CONVEYING AND UNLOADING APPARATUS

Fig. 1

Fig. 8

Fig. 9
This invention relates to conveyor mechanisms and particularly to conveyor mechanisms of the type adapted to unload bottles or similar articles (hereinafter referred to as bottles) from cases in which they are stored in a regular aligned arrangement.

The invention is particularly adapted for unloading empty bottles from a "full-depth" case, that is, a case in which the side walls extend upwardly for at least the height of the bottles.

In a case of this type the bottles are arranged in longitudinal rows, each consisting of from six to eight bottles, and the number of such rows in a case is usually three or four. For simplicity, the invention will be described as applied to a mechanism particularly adapted to unload bottles from cases having three rows.

Heretofore it has commonly been the practice to unload such cases by disposing the case containing the empty bottles beneath a mechanism provided with a plurality of gripping members, there being one such member for each bottle in the case. The bottles are lifted bodily from the case and disposed on a conveyor, while the empty case is carried away, usually automatically.

Such mechanism requires substantially perfect alignment between the bottles and the gripping members and sometimes fails to remove one or more of the bottles. These mechanisms are relatively complicated in construction and erratic in operation.

According to the present invention, cases containing the bottles to be removed are supplied to a substantially horizontal conveyor at spaced intervals. Suitable mechanism is provided for timing the entrance of the case to the conveyor, an arrangement is provided for inverting the cases and, when the cases are inverted, a selected row or rows of inverted bottles is removed and the empty case is re-inverted to its normal position and removed from the mechanism by a suitable conveyor.

In the meantime, the rows of bottles removed from the case are grasped at their sides with their neck ends inverted, by a suitable rotary conveyor having its periphery below the inverted case, and are carried around by this wheel to a lower position almost diametrically opposite the position from which they are received from the case, at which lower point they are released from the wheel with their bottoms resting on a horizontal conveyor by which they are carried away from the uncasing mechanism.

The invention also contemplates the provision of an arrangement for stopping the mechanism in the event bottles become jammed in the inverted case as they enter the conveyor wheel and as they leave that wheel.

Another feature of the invention is the provision of a simple structure for timing the admission of the full cases to the lower horizontal portion of the main conveyor before they are inverted so as to ensure they are properly spaced with respect to that conveyor which moves the cases through the unloading mechanism.

Still another object is to provide means adjacent the discharge end of the conveyor wheels for retarding the discharge of bottles from those wheels.

Other objects and advantages of the invention will be readily apparent from the following description and accompanying drawings wherein:

Fig. 1 is a schematic representation showing the path of movement of cases and bottles through a machine embodying the invention.

Fig. 2 is a side elevation of the machine.

Fig. 3 is a fragmentary top plan view of the machine of Fig. 2.

Fig. 4 is a sectional view on an enlarged scale through the center of the inner row transfer wheel or conveyor.

Fig. 5 is a sectional view on an enlarged scale through the transfer wheel or conveyor for the outer rows of bottles.

Fig. 6 is a side elevation of one of the transfer wheels showing a stationary plate associated therewith.

Fig. 7 is a fragmentary view partly in section on an enlarged scale showing one of the pressure members or shoes disposed between the flexible rim or flange of a rotary transfer wheel and its adjacent stationary plate.

In the drawings, and referring to Fig. 1, a case 10 containing bottles to be removed therefrom, enters the mechanism at its lower side with the bottles in an upright position. The loaded case is carried upward by suitable mechanism, to be hereafter described, and is finally inverted so that the bottles tend to fall from it by gravity. Such a case contains bottles or similar articles disposed in rows and there may be either three or four rows in a case. When the case is inverted, the arrangement herein described regulates the discharge of separate rows from the case to suitable rotary conveyor wheels 12 and 14 which grasp the bottles by their sides as they rotate from the case, and carry them around to a lower position at which they are released from the wheels with their necks up and their bottoms resting on a suitable conveyor 16 which carries them away from the mechanism.

