor level, Figs. 1, 2 and 3.

Referring to Figs. 3, 4 and 5, a pair of stop rollers, as 38, 38 are mounted in the path of the moving stacks of boxes, on conveyors 16, 16, and against which said stacks of boxes may be stopped. Said stop rollers are carried at the upper ends of members 39, 39, in guide boxes 40, and are provided with antifriction rollers, as 41, 41. The lower end of said member 39 has an angle member 42 secured thereto, as seen in Fig. 9. A coiled spring 43 is attached at its lower end to said angle member 42, and at its upper end said spring is connected to a cross angle member 35, whereby to normally hold said stop roller in its raised and operative position.

Referring to Figs. 5 and 7, a clutch ring 44 is mounted on the side of the large sprocket wheel 25, on shaft 26. Secured on said shaft 26, within said clutch ring 44, is a clutch disc 45, having a segmental notch 46 formed therein, in which is a clutch dog 47, pivotally held so as to be moved outwardly by a spring loaded plunger 48, into position to be engaged in and be rotated by one of the notches in the clutch ring 44, as one of said notches engages the edge of said clutch dog 47, whereby to turn said clutch disc 45 and its shaft 26.

A clutch release member 49, shown in transverse section in Figs. 4 and 5, and in longitudinal section in Fig. 6, is suspended from shaft 50, one end of which is supported in a plate 51 on a cross member 35, while its other end is supported in a plate 52, on another cross member 35, as will be understood from the plan view in Fig. 3, and the sectional view Fig. 6. Said clutch release member 49 is formed to overlie the clutch disc or member 45, which extends beyond the side of the clutch ring 44, as will be understood from Figs. 5, 6 and 7. Mounted on shaft 26, on which said clutch disc 45 is mounted, is an arm 53, having at its free end a roller 54, which, when said shaft 26 is turned, will swing around over said shaft and engage the angle member 42, on the lower end of the stop roller support 39, and pull said stop roller down to release a stack of boxes which may be held by it, as hereinafter again referred to.

Pivotally mounted alongside of said clutch release member 49, is an upstanding safety lever 55 of A-shape, with its pivot support 56 in the A-form as seen in Fig. 6. Between the ends of said A-frame lever is a roller 57, which bears against the side of said suspended and swinging clutch release member 49, as will be understood from Figs. 5 and 6. When said safety lever 55 is depressed by a stack of boxes moving upon it on its way to the stop roller 38, the roller end 57 is moved away from said clutch release member

49, leaving it free to be moved outwardly off of said clutch ring so as to permit the clutch dog 47 to be moved out into engagement with one of the notches 44' in the clutch ring 44, whereby to turn the clutch disc 45 and its shaft 26, and swing said arm 53 around said shaft 26.

Referring to Figs. 1 and 2, the shaft 26 is shown broken away, but two of the spring arms 53, 53 are shown. In Fig. 1 said arms are down, while in Fig. 2 said arms 53, 53 are shown in their raised positions. Short pivoted arms, 58, 58, are shown at the opposite sides of the structure, pivoted as at 59 with their free ends connected with cross members 58'. As said arms 53 are raised, as before stated, the rollers at their free ends engage and lift said short arms 58, 58, from the positions shown in Fig. 1, to the positions shown in Fig. 2. The end of said pivoted arm 58 and one of its cross member 58' can be seen in Fig. 6 before the arm 53 and its roller 54 are raised to engage and lift it. This is the mechanism which operates the vertical box straightening arms or levers now to be described.

At opposite sides of the vertical structures in which the stacks of boxes are deposited, are two vertical levers or arms, as 60, 60, pivotally mounted at their lower ends, as at 61, and in the present form said arms or levers 60 have the angles 60' formed therein to facilitate movement against the opposite sides of a stack of boxes, as will be understood from Figs. 1 and 2.

