July 28, 1959 E. W. CARLSEN ET AL 2,896,384

AUTOMATIC BOX FILLER

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FIG. 2.

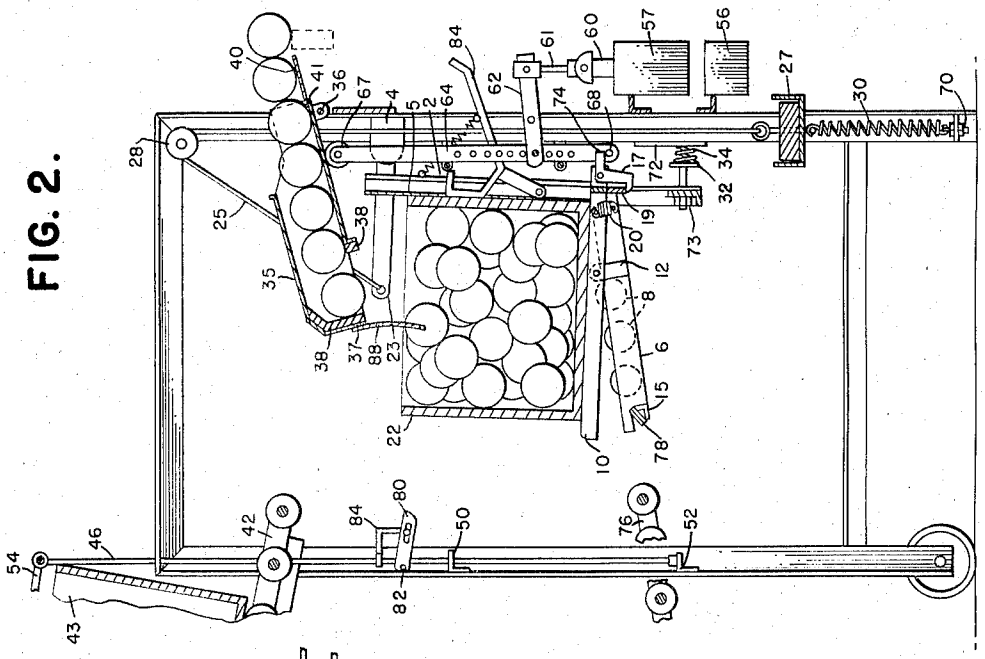
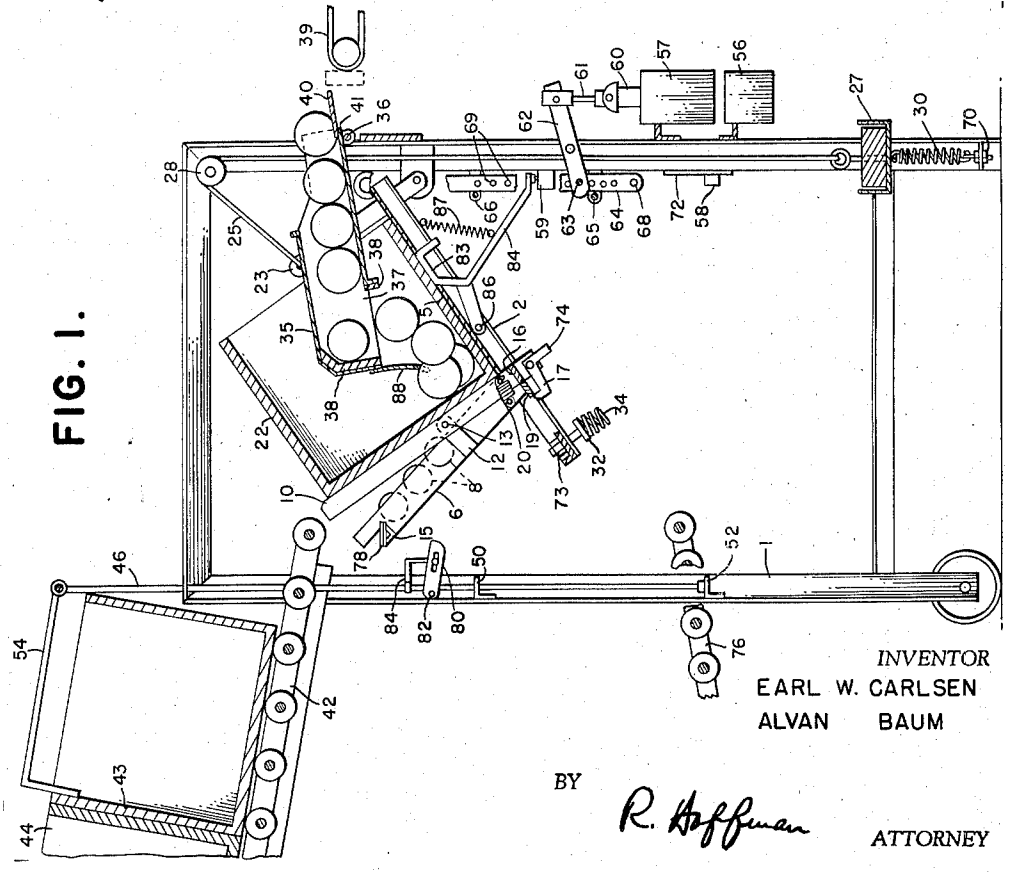