In the meantime, the empty cases are re-inverted and are likewise carried away from the mechanism in the direction of the arrow (Fig. 1) by a suitable conveyor 62 as indicated schematically in Fig. 2.

Referring to Figs. 2 and 3, the mechanism comprises a continuous conveyor belt 18 driven from a motor M by suitable connections (not shown), in a clockwise direction as indicated by the arrow in Fig. 2. This belt comprises a pair of parallel spaced chains 20 and 22, joined at spaced intervals by cross-bars 24. The chains are spaced from each other a distance slightly greater than the width of a case while the cross-bars, hereafter sometimes referred to as pusher bars, are spaced from each other a distance slightly greater than the length of a case. The conveyor belt assembly is driven near the infed end of the mechanism by sprocket wheels 26 which have teeth engaging the link belt portions 20 and 22 of the conveyor.

A platform having a generally horizontal lower portion 28 and a curved portion 30 extending upwardly from the aforesaid horizontal portion 28, is disposed outside and around a portion of the movable conveyor. The curved portion 30 of this platform is hinged as at 32 to the lower portion 28 and serves as a guide for the bottoms of the loaded cases 10 as they move to their inverted position.

This platform is made preferably of several parallel straps 34 so that the cases will glide easily thereon. The upper end of the curved portion 30 is urged toward the center of the mechanism by springs 36, only one of
which is shown, connected to the curved portion and the frame portion 38 of the mechanism.

The space between the side chains 20 and 22 and each pair of pusher bars 24 is large enough to receive a case with the case being urged forward by the force of the pusher bar behind it. As the case leaves the platform at its upper curved end, it is inverted and rests on means which maintain the bottles in the case as the latter passes along and from the curved portion 30 of the platform. This means, which comprises continuous belts 46 and 48, also serves to convey inverted bottles from selected rows in the case to the respective transfer or conveyor wheels 12 and 14. For a three row case, a single belt 46 is provided to convey bottles from the center row to the wheel 12, while two belts 48 are provided to convey bottles from the outside rows to the conveyor wheel assembly 14. These belts are parallel for a considerable portion of their length and extend around a pulley 50 disposed near the beginning of the curved portion 30 of the platform. The belts run parallel to the inverted case a short distance and then belt 46 descends diagonally to and around a pulley 52 suitably supported between the flanges of the inner row transfer or conveyor wheel 12, while the belts 48 continue parallel to the case a longer distance to a point where they too descend diagonally to and around small pulleys 54 supported between parallel flanges of the outer rows transfer or conveyor wheel assembly 14. Pulley 50 is driven from motor M by suitable connections (not shown). This pulley drives belts 46 and 48 in a clockwise direction and their speed is synchronized with that of the main conveyor 18. Between the pulley 50 and the beginning of the upper horizontal portion of the mechanism, the belts run over a series of parallel rollers 55 which tend to maintain the bottles in the case until the case is fully inverted. As the inverted case moves along the horizontal portions of the belts the three rows of bottles are maintained in the case with their necks down and supported by the belts. This condition is maintained until the inner row reaches the sloping portion of belt 46. Thereupon the bottles in this row are carried neck down to the wheel 12 where the bottles are grasped by their sides by the two opposite flanges of the wheel as will be hereafter described. The case 10 moves onward along the conveyor with the two outer rows maintained in the case, with their necks resting on the horizontal portions of belts 48 until the case reaches the end of that portion whereupon the two outer rows are carried with their necks down by the downwardly sloping portion of belts 48 to the conveyor wheel assembly 14, to be hereafter described.

The wheels 12 and 14 are driven synchronously and clockwise by suitable means which may be the motor M. These wheels carry the bottles around from their inverted position to a lower position in which they are reinserted, released from the wheels and deposited on a conveyor 16 which carries them away from the machine. In the meantime the emptied case is carried on past the wheels by the main conveyor and is guided by a platform 60 to a position in which it drops from the main conveyor in a reinserted position onto a conveyor 62 which carries it away from the platform.

