July 14, 1953

C. E. KERR
SUPPLY CONTROL MECHANISM FOR
CONTAINER HANDLING MACHINES

2,645,326

Filed July 5, 1949

4 Sheets-Sheet 1

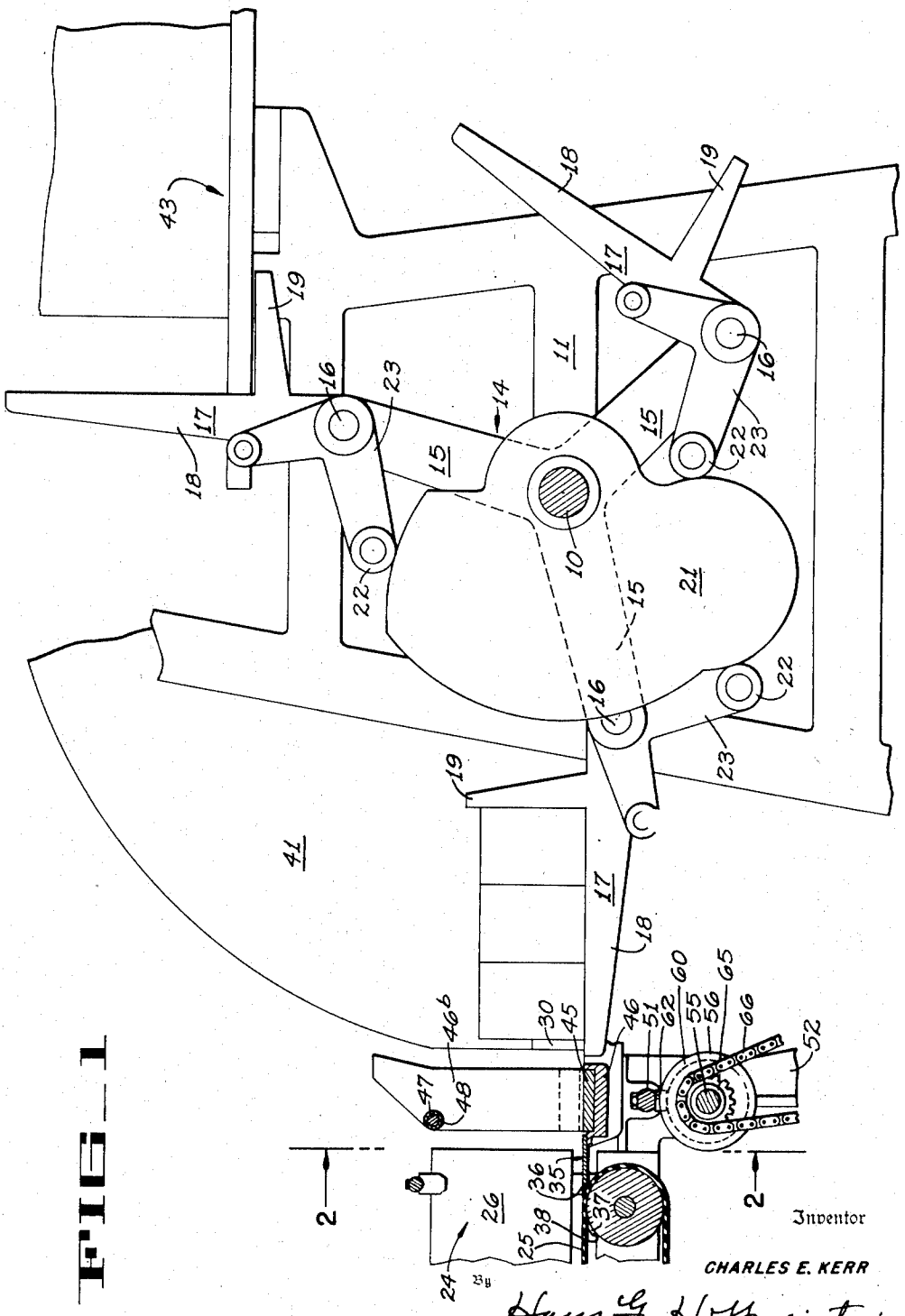


FIG. 1

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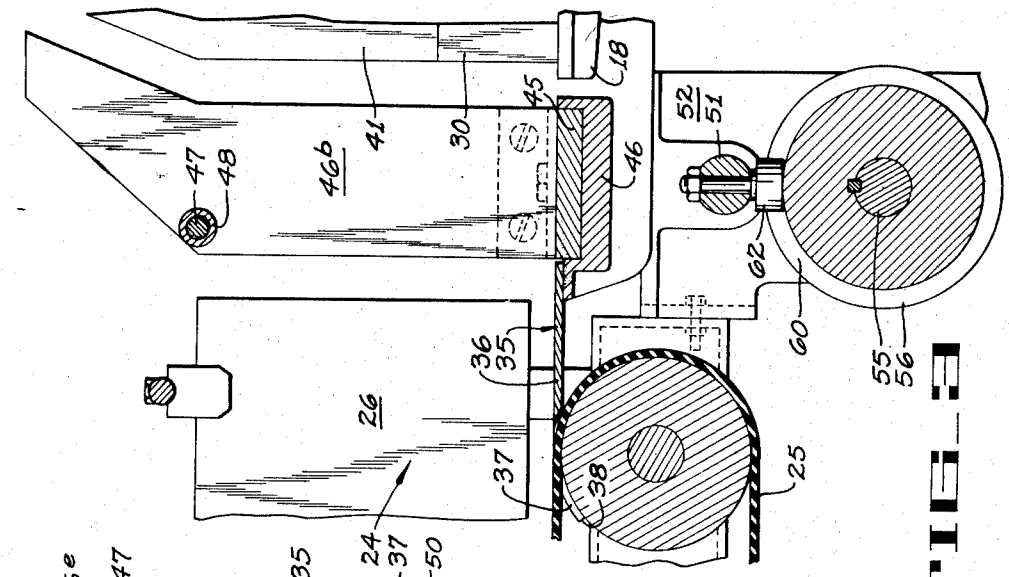