FIG. 1.



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AUTOMATIC BOX FILLER

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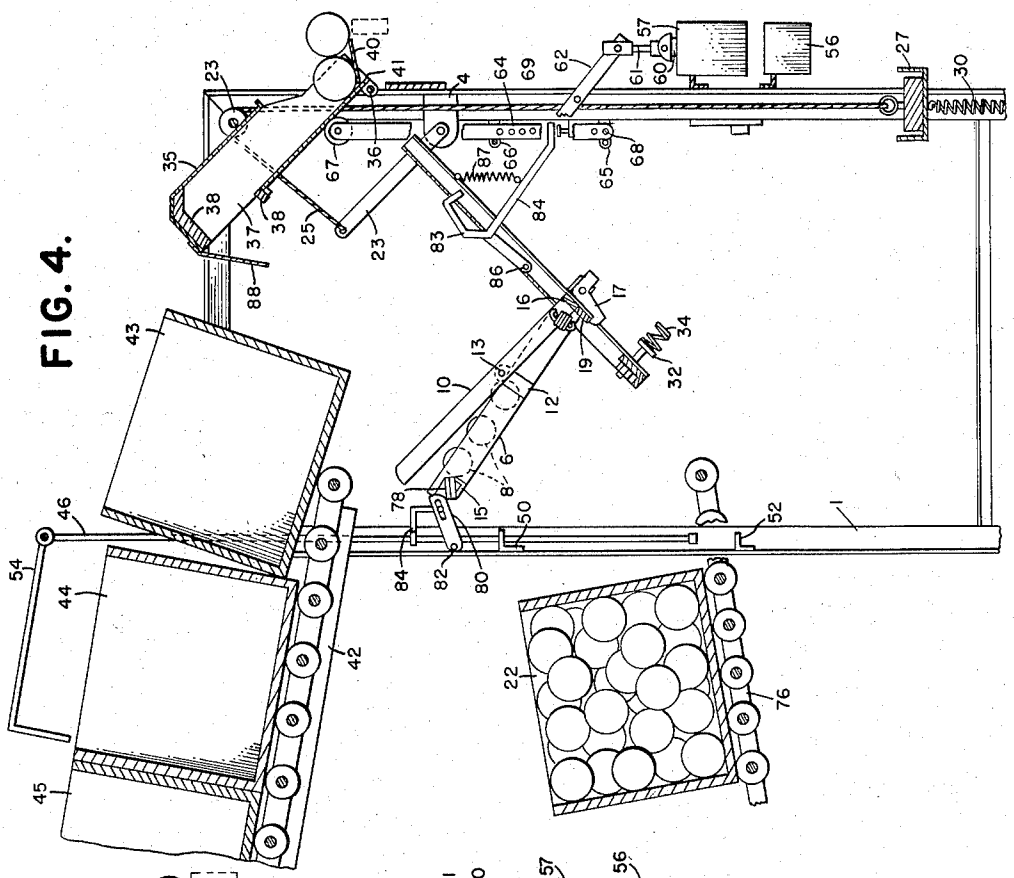

FIG. 4.