Referring to Fig. 4, the wheel 12 is shown as comprising a pair of opposed discs 62 and 64 rotatably mounted on a drive shaft 66 which is in turn supported in stationary hubs 68. These hubs each support a stationary plate 70 and 72, the plate 70 being disposed outside and closely adjacent disc 62 and plate 72 being disposed outside and closely adjacent disc 64. A flexible flange 74 is attached to the rim of each disc and extends outwardly from the periphery of the disc a considerable distance. This flange is made preferably of Neoprene or some other synthetic material not readily affected by oil. As will be noted in Fig. 4, this flange is dish-shaped and flares inwardly toward the center of the wheel so that its outer edge is spaced some distance from the stationary plate adjacent. The outer ends of these flanges are urged toward the center of the wheel by separate springs 76 interposed at spaced intervals around a portion of the periphery of the stationary plates 70 and 72. One end of each spring bears against a plate while the other end bears against the inner surface of a dish-shaped pressure shoe member 78 having a smooth outer surface bearing directly against the flange 74. As the flange 74 rotates while the shoes 78 are stationary, it is desirable to apply a suitable lubricant to the outer surface of the flange. Each spring 76 is supported from the adjacent plate by a flexible arm 80 extending diagonally from the member to the plate and attached to the latter by suitable fastening means such as the screw 82. A flexible cable 84 connects the member 78 centrally to the plate. This cable, which extends through the plate and is held at its inner end by a stop member 86, limits the inward travel of the pressure shoe member. It will be noted from Fig. 6 that the spring assemblies just described extend only a portion of the way around the periphery of the stationary plates, that is, from a point about vertically above the hub 68 to a point not quite vertically below the hub. It will also be noted that a substantial portion of the plate beyond the two points just mentioned is cut away so that no external force is exerted against the flange 74 at that portion. Thus, when an inverted bottle is carried between flexible flanges 74 attached to the wheels 12 and 64, the sides of that bottle are grasped between adjacent flanges at the spring-pressed portions thereof and are rotated around in a clockwise direction by the wheel until the bottle is carried beyond the portions of plates 70 and 72 carrying springs 76. Thereupon, the bottle, which has been reinserted, is released from the wheel and carried away by conveyor 16. Means comprising a reverse-threaded bolt 88 extends through adjacent hubs 68 to permit adjustment of the distance between adjacent disc and plate assemblies and thus allow the wheel to carry bottles of varying width. The structure shown in Fig. 5 for the wheel assembly 14 is basically similar to that just described for wheel assembly 12, except provision is made for two separate parallel wheel assemblies coaxially mounted on a single shaft and spaced from each other a distance equal to that of the inner row of bottles. In this example a flexible flange 74 is shown for each assembly, the cooperating disc 90 extending out to the periphery of the flexible flange on the opposite disc and the disc 90 having a resilient surface 92 at its periphery to cooperate with the spring-pressed flange of the adjacent wheel. It will be obvious from the foregoing description that the combinations of discs used in Fig. 4 for removing one row of bottles could be used in place of the combination described for wheel 12 and vice-versa.

It is desirable to keep a few bottles in the discharge end of the conveyor wheels to stabilize the following bottles as they approach the point of discharge. To this end I provide the arrangement shown in Figs. 8 and 9 in which the bottles being discharged from the wheel, the latter being indicated by the flexible flange 74, are releasably clamped between a fixed plate 94 disposed above the conveyor belt 16 and a plate 96 mounted on a flat spring 98, the plate 96 extending between the flange 74 and the bottles, and the other end of the spring 98 being attached to the adjacent fixed plate such as the plate 70. Screw means 100 is provided for adjusting the tension on spring 98. Occasionally a bottle may become jammed as they leave the inverted case. Jamming may also occur as they descend with the conveyor wheels because a bottle may become tilted or otherwise misaligned in the wheel. It is necessary, therefore, that a safety mechanism be provided for stopping the drive motor when such a jam occurs.