Operating members, as 62, 62, are pivotally connected at their lower ends to said short levers 58, 58, as at 63, and at their upper ends said operating members are connected by means of toggle links 64, 64, to said vertical arms or levers 60, 60, with coiled springs, as 65, 65, between the ends of said members 62 and said toggle links 64. Thus when the clutch release member 49, permits the arms 53, 53, on shaft 26, to be rotated, the rollers 54, 54, on the free ends of said arms, engage said cross members 58', 58' on the free ends of the pivoted levers 58, 58, and raise said operating members 62, 62 in such a way as to move the vertical arms or levers 60, 60 toward each other at the opposite sides of a stack of boxes therebetween, as seen in light broken lines in Figs. 1 and 2.

Said clutch release member 49, has pivotally connected to one side thereof a thrust rod 66, Fig. 4, extended to and through one arm 67 of a bell crank 68, the other arm of which bell crank is connected by a rod 69 to a pivoted lever 70. A coiled spring 71 is placed on the end of said rod 66, outside of the bell crank arm 67, with an adjustment nut 72 on the end of said rod for regulating the tension of said spring. This spring is to provide for a certain yieldable movement of bell crank 68, if the clutch release member is not free to be moved.

Assuming that a stack of boxes has been moved by conveyors 10, 10, and have been picked up by, conveyors 16, 16, and carried to the stop rollers 38, 38, said stack is held by said stop rollers and the conveyor chains 16, 16 continue to move thereunder.

Just prior to the arrival of said stack of boxes at the stop rollers 38, 38, said stack of boxes has engaged and moved the pivoted member 55 from its up position as seen in Fig. 6, to its down position, shown in light dotted lines. This movement of said member 55 will permit the clutch release member 49 to be moved sufficiently to release the clutch disc dog or pawl 47 to be moved out to be engaged by one of the notches in the

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clutch ring 44 for turning the arm 53 around so as to engage and lift the cross members 58' on levers 58, Fig. 1, which operate the box engaging and straightening arms 60, 60.

As said arm 53 is moved around with its shaft 26, after it has engaged and moved the levers 58, 58, for operating the box straightening arms 60, 60, it moves on around to engage and depress the angle member 42, for withdrawing the stop rollers 38, 38, so as to permit said stack of boxes to be moved forwardly to the elevator angle members 34, 34, seen in Fig. 3. There are two of these arms 53, one at each end of shaft 26, as seen in Fig. 5, to engage and move the levers 58, 58, and also the stop rollers. In order to prevent accelerated movement of said arms 53, after they have moved the box straightening mechanism, as they move over the top of their arc of movement, the brake mechanism shown in Fig. 8, is provided on the shaft 26, Figs. 5 and 8, keeps said arms from moving too fast. This brake mechanism includes a brake member 77, having two brake faces as 78 and 79 to be engaged by a brake shoe 80, supported on a pivoted arm 81, pivoted at one end, as at 82, and at its other end yieldingly held by a bolt 83 having a spring 84 thereon, bearing against a fixed angle member 85, having a stop bolt 86 adjustably secured therethrough, as shown in Fig. 8, whereby said brake shoe supporting pivoted arm 81 can be adjusted to give the proper friction on said brake member 77 to hold the shaft 26 and its swinging arm 53, which is power driven through the shaft 26. Thus the swinging arm 53, which operates the box straightening mechanism first, and then as it moves on over the arc to operate the withdrawal of the stop rollers 38, 38, can be held automatically by said brake mechanism against uneven movement.

As the angle members 34, 34, which carry the stacks of boxes up, pass the arm 74, on shaft 73, a projecting member 75 on one of said angle members 34, as seen in Fig. 3, engages and moves said arm 74 and rocks shaft 73, on the outer end of which, as seen in Fig. 4, is an arm 70 and the connecting rod 69, hereinbefore described, which operates the bell crank 68 for pulling the clutch release member 49, if there is a stack of boxes on the lever 55, before the stop rollers 38. If there is no stack of boxes holding said lever 55 down, then said clutch release member 49 cannot be moved, but the bell crank 68 can be moved by reason of the coiled spring 71 on said rod 66, when the prior stack of boxes which is being carried up on the elevator angle plates 34, 34, engages through the arm or member 75 the arm 74 and rocks said shaft 73, and through its connections, operates the bell crank 68. Each carrying angle member 34, on one side, has one of the projecting arms or members 75 on it, so that it operates the bell crank 68, whether there is a stack of boxes on said angle members or not. If there is no stack of boxes over the tilting lever 55, to hold it down and release the clutch release member 49, the bell crank is moved on the rod 66, against the tension of the spring 71, as before described. If said tilting lever 55 is being held down by a stack of boxes, then the former stack, or the angle member 34 operates the bell crank and pulls the clutch release member 49 away from the clutch disc 45, so as to release the pawl 47 and permit it to be moved out by its plunger 48 into operative engagement with one of the teeth or notches 44' in the clutch ring 44, for turning the shaft 26 and the swinging arm 53, before described.