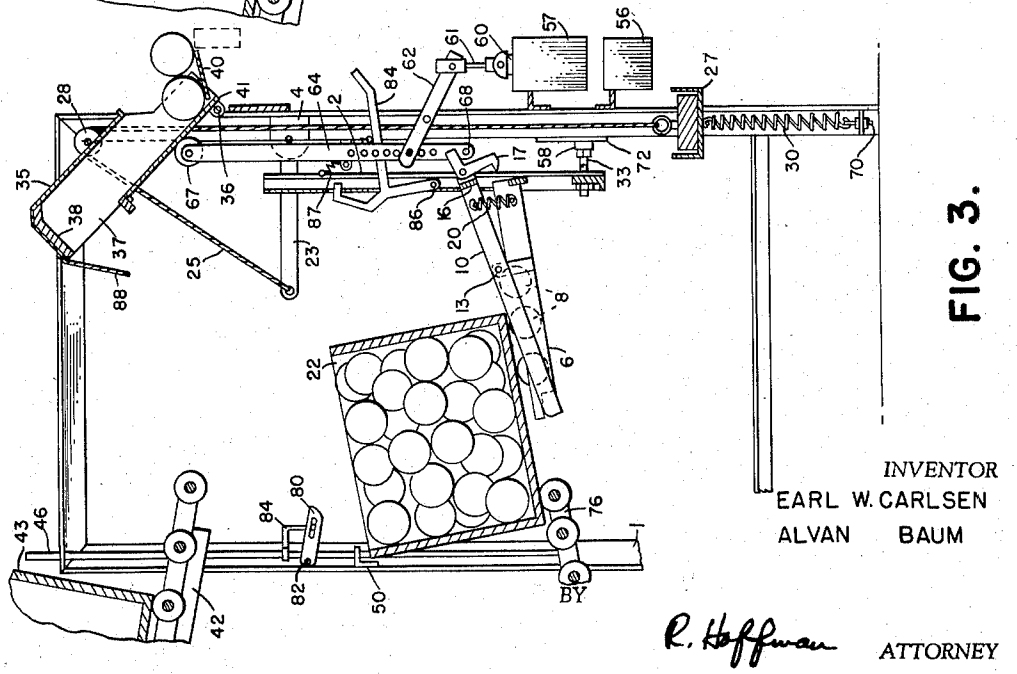

FIG. 3.