FIG. 3

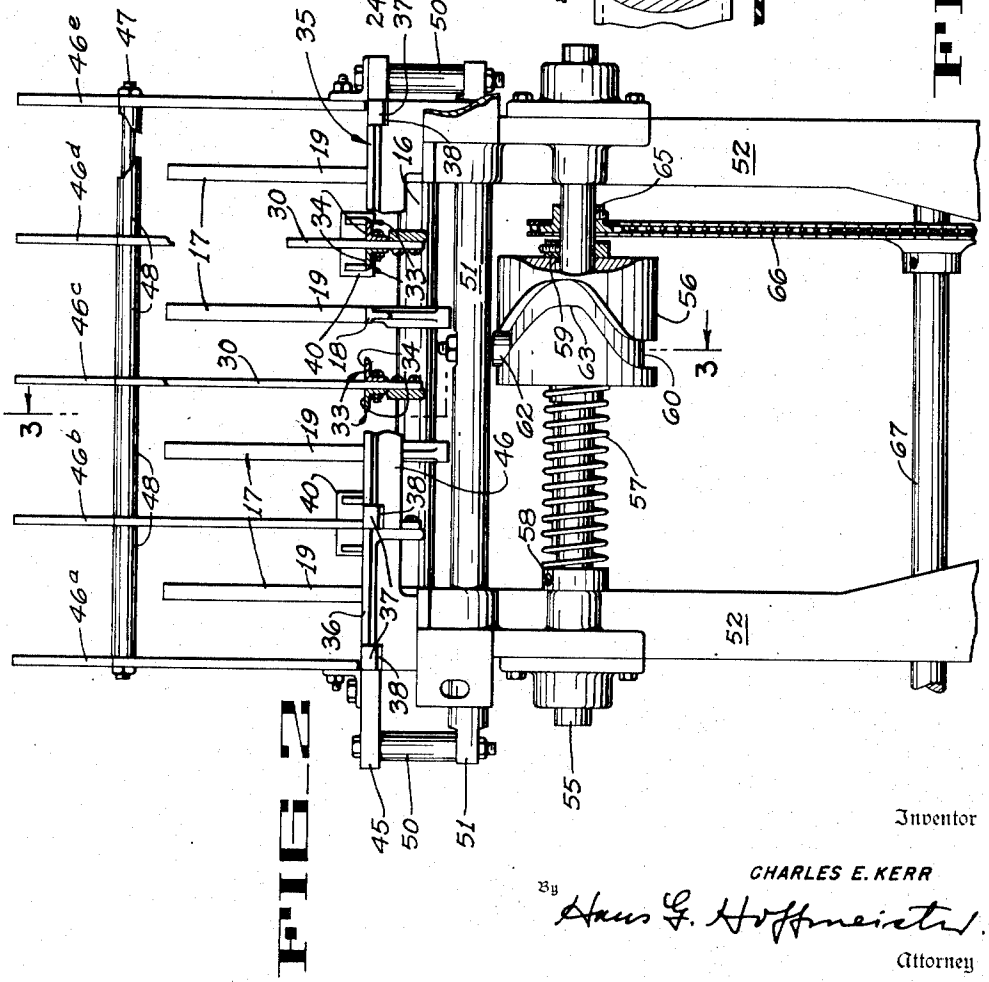


FIG. 2

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4 Sheets-Sheet 3

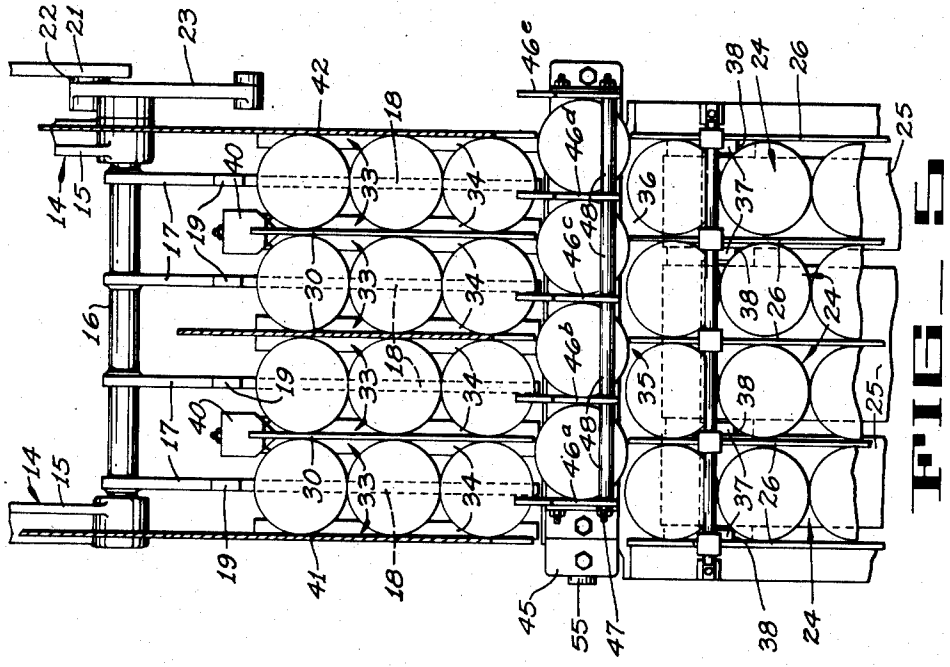


FIG. 5

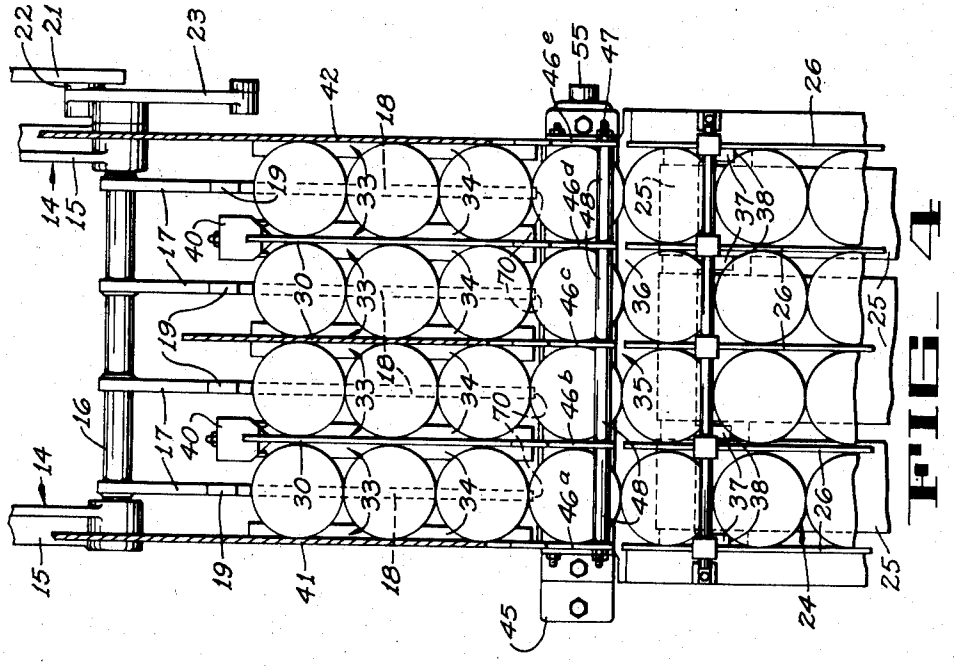


FIG. 4

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4 Sheets-Sheet 4

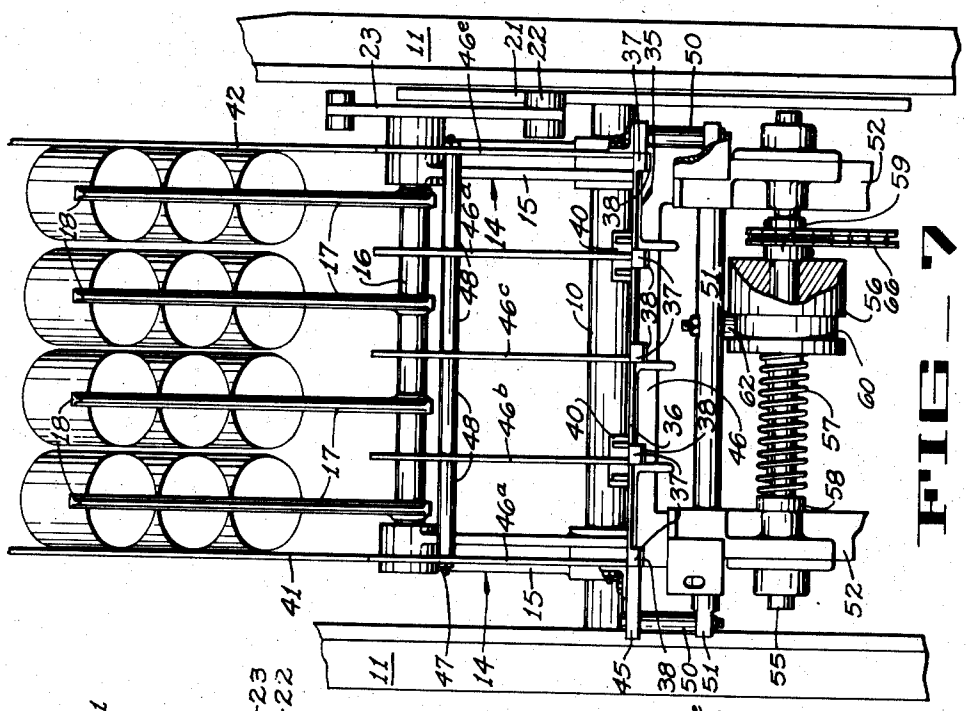


FIG. 7

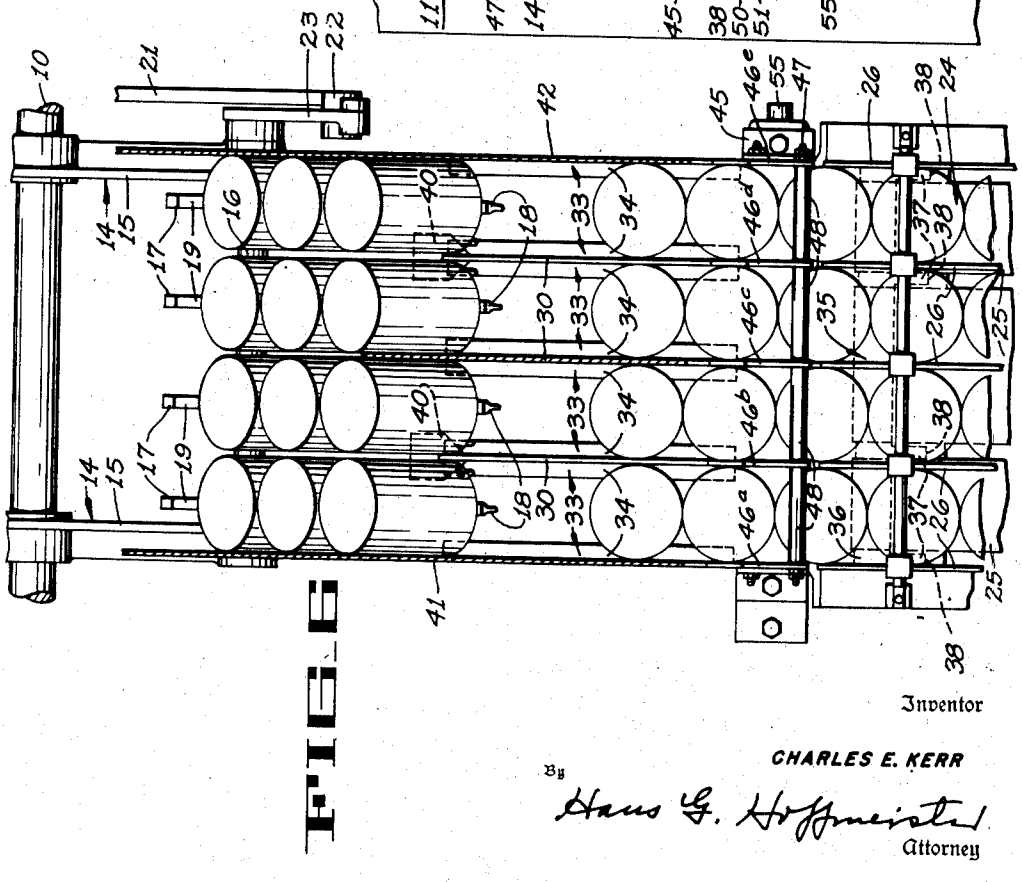


FIG. 6

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UNITED STATES PATENT OFFICE

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SUPPLY CONTROL MECHANISM FOR CONTAINER HANDLING MACHINES

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Application July 5, 1949, Serial No. 103,126

11 Claims. (Cl. 198—25)

1

Present invention relates to container handling machines, such as machines for packing containers into crates, cases and the like. Such machines are usually associated with a multi-lane container supply line and comprise sets of operationally alingned transfer fingers which lift multi-row tiers of containers from centrally apertured stationary ramps, arranged at the end of the container supply line, onto a suitable loading chute. Whenever a predetermined number of such container tiers has been deposited into said loading chute, means are set into motion to push all of said tiers simultaneously out of said chute and into a case or crate that has been slipped over the discharge end thereof. The depth of the individual container tiers, i. e., the number of containers in each of the rows of said tiers depends upon the number of containers that each individual transfer finger may properly carry. With the containers sliding in continuous succession from the supply line onto the receiving ramps containers in excess of the proper number, to be transferred by each transfer finger, may crowd onto said ramps and settle above the ends of the transfer fingers. Such a condition is harmful because containers that are situated only partially above the transfer fingers are caught by the ends of said fingers whenever the transfer mechanism commences operation, and will be thrown backwards into the container supply lines, where they may disorganize the container supply, to say nothing of the possibility that they may be damaged or damage other containers in the process.

It is an object of the invention to eliminate the dangers that result from overcrowding of the container receiving ramps in container handling machines that are operatively associated with a continuously running container supply line.