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Thus this control mechanism operates to prevent a stack of boxes from being carried forward to the elevator mechanism until the preceding stack of boxes has been moved up out of the way, said preceding stack operating through the connections described to release the clutch release member 49 and permitting the box straightening arms to be operated, and the stop rollers to be withdrawn, to permit the following stack of boxes to be moved forwardly to the elevator members 34, 34.

I do not, however, limit my invention to the details of construction and arrangement here shown for explanatory purposes, realizing that many changes in such details can be made, except as I may be limited by a reasonable interpretation of the hereto appended claims forming a part of this specification.

I claim:

1. A mechanism for aligning boxes in a stack and including a horizontal conveyor to receive a stack of boxes and move it as a stack, means for operating said horizontal conveyor, a vertical structure having two vertical elevators therein and facing each other to receive said stack of boxes therebetween, means on said elevators for engaging under opposite sides of said stack of boxes for elevating them, means at opposite sides of said horizontal conveyor to be operated against the opposite sides of said stack of boxes for aligning said boxes, means for operating said aligning means, means for stopping said stack of boxes during its horizontal movement on said conveyor and for holding it during said aligning operation, and means for automatically releasing said stopping means to permit said stack of boxes to be carried forwardly in aligned condition.

2. A mechanism for aligning boxes in a stack and including: a traveling horizontal conveyor to receive a stack of boxes, means for driving it, a second horizontal conveyor to receive said stack of boxes from said first conveyor, means for driving said second conveyor at a faster speed, a vertical structure having vertical elevators in its opposite sides, and between which said stacks of boxes are moved, means on said elevators for engaging at opposite sides a stack of boxes and elevating it, stop means in the path of said horizontal conveyor to stop and hold said stack of boxes for a period, means at opposite sides of said conveyor operable against the opposite sides of a stack of boxes for aligning the boxes in a stack, means for automatically operating said aligning means during the time said stack is held against movement, and means for automatically releasing said stop means to permit said stack to be moved forwardly to said vertical elevators.

3. A machine for aligning boxes in a stack including a traveling horizontal conveyor to receive a stack of boxes, means for driving it, a second horizontal conveyor to receive said stack of boxes from said first conveyor, means for driving said second conveyor at faster speed than said first conveyor, means in the path of travel of said stack of boxes on said second conveyor for stopping and holding a stack of boxes while the conveyor continues to move thereunder, vertical straightening arms movably supported at opposite sides of said conveyor, at the stop position, means for automatically operating said arms toward each other on the opposite sides of a stack of boxes to straighten the boxes in said stack, means for automatically releasing said stop means to permit said stack of boxes to be moved forwardly, vertical elevators at opposite sides of

said conveyors, said elevators having lifting means to engage the opposite undersides of a stack of boxes for lifting it to a higher level, and means for operating said vertical elevators.

4. In combination with a conveyor to receive and move a stack of boxes forwardly, means for arresting the movement of said stack of boxes, pivotally movable means at opposite sides of said stack of boxes and movable toward and from each other for engaging and aligning said boxes in the stack, means for automatically operating said aligning means, and means for releasing said stack of boxes for continued forward movement as a stack.

5. In combination with a horizontal conveyor to receive and move a stack of boxes, a vertical elevator to receive said stack of boxes and elevate it, means cooperating with said horizontal conveyor for stopping the movement of said stack of boxes momentarily, pivoted levers at opposite sides of said stack of boxes for engaging and aligning said boxes in the stack, means for automatically operating said aligning levers, and means for releasing said stack of boxes for continued forward movement as a stack with said horizontal conveyor.