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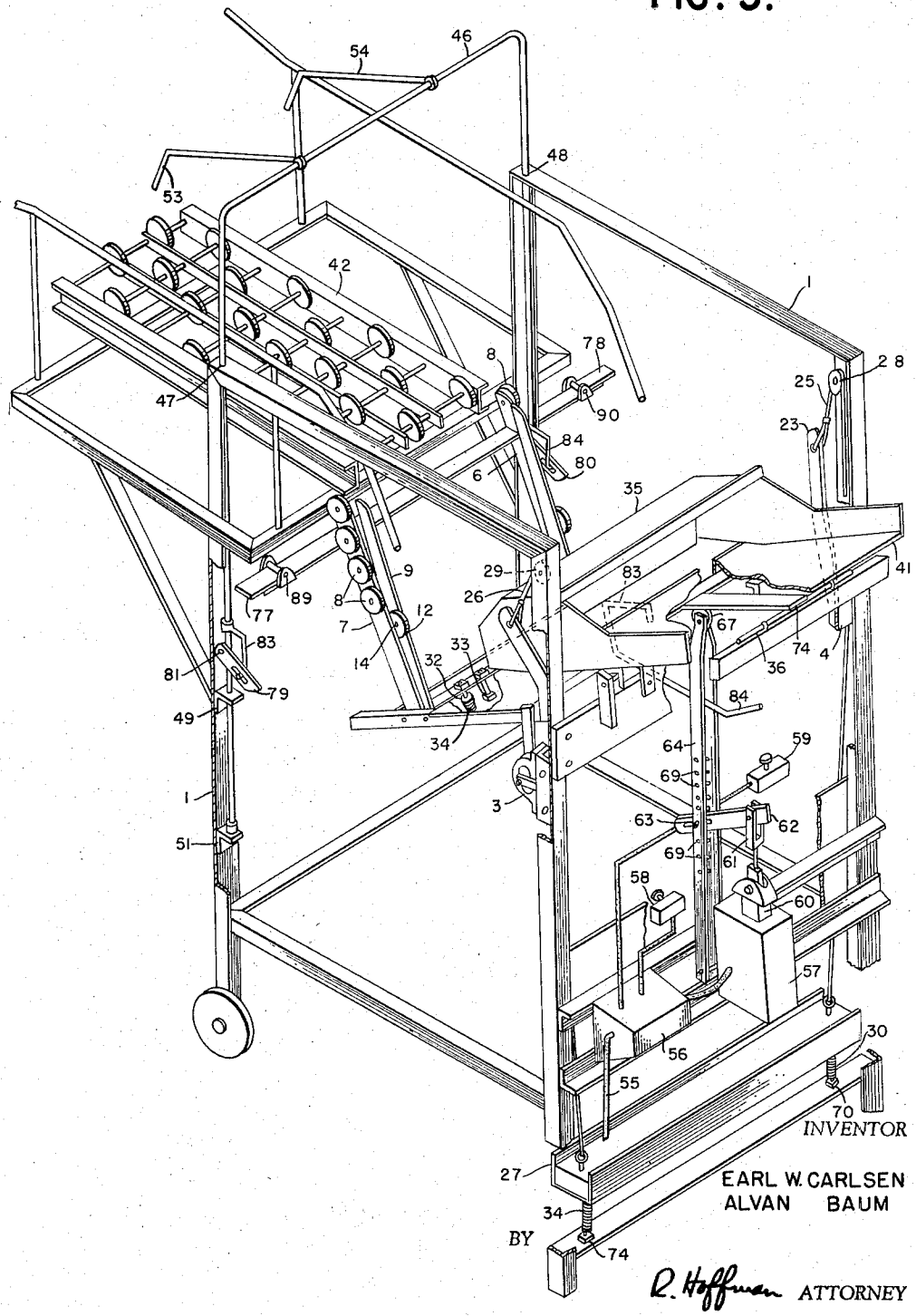
FIG. 5.