Another object is to provide means effective to prevent newly arriving containers from reaching the container receiving ramps of a case loading machine, whenever the transfer mechanism of said machine is about to commence operation.

Another object is to provide means automatically effective, upon commencement of operation of the transfer mechanism to move excess containers crowding upon properly filled container receiving ramps, out of reach of the transfer fingers.

An additional object is to provide means, of the type referred to, that are of simple construction, yet positive and dependable in operation.

Furthermore, it is an object of the invention to furnish a mechanism, of the type referred to, which while adapted to positively remove containers crowding upon properly filled container receiving ramps, from the reach of the transfer fingers, will neither crush nor otherwise deform said containers.

2

A further object is to provide a mechanism that will automatically restore excess cans to their previous positions centrally in front of the container receiving ramps, whenever the ends of the container lifting transfer fingers have risen to a height where they can no longer become entangled with newly arriving containers, so that the receiving ramps may, without interruption, be replenished with new containers from the supply line, while the transfer fingers of the machine are still in the process of lifting a previously assembled container tier onto the loading chute of the machine.

These and other objects and advantages of the present invention will become apparent from the accompanying drawings in which:

Figure 1 is a side elevation, partly in section, of a container casing machine supplied from a continuously operating container supply line, and provided with a feed control mechanism in accordance with the present invention.

Figure 2 is a front elevation, partly in section, of the mechanism of the present invention taken along line 2—2 of Figure 1.

Figure 3 is a vertical section taken along line 3—3 of Figure 2.

Figure 4 is a plan view.

Figures 5 and 6 are plan views similar to Figure 4, illustrating sequentially later operational positions of the mechanism.

Figure 7 is a front elevation of the mechanism in the same operational position as represented by Figure 6.

Referring to Figure 1, the case loading machine to which the present invention is applied, by way of example, comprises a horizontal operating shaft 10 that is suitably journaled in the side frames 11 of the machine. Firmly secured to the opposite ends of said shaft are two angularly aligned spiders 14, which may be composed of three arms or spokes 15. Rotatably received within the bored ends of said spokes are three subsidiary shafts 16, and firmly secured to each of said shafts are four transfer levers 17, each composed of a radially directed transfer finger 18 and a retaining thumb 19 extending at right angles thereto. During operation of the machine, when rotation of the main shaft 10 swings the subsidiary shafts 16 in a circular orbit about the center axis of the machine, the angular position of said subsidiary shafts relative to their

own center axis and hence the position of the transfer fingers 18, is determined by a stationary cam 21 secured to one of the side frames 11 of the machine (Figure 7). The edge of said cam is engaged by rollers 22 that are pivoted to bell cranks 23 which, in turn, are firmly secured to the adjacent ends of said subsidiary shafts 16. A four-lane supply line 24 formed by a plurality of conveyor belts 25, moving continuously in clockwise direction, as viewed in Figure 1, and five transversely spaced vertical walls or partitions 26, suitably held above said belts, delivers four rows of containers, one for each of the four transfer fingers mounted upon the subsidiary shafts 16, in upright condition and in continuous procession to the described transfer mechanism. The operation of the casing machine and the conformation of the aforementioned control cam 21 are arranged in such a manner, that whenever the machine is at rest, one of the shafts 16 is positioned in front of the forward end of said four-lane container supply line 24, with the fingers 18 of its transfer levers 17 held in a horizontal position adjacent to and at about the level of the conveyor belts 25 that form the floor of the supply line, each of said fingers being centrally aligned with one of the individual lanes of said line, as may be seen from Figures 1 and 4.

Suitably supported from the machine frame at either side, and intermediately of, the transfer fingers 18 in the last described position and in line with the walls 26 of the four supply lanes are walls 30 and suitably supported from said walls 30, on either side of each of the transfer fingers 18, are pairs of angle bars 33 (Figure 4). The upper horizontal flanges 34 of said angle bars are positioned at about the same level as the conveyor belts 25 with the flanges 34 of each pair arranged to oppose one another, as shown in Figures 2 and 4. Thus, each of said angle bar pairs forms a centrally open stationary continuation of one of the four container supply lanes, upon which the containers arriving on the belts 25 may slide and from which they may readily be lifted by the fingers 18 of said transfer levers, whenever the machine is set into motion. To prevent entanglement of the container rims with the edges of the ramps 34, as the containers arrive upon the belts 25 and are passed over onto said ramps, a special transfer bridge 35 may be interposed between the forward ends of the conveyor belts 25 and the rearwardly directed edges of the ramps 34. Said bridge may have the form of a horizontal plate 36, which is suitably supported from the machine frame and is provided with rearwardly directed tails 37, one for each container lane, that extend laterally of the conveyor belts at the level of their upper surfaces, but have their free ends 38 bent downwardly below said level, as shown in Figure 3. Thus, containers arriving upon the upper surfaces of the belts 25 glide smoothly over the downwardly curved ends of the tails 37, which lift them to the level of the bridge 35, so that they may pass unobstructedly over the rear edge of said bridge, from where succeeding containers will push them onto the ramps 34 without any possibility of entanglement.