6. In combination with a horizontal conveyor to receive and carry stacks of boxes forwardly, stop members movable into and out of the path of travel of said stacks of boxes for momentarily stopping the movement of said stacks of boxes, means for automatically operating said stop members, aligning members operably located at opposite sides of the path of travel of said stacks of boxes and movable toward and from each other to engage and align the boxes in a stack during the stop period thereof, means for automatically operating said aligning members, said stop members being moved into releasing position after said aligning members are moved away from said boxes.

7. In combination with a vertical elevator for elevating stacks of boxes, a horizontal conveyor for moving stacks of boxes to said elevator, retractable stop means projecting into the path of movement of said conveyor to arrest the movement of said stack, means for automatically operating said stop means, means at opposite sides of said conveyor and operable against each stack of boxes during its stopped period for aligning the boxes in the stack, means for automatically operating said aligning means, and means for automatically releasing said stop means as said aligning means are moved away from said stack of boxes, whereby said stack of boxes is then moved forwardly to said vertical elevator.

8. In a mechanism for handling stacks of boxes, a horizontal conveyor for receiving stacks of boxes, means for driving it, a second horizontal conveyor in alignment with said first conveyor and to receive stacks of boxes from said first conveyor, means for driving said second conveyor at a faster speed, whereby to move the received stack of boxes forwardly in spaced relationship to the next succeeding stack, stop means for momentarily stopping the movement of a stack of boxes on said second conveyor, box aligning means at the opposite sides of said conveyor and operable against the opposite sides of said stack of boxes during its stopped period for aligning the boxes in said stack, means for automatically operating said aligning means during said stopped period, said stopping means and said aligning means being timed to release said stack of boxes for forward

ward movement as said aligning means is retracted from said boxes.

9. In combination, an elevator for elevating stacks of boxes to a higher level, means for operating it, a horizontal conveyor for moving stacks of boxes to said elevator, means for operating it, a horizontal conveyor for carrying stacks of boxes to said first conveyor, said conveyors overlapping to transfer a stack from one conveyor to the other, said conveyors being moved at different speeds to provide greater distance between said stacks as they are picked up by the first mentioned conveyor, means whereby said stacks of boxes are intermittently stopped during the movement of the faster conveyor, aligning means at opposite sides of said conveyor and operable against the opposite sides of said stack of boxes during its stopped period for aligning the boxes in said stack, means for releasing said stopping means to permit forward movement of said aligned stack of boxes to said elevator, said stopping means for said stacks of boxes being timed to release said stacks of boxes for forward movement following the operation of said aligning means.

10. In combination with an elevator mechanism for stacks of boxes, a feeding mechanism for moving stacks of boxes to said elevator mechanism, retractable stops for holding said stacks against movement by said feeding mechanism, means for aligning the boxes in a stack during the stopped period of said stack of boxes, a clutch mechanism for operating said aligning means, means controlled by the elevator mechanism, for actuating said clutch mechanism, means to prevent such actuation of said clutch mechanism when there is no stack of boxes in position to be aligned by said aligning means, said retractable stops, aligning means, and clutch mechanism being timed to successively move, stop, align and release a stack of boxes under the control of said elevator mechanism.

11. The combination with an elevator mechanism to receive and elevate stacks of boxes, of a pair of horizontal conveyors, with means for driving them at different speeds, to receive stacks of boxes and move them forwardly toward said elevator, stop means in the path of said conveyors for momentarily stopping the movement of said stacks of boxes toward said elevator mechanism, aligning mechanism at the opposite sides of said conveyors and operable against the opposite sides of a stack of boxes during its stopped period for aligning the boxes in said stack, means automatically and intermittently operating said aligning mechanism, said stop means and said aligning mechanism being timed to release said stack of boxes for forward movement to said elevator mechanism following the operation of said aligning mechanism, said mechanisms being controlled by the movement of the elevator mechanism with a stack of boxes thereon.

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