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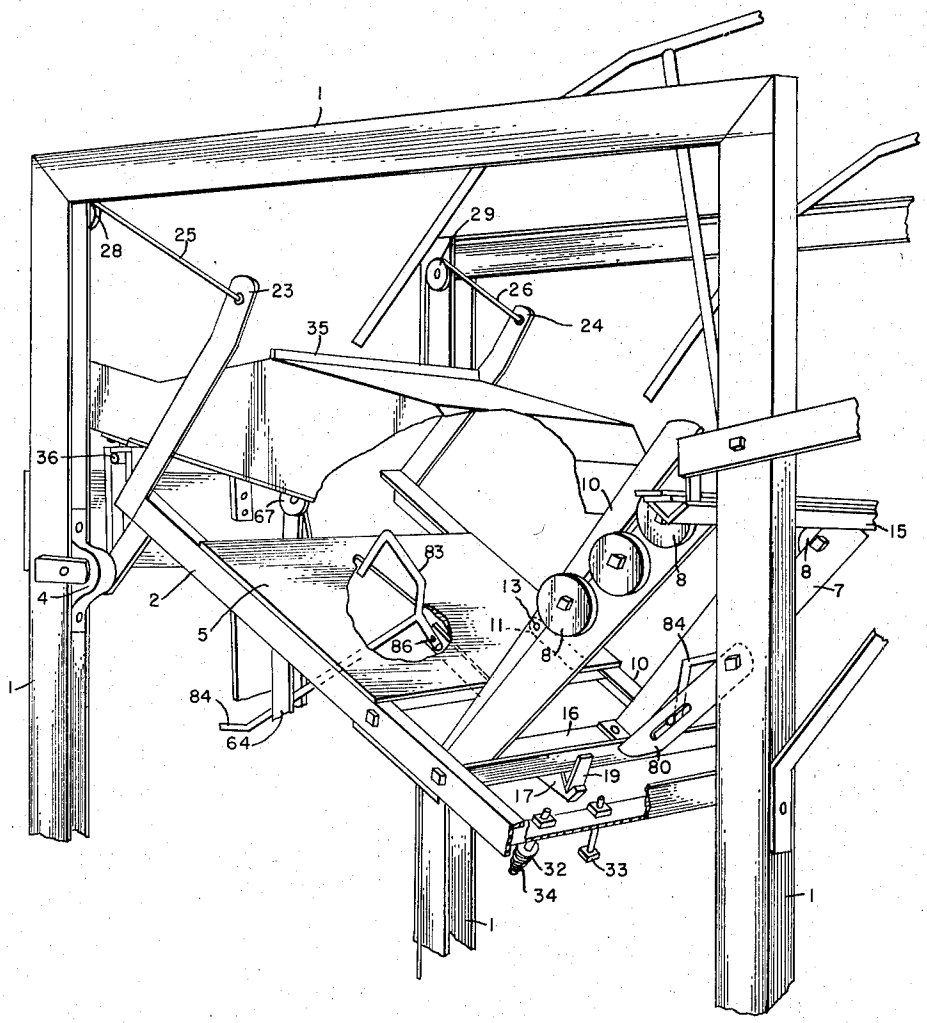

FIG. 6.

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AUTOMATIC BOX FILLER

Earl W. Carlsen, Yakima, and Alvan Baum, Wapato, Wash.

Application March 20, 1958, Serial No. 722,823

4 Claims. (Cl. 53—59)

A non-exclusive, irrevocable, royalty-free license in the invention herein described, throughout the world for all purposes of the United States Government, with the power to grant sublicenses for such purposes, is hereby granted to the Government of the United States of America.

The patent rights for the United States in any invention in the patent to be granted on this application are dedicated to the public.

This invention relates to a box filling machine. More particularly, it relates to a machine which will automatically fill an empty box with loose fruit, such as, apples, or other objects, to a predetermined weight, and then eject the full box.

One object of the invention is to provide a machine which will operate automatically in successive filling and ejecting cycles.

Another object is to provide such a machine in which the objects being packed, if fruit, are deposited in the box in such a manner as to eliminate bruising.

In order that the invention may be readily understood, reference is made to the following description and to the accompanying drawings in which:

Figure 1 shows the machine with a box in the filling position at the start of the filling phase of the cycle;

Figure 2 shows the box in the filling position nearly full and about to be ejected;

Figure 3 shows the machine in that phase of the cycle in which the box is being ejected;

Figure 4 shows the machine in the phase after a full box has been ejected and an empty box is being dropped into the filling position;

Figure 5 is a perspective view of the complete machine; and

Figure 6 shows the details of construction of the cradle and tilt table on which the box rests while it is being filled.

Figures 1–4 are vertical sectional elevations through approximately the center of the machine as indicated on Figure 5.

The details of construction and operation will become apparent from the description which follows.

In accordance with this invention, the machine comprises a framework 1 on which a vertically rotatable cradle 2 is mounted by means of bearings 3 and 4 at what may be considered the front of the machine.

As will be apparent from Figures 5 and 6, the cradle is of rectangular shape and is constructed out of any suitable material, such as, angle iron bars. A flat plate 5 over the cradle provides a surface for supporting a box during the filling operation. A pair of roller arms 6 and 7 are rigidly secured to the sides of the cradle and extend upward at somewhat more than right angles to the cradle. Each roller arm is provided with a number of rollers 8. A tilt table comprising a pair of arms 9 and 10, is pivoted to brackets 11 and 12 on the roller arms by means of pivots 13 and 14, respectively. Roller