With the conveyor belts 25 of the supply line 24 continuously in operation, container after container slides upon the above described container ramps, and the containers arriving first will be pushed forwardly along said ramps by succeeding containers until the foremost strike against the retaining thumbs 19 of the transfer levers 18 and the ramps are filled. At this moment the transfer mechanism of the invention is ready for operation.

The operation of the transfer mechanism may be controlled by a single revolution clutch (not shown) which is arranged to apply the power of a continuously running motor (not shown) to the main shaft 10 of the machine but is normally held out of engagement. An electrical control circuit may be provided which is adapted upon energization to render the clutch operative for a limited period of time, but is normally interrupted by a plurality of open contact switches 40. These switches are located at the inner ends of the container receiving ramps 34 near the retaining thumbs 19 of whatever set of transfer fingers may be stationed in the open center spaces of said ramps, and are adapted to close upon contact with a container.

Whenever all of said switches are closed, indicating that all the container receiving ramps are properly filled, the control circuit is energized and releases the control clutch of the transfer mechanism for limited engagement, which causes the transfer fingers 18 to rise above the ramps 34 and lift the cans positioned thereon between lateral guide members 41 and 42 (Figures 1 and 4) onto a suitable case loading chute 43, with another set of transfer fingers moving into position into the open centers of the container receiving ramps. Thereupon the machine may come to a temporary halt until, or unless, the container receiving ramps have again been filled with the proper number of containers. The transfer mechanism briefly outlined above and the manner in which it is controlled are fully described in my co-pending patent application Serial Number 81,254, filed on March 14, 1949, for Method and Apparatus for Packing Containers to which reference is made for details.

Since some of the container receiving ramps may be filled earlier than others, due to irregularities in the container supply within the individual lanes, newly arriving containers may accumulate before the filled ramps and press against the containers situated thereon, and may in this manner crowd into positions at the entrance ends of said ramps, where they may be caught by the transfer fingers 18 as they rise above the ramps to transfer a container tier onto the loading chute 43. If this happens, they will be thrown backwards into the supply lanes which may disorganize the container supply or damage the containers, as previously pointed out. To avoid any such failures in the operation of the described container casing machine, a transversely extending horizontal board or shelf 45 is slidably supported upon a bridge member 46 of the machine frame, between the transfer bridge 35 and the ramps 34 (Figures 1 and 3) and projecting upwardly from said board are five transversely spaced parallel plates or partitions 46*a*, *b*, *c*, *d* and *e*, one for each of the walls or partitions 26 of the four container supply lanes. Said plates 46 may be of the shape shown in Figure 3, with the upper ends of their outwardly directed edges slanting in the direction of the machine, and they may be held in properly spaced relation by a transverse rod 47, extending through said plates, with spacer bushings 48 provided around the rod between each two adjacent plates 46, as best shown in Figure 2. The slide 45 is firmly mounted upon two lateral posts 50 which, in turn, are rigidly supported from the laterally protruding ends of a horizontally positioned shaft 51 that

is mounted for transverse sliding movement within the piers 52 of the above mentioned bridge 46. A rotary shaft 55 is suitably journaled within said piers 52 a distance below the slidable shaft 51, and a box cam 56 is keyed upon said rotary shaft 55 in such a manner that it is compelled to partake in the rotary motion thereof, but may slide transversely along said shaft. A compression spring 57 coiled about the shaft 55 and interposed between a collar 58, pinned to said shaft near its left end, as viewed in Figure 2, and the left face of the box cam 56, yieldably urges said cam into a rightward position determined by another collar 59 pinned to said shaft near the right end thereof. The guide groove 60 of the box cam 56 is engaged by a roller 62 that is pivoted to the previously described slidable shaft 51. Said guide groove 60 has a single rightwardly directed rise 63 of short duration, as shown in Fig. 2. The shaft 55 is preferably operated from the same source of power that drives the main shaft 10 of the transfer mechanism, and for this purpose a sprocket 65 is firmly mounted upon the shaft 55 and around said sprocket is trained a sprocket chain 66 that operatively connects said sprocket with any of the other rotary shafts of the machine, such as the shaft 67 shown in said Figure 2.

In the particular embodiment of the invention, wherein the box cam 56 has only a single rise 63, as previously pointed out, and wherein the transfer mechanism comprises three angularly equispaced sets of transfer levers, as is apparent from Figure 1, and thus requires only one-third of a revolution to lift a set of transfer fingers from the receiving ramps 34 to the loading chute 43, the operation of the cam shaft 55 must be so related to the operation of the main shaft that it makes one complete revolution every time the main shaft makes one-third of a revolution.

When the container casing machine is at a standstill, the feed control mechanism of my invention is likewise at a standstill, and is in the position illustrated in Figure 2, wherein the cam follower roller 62 within the guide groove 60 of the box cam 56 is located directly in front of the single rise 63 of said guide groove, with the slidable shaft 51 and the slide 45, supported thereon, in their leftmost positions. In this position the partitions 46 carried by said slide are longitudinally aligned with the walls 26 that define the four lanes of the container supply line and also with the wall or partitions 30 which separate the container receiving ramps 34. Thus, containers arriving upon the belts 25 of the container supply line 24 may slide freely over the transfer bridge 35 and the slide 45 onto the container receiving ramps 34; and after the ramps have been filled to capacity, newly arriving containers will press against and crowd the containers on the ramps, and may partially settle above the ends of the transfer fingers 18, as shown at 70 in Figure 4.