I provide a plate 102 (Fig. 3) adjacent and beneath the case at the point of departure of the inner row of bottles from the case. This plate lies between the horizontal portions of conveyor belts 48 and is an extension of...
a plate 104 which is similarly disposed adjacent the point of departure of the bottles in the two outer rows from the case. These plates, which are rigidly united, are supported by a pair of upwardly projecting leaf springs 106 which are attached at their lower ends to a flexible support bar 108. A pair of similar leaf springs 110 depend from bar 108 and are attached to a transversely movable horizontal rod 112. This rod carries a curved shoe 114 at each end, which shoe is disposed adjacent the lower portion of a conveyor wheel in a position to be contacted by any misaligned bottle in the wheel. A flat spring member 113 is attached at its upper end to plate 104 and at its lower end to rod 112. Its central portion is arranged to contact and maintain closed a switch 116. Any time the plates 102 and 104 or rod 112 are moved to the right (Fig. 2) by a misaligned bottle, the central portion of spring 113 will move away from the switch 116 whereupon the latter will open to break a circuit (not shown) to the drive motor M.

Cases containing bottles to be unloaded are fed into the main conveyor 18 in timed relation from an infeed conveyor by the following arrangement: A continuous conveyor 118 driven synchronously with the main conveyor 18 by any suitable means, is provided. This infeed conveyor has cross-bars 120 joining two parallel roller chains, one of which chains is at 122. The cross-bars 120 are spaced apart the same distance as those on the main conveyor. Each cross-bar pushes a loaded case ahead of it along a stationary platform 123. The frame of conveyor 118 is mounted about a pivot 124 supported on an upright 126. The infeed conveyor is unbalanced about this pivot so that its infeed end 128 tends normally to drop below the horizontal. It is maintained horizontal by a stop member 129 and a spring member 130 which tends to partially offset this unbalance. One end of spring 130 is attached to the frame portion 132 and the other end is connected to the conveyor frame at 134. A stop or barrier member 136 is attached to and movable with the infeed end 128 of the conveyor 118. When the conveyor is in its horizontal position as shown in full lines in Fig. 2, cases may pass freely from an auxiliary conveyor 138 directly onto the infeed conveyor 118 where they are picked up by the pusher bars 120 and carried onto the main conveyor 18.

In order to time the entrance of cases onto the infeed conveyor and to space them properly, I provide means for tilting the infeed end 128 of this conveyor upwardly at predetermined intervals so that the stop member 136 is interposed in the path of a case coming from the auxiliary conveyor at 134. A stop or barrier member 136 is attached to and movable with the infeed end 128 of the conveyor 118. The conveyor is so tilted by the contact of the pusher bars 120 of the infeed conveyor with a cam-like member 140 as these bars pass under the frame of the conveyor, on their way to the infeed end 128. The cam-like member 140, which may take the shape shown in Fig. 2, preferably comprises a hardened steel plate. If the pusher bars 120 are rotatably mounted they may contact the plate directly. However I prefer to make the bars non-rotatable and in this event it is desirable that a hardened roller claim 142 be disposed around the periphery of the cam plate to reduce wear. The time at which the rise occurs, the duration of the rise and the rate of rise and fall can be varied depending on the position and shape of the cam-like member.

Since the position and motion of the pusher bars on the infeed conveyor is such as to assure that the cases always in proper relation to each other, a case which has been properly timed onto the infeed conveyor by the cam and stop member arrangement will automatically be timed correctly for the main conveyor.

It is believed that the operation of the mechanism is readily apparent from the accompanying drawings.

While only one embodiment of the invention has been shown and described it is apparent that the invention is not so limited and that other forms might be adopted within the scope of the following claims.

I claim:

1. Means for removing bottles and similar articles from a case containing separate rows of such articles in a uniform aligned pattern, said means comprising, a continuous movable main conveyor having two horizontal portions spaced one above the other, the lower horizontal portion being adapted to receive and move the loaded case in its normal position and the upper horizontal portion being adapted to move the loaded case in an inverted position, means for driving said conveyor, a stationary case supporting and guiding platform extending around and substantially parallel to but spaced from said