arms 6 and 7 are connected by an angle iron 15 extending between their rear ends. The ends of the tilt table closest to the cradle are connected by a cross-bar 16 which carries latch 17. Across the back of the cradle there is a bar 18 to which is secured a normally extending bar 19. Tension springs 20 and 21, secured to the tilt table and the roller arms between pivots 13, and 14, respectively, keep the tilt table raised above the roller arms, thus also keeping the latch engaged by extension 19. In this position, the tilt table forms substantially a right angle with the cradle and thus retains the box 22 on the cradle during the filling operation, as can be seen from Figures 1 and 2. It will be obvious that the arms 9 and 10 of the tilt table should be close enough together to retain at least the smallest box which it is intended to use in conjunction with the machine.

The cradle itself is provided with a pair of upwardly extending lever arms 23 and 24 which are connected by means of cables 25 and 26, respectively, to a weight 27 suspended in the framework at the front of the machine. Pulleys 28 and 29 permit easy movement of the cables. Adjustable springs 30 and 31 are secured to the frame of the machine and to the weight.

Cross-bar 16 on the cradle carries an adjustable cradle stop 32 and a pin 33. The cradle stop is provided with a compression spring 34 whose function will be explained in the description below of the operation of the machine.

In order to feed the material to be packed, as for example, apples, to the box, a vertically rotatable chute 35 is pivoted to the front of the frame so as to rotate about horizontal rod 36. Chute 35 overhangs the cradle in such a position that apples entering it will pass through opening 37 and be deposited into box 22 being supported on the cradle. The interior of the chute is preferably lined with a soft material 38, such as, for example, foam rubber, to prevent bruising of the fruit which is fed to the chute by means of endless conveyor 39. Fabric apron 88 provides further protection for the rolling fruit. A stationary sloping platform 40 bridges the space between the chute and the endless conveyor. The chute itself is provided with a rearward extension 41 which engages the underside of platform 40 and is thus maintained in a forwardly sloping position which is in normal filling relationship with the cradle and the box supported thereon.

Opposite the chute, a sloping roller conveyor 42 is mounted on the framework and carries a plurality of empty boxes, such as 43, 44, and 45. The conveyor serves as a storage means for these boxes. An inverted U-shaped rod 46, guided by holes 47 and 48 in the framework and by perforated brackets 49 and 50, and supported at its lower ends by solid brackets 51 and 52, carries a pair of lateral rigidly secured fingers 53 and 54. These fingers are bent downward at their ends and, in the normal position of rod 46, are adapted to engage the first box 43 on storage conveyor 42, thus preventing the box from being deposited onto the cradle until needed.

The control elements of the machine comprise a cable 55 connected to a source of electrical energy (not shown) and to relay switch 56 mounted on the front of the machine. A solenoid 57 is connected to the source of energy through the relay switch, which itself is connected to two microswitches 58 and 59. Armature 60 of the solenoid is mechanically connected by means of levers 61 and 62 through pin 63 to a vertically movable push rod 64 which is guided on the framework of the machine by guides 65 and 66. The push rod 64 is constructed of two parallel bars joined at the top, and is provided at the upper end with a roller 67. The lower ends of the two bars are joined by a pin 68. When

push rod 64 is in its lowermost position pin 63 rests on guide 64, and the vertical distance through which the rod can move is determined by selecting a pair of suitable holes 69 through which to insert pin 63. It will be apparent that this selectivity or adjustability of the effective length or travel distance of push rod 64 will determine the angle of inclination of chute 35. In this manner the chute may be adjustably lowered into container 2 to varying degrees to minimize the height of drop to prevent bruising of the fruit during the filling operation.

The various phases of the operating cycle of the machine are illustrated by Figures 1–4.

Figure 1 shows the machine at the beginning of the filling phase of the cycle. An empty box 22 rests on its side on cradle 2 and is supported on its bottom by tilt table 10 which is held above roller arms 6 and 7 and rollers 8 by means of latch 7. Cradle 2 is held in its uppermost position by the combined effects of counterweight 27 and springs 30 and 31. As fruit is delivered into the box from belt 39 through chute 35, the weight of the fruit causes cradle 2 to rotate downward about pivot bearings 3 and 4. The rate at which the cradle rotates downward may be predetermined by adjusting the tension in springs 30 and 31 by means of nuts 70 and 71, respectively. In this way it is possible to control the lowering rate so that the level of the fruit in the box is maintained in substantially the same position with respect to the chute.