When all the container receiving ramps are filled to capacity, the transfer mechanism of the container casing machine is conditioned for operation, as previously explained, and actual operation may be initiated automatically or manually by an attendant, depending upon the construction of the particular container casing machine to which the feed control mechanism of my invention is applied. As soon as the main shaft 10 begins to turn to raise a set of transfer fingers 18 above the container receiving ramps, the drive shaft 55 of the box cam 56 will also begin to turn, since its operation is controlled by the same clutch that controls the transfer shaft 10, as

pointed out hereinbefore. Thus, the very instant the transfer fingers begin to move, the rise 63 in the groove of the box cam 56 shifts the shaft 51 and hence the shelf 45 to the right, as viewed in Figure 2, which places the partitions 46*a*, *b*, *c*, and *d* into the centers of the four container supply lanes, as shown in Figure 5, so that said lanes are effectively blocked. This lateral movement of the partitions 46*a*, *b*, *c*, *d* and *e* interferes in no way with the containers that are properly situated upon, and are about to be lifted from, the receiving ramps 34 by the rising transfer fingers 18 but the foremost ones of the directly succeeding containers, which may be crowding upon the outer ends of the receiving ramps, are shifted laterally into the spaces between the forward ends of the walls 26 of the container supply lanes and the rearward ends of the ramp partitions 30, as shown in Figure 5. With said excess containers thus positioned the transfer fingers 18 may freely rise in the spaces between the diverging walls thereof, so that there is no danger that said transfer fingers may throw them backwards into the container supply line.

As previously indicated, the rise 63 of the guide groove 62 is of limited angular width. Thus, as soon as the ends of the transfer fingers 18 have risen above the level of the approaching cans on the supply line, the partitions 46 are shifted back to their original positions in alignment with the supply lane walls 26 and the ramp partitions 30, as shown in Figures 6 and 7. As a result thereof the container supply lanes are unblocked and the laterally displaced containers are returned to properly centered positions in front of the container receiving ramps and ahead of the container processions that press forward in said supply lanes. These container processions push said foremost containers fully onto said receiving ramps and fill said ramps with a new set of containers in the same manner as previously described. By the time the transfer mechanism of the container casing machine has completed its current operational phase, with the first mentioned set of transfer fingers placed behind the loading chute 43 and the second set of transfer fingers in position within the open centers of the container receiving ramps, the cam drive shaft 56 has made one complete revolution which places the roller 62 again at the foot of the rise 63, in the cam groove 59, so that both the casing machine and the container supply control mechanism of my invention are in position for commencement of another operational cycle.

In the event that a belatedly arriving container should be caught between one of the shifting partitions 46 and an adjacent wall or partition 26 of the container supply line, the box cam 56 may yield to the left against the urgency of the compression spring 57 as the roller 62 climbs the rise of the guide groove 60. Thus, the box cam 56 may continue to participate in the rotation of its drive shaft 55, without being effective to shift the partitions 46 farther to the right than the intercepted container will permit. Hence, there is no danger that cans caught in the described manner, between the reciprocating partitions 46 and the walls 26 of the supply lanes, will be crushed; and as the partitions 46 return to their original positions in alignment with the walls of the container supply lanes, the intercepted container is released to be pushed forwardly onto the container receiving ramp by the newly arriving containers so that the container cas-

ing machine may continue its operation uninterruptedly in spite of an occurrence of the type described above.

Thus, the simple mechanism of the invention, as illustrated and described, dependably prevents failures in the supply of container handling machines that are due to overcrowding of the container receiving ramps, without risk to the machine or to the containers which it handles; and its operation may easily be synchronized with the operation of the container handling machine.

While I have described my invention with the aid of a particular embodiment thereof, it will be understood that I do not wish to be limited to the particular constructional details shown and described, which may be departed from without departing from the spirit and scope of my invention. Also my invention is not limited to container casing machines, but may be usefully employed in all cases where a cyclically operating container handling machine is supplied from a continuously operating container supply line.

I claim:

1. In a container handling machine supplied from a container supply lane, a supply control mechanism comprising a container receiving ramp arranged at the discharge end of said container supply lane, means for feeding round containers in upright position along said lane, means for removing the containers accumulating on said ramp, and means operable coincident with said container removing means for shifting containers stationed at the entrance end of said ramp laterally out of reach of said container removing means.

2. In a cyclically operating container handling machine supplied from a continually operating laterally confined container supply lane, a supply control mechanism comprising a stationary container receiving ramp arranged at the discharge end of said container supply lane, cyclically operable means for removing the containers accumulating on said ramp, and means operable coincident with said container removing means for momentarily shifting containers stationed at the entrance end of said ramp laterally of the direction of movement of said containers onto said ramp out of reach of said container removing means while at the same time blocking said container supply lane.

3. In a cyclically operating container handling machine supplied from a continually operating laterally confined container supply lane, a supply control mechanism comprising a stationary container receiving ramp arranged at the discharge end of said container supply lane, cyclically operable means mounted centrally of a line of containers in said lane for lifting containers from said ramp, and means operable coincident with said container lifting means for shifting containers stationed at the entrance end of said ramp laterally out of reach of said container lifting means, while at the same time blocking said container supply lane.

4. A supply control mechanism for container handling machines, comprising a container supply lane having a pair of parallel side walls, a stationary container receiving ramp disposed at the discharge end of said lane, intermittently operable means for lifting containers from said ramp, a pair of parallel plates arranged at the end of said lane in alignment with the side walls thereof, and means operable coincident with said container lifting means for reciprocating said plates in unison between their above defined position and a laterally displaced position so as to temporarily shift containers stationed at the entrance end of said ramp out of reach of said container lifting means, while at the same time blocking said container supply lane.

5. A supply control mechanism for container handling machines, comprising a container supply lane having a pair of parallel side walls, a stationary container receiving ramp disposed at the discharge end of said lane and having a central opening, a transfer finger disposed in the central opening of said ramp, means operable to lift said finger above said ramp, a pair of parallel plates arranged at the end of said lane in alignment with the side walls thereof, and means operable coincident with said transfer finger for temporarily shifting said plates in unison laterally out of their above defined position over a distance adapted to place one of said plates centrally in front of said container supply lane.

6. A supply control mechanism for container handling machines, comprising a continuously operating container supply lane having a pair of parallel side walls, a centrally open container-receiving ramp disposed at the discharge end of said lane, a transfer finger cyclically operable to rise through the central opening of said ramp, a pair of parallel plates arranged at the end of said container supply lane in alignment with the side walls thereof, and yieldable means operable coincident with said transfer finger for shifting said plates temporarily from the above defined position to a laterally displaced position.

7. In a container handling machine supplied from a multi-lane container supply line, and having intermittently operating means for accepting a predetermined number of containers from each of the lanes of said supply line; a supply control mechanism comprising a plurality of stationary ramps provided at the discharge ends of said supply lanes, a plate mounted for transverse movement between the discharge ends of said lanes and said ramps, a number of elements supported from said plate substantially in alignment with the walls of said container supply lanes, means comprising a box cam having a guide groove with a laterally directed rise for reciprocating said plate in transverse direction over a distance adapted to place said elements into the paths of said supply lanes momentarily to block the passage of containers therethrough, and means operable in timed relation with said container accepting means for rotating said box cam.

8. In a container handling machine supplied from a multi-lane container supply line, a supply control mechanism comprising a plurality of centrally apertured ramps provided at the discharge ends of the lanes of said container supply line, operationally aligned transfer fingers, cyclically operable means for raising said transfer fingers through the central apertures of said ramps to lift a predetermined number of containers from said ramps, a plate mounted for transverse movement between said ramps and the ends of said supply lanes, a number of vertical partitions supported from said plate in alignment with the side walls of said container supply lanes, and means operable coincident with said transfer fingers for reciprocating said plate in transverse direction over a distance adapted to place said partitions into the paths of said supply lanes.

9. In a cyclically operating container handling

machine supplied from a continuously operating multi-lane container supply line, a supply control mechanism comprising a plurality of centrally apertured ramps provided at the discharge ends of the lanes of said container supply line, operationally aligned transfer fingers disposed within the apertures of said ramps, cyclically operable means for raising said transfer fingers above said ramps to lift a predetermined number of containers from each of said ramps, a slide mounted for transverse movement between said ramps and the ends of said supply lanes, a number of vertical partitions supported from said slide in alignment with the side walls of the container supply lanes, a transversely slidable rod rigidly supporting said slide, a rotary shaft extending parallel to said rod, a box cam keyed upon said rotary shaft and having a guide groove, a cam follower roller pivoted to said rod and arranged to engage said guide groove, said guide groove having a laterally directed rise adapted upon rotation of said shaft to shift said slidable rod with said slide in transverse direction over a distance adapted to place said partitions into the paths of said supply lanes, and means operable coincident with said transfer fingers for rotating said rotary shaft.

10. Arrangement according to claim 9 wherein said box cam is adapted to slide axially along said rotary shaft, and including stop means to positively limit movement of said box cam in the direction of the rise of its guide groove, and

spring means arranged to yieldably urge said box cam into the position determined by said stop means.

11. In a container handling machine supplied from a continuously operating laterally confined container supply lane, and having intermittently operating means for accepting a predetermined number of containers from said supply lane, a supply control mechanism comprising a stationary ramp provided at the discharge end of said supply lane, a laterally confining element mounted for transverse movement between the discharge end of said lane and said ramp, means normally maintaining said confining element in alignment with a side of said supply lane, and means momentarily operable coincident with each intermittent operation of said container accepting means for reciprocating said lateral confining element in transverse direction over a distance adapted to place said lateral confining element in the path of said supply lane momentarily to block said supply lane.

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