Figure 2 shows the box nearly full, with the weight of the fruit having caused the cradle to rotate almost to the limit of its travel. At this stage, spring 34 at the end of cradle stop 32 is in contact with stop plate 72 mounted on the framework of the machine. Adjustment of the length of the cradle stops by means of nut 73 will determine the weight of fruit in the box necessary to compress spring 32 sufficiently to bring pin 33 into contact with and to actuate microswitch 58. Actuating microswitch 58 causes relay switch 56 to close and to energize solenoid 57. When this occurs armature 60 of the solenoid is drawn downward, causing levers 61 and 62 to move push rod 64 upwards. Roller 67 at the top end of the push rod bears on plate 74 on the underside of chute 35, raising the latter and stopping the flow of fruit to the box. At the same time pin 68 at the lower end of the push rod engages extension 75 on latch 17 and releases the latter. The weight of the full box 22 causes tilt table 10 to pivot downward about pivots 13 and 14 and to roll down roller arms 6 and 7 onto roller conveyor 76, as shown in Figure 3, and be removed from the scene of operations.

Removing the full box 22 allows tilt table 10 to be returned by spring 20 to its original latched position. At the same time, the combination of weight 27 and springs 30 and 31 causes the cradle to swing upwards. As this occurs, a pair of hinged lugs 77 and 78 engage box release pawls 79 and 80, respectively, causing the latter to rotate about their pivots 81 and 82 which are mounted in the framework of the machine. See Figure 4. The hinged lugs rest on cross-bar 15 and are pivoted on pins 89 and 90 so that they can rotate upwards only. This permits them to pass pawls 79 and 80 on the downward swing of the cradle during the filling phase. Pawls 79 and 80 are connected to the arms of U-shaped rod 46 through levers 83 and 84 in such a manner that their rotation momentarily raises the U-shaped rod and attached fingers 53 and 54. This permits empty box 43 to drop onto the cradle. As the hinged lugs pass the pawls, rod 46 drops back and the fingers engage and hold the next empty box 44. At the same time, pawls 79 and 80 drop back to their positions shown in Figures 1, 2, 3, and 5 to be engaged by the hinged lugs in the next upward cycle.

During the portions of the cycle in which a full box is released and an empty one is being deposited onto the cradle, the solenoid remains energized and push rod 64 maintains chute 35 in a raised position and thus out of filling relationship to the cradle.

When empty box 43 is deposited onto the cradle, it depresses the upper portion 83 of lever 84 which protrudes through opening 85 in plate 5. Lever 84 rotates about pivot 86 beneath plate 5; and upper position 83 is normally maintained in a protruding position by means of spring 87. When the weight of the empty box depresses lever 84, the latter comes in contact with microswitch 59 which is so connected to relay switch 56 as to break the circuit to the solenoid. Armature 60 is thus released, permitting push rod 64 to drop back and at the same time permitting chute 35 to return to its lower position wherein fruit will again flow into the empty box.

The filling cycle is thus completed and is ready to start anew.

We claim:

1. A machine for filling containers which comprises a vertically rotatable support for holding a container to be filled; filling means in adjustable proximity to said rotatable support adapted to transfer material into a container held on said rotatable support; storage means also in proximity to said rotatable support adapted to hold a plurality of empty containers; means for removing a full container from said rotatable support; counterbalancing means connected to said rotatable support adapted to maintain the rotatable support in filling relationship to said filling means, said counterbalancing means being further adapted to permit the rotatable support to descend at such a rate while the container is being filled that descent is completed when the container is full and to cause the rotatable support to return to its uppermost position after a full container has been removed; interlocking means actuated by the rotatable support for simultaneously releasing a full container from said rotatable support and for closing off said filling means; first release means on said storage means cooperative with the rotatable support adapted to deposit a single empty container on said support as it returns to its uppermost position; and second release means on said rotatable support cooperative with the interlocking means adapted to reopen the filling means as soon as an empty container is deposited on the rotatable support.

2. An automatic box filling machine comprising a vertically rotatable cradle for holding a box to be filled; a chute above the cradle for depositing objects into the box, said chute being adapted to remain in filling relationship to the cradle and to the box being held on said cradle until the box is full; releasable means on the cradle for maintaining the box on said cradle until said box is full; means below the cradle for removing a full box released from said cradle; counterbalancing means connected to the cradle adapted to maintain said cradle in an uppermost position when the box is empty, said counterbalancing means being further adapted to permit the cradle to descend to a lowermost position at such a rate while the box is being filled that descent is completed when the box is full and to return the cradle to the uppermost position when the full box has been removed; interlocking means cooperative with the cradle adapted to simultaneously release the full box from the cradle when said cradle has reached the lowermost position and to remove the chute from filling relationship to the cradle; storage means above the cradle for storing a plurality of empty boxes; retaining means associated with the storage means for maintaining said boxes on said storage means; a first release means on the cradle cooperative with the retaining means adapted to deposit a single empty box onto the cradle as said cradle is returned to its uppermost position; and a second release means on said cradle cooperative with the interlocking means adapted to return the chute to a filling relationship when an empty box is deposited on the cradle.

3. An automatic box filling machine comprising a

framework; a vertically rotatable cradle for holding a box to be filled hinged to the framework; a vertically rotatable chute above the cradle for depositing objects into the box, said chute being maintained in a filling relationship to the cradle and to the box being held thereon until said box is full; a tilt table for retaining the box on the cradle pivoted near the end of the cradle opposite the hinges and maintained substantially at right angles to said cradle by a latch; conveying means below the cradle for removing a full box; counterbalancing means connected to the cradle adapted to maintain said cradle in an uppermost position when the box is empty, said counterbalancing means being further adapted to permit the cradle to descend to a lowermost position at such a rate while the box is being filled that descent is completed when the box is full and to return the cradle to the uppermost position when the full box has been removed; a vertically movable push rod guided on the framework normally maintained in a lowermost position while the box is being filled; raising means for operating said push rod; means attached to the cradle at the end opposite the hinge adapted to actuate the push rod raising means when the cradle reaches its lowermost position whereby the push rod raises the chute to prevent further passage of objects therethrough; means on the push rod for releasing the latch on the tilt table as the push rod is raised thereby permitting the tilt table to tilt and deposit the full box on the conveyor; resilient means on the tilt table for returning it to a holding position after the full box is removed; storage means secured to the framework above the cradle for storing a plurality of empty boxes; releasable retaining means for retaining the empty boxes on the storage means; a lug on the cradle adapted to engage said releasable retaining means as the empty cradle rotates upward for a sufficient time

to release only one empty box onto the cradle; and means on the cradle cooperative with means on the frame for releasing the push rod to permit it to drop when an empty box is deposited onto said cradle, thereby permitting the chute to return to a filling relationship with said box.

4. In combination with a machine of the character described comprising a framework, a vertically rotatable cradle hinged to the framework for supporting a box to be filled, a vertically rotatable chute in filling relationship with the cradle for depositing objects into the box, counterbalancing means to permit descent of the cradle at a predetermined rate as the box is being filled and to raise the cradle when the full box is removed, and means for depositing an empty box on the cradle as it is being raised, a source of electrical energy, a solenoid connected to said source of electrical energy, a relay switch connected between the solenoid and the source of electrical energy, a vertically movable push rod connected to the armature of the solenoid, means attached to the cradle for actuating a first switch connected to said relay switch when said cradle reaches its lowermost position with a full box thereby energizing the solenoid and causing the push rod to move upward and raise the chute out of filling relationship with the cradle, a second switch also connected to said relay switch, and a retractable rotatable lever on the cradle operated by an empty box on the cradle for actuating said second switch to deenergize the solenoid to permit the push rod to drop and permit the chute to return to filling relationship with the cradle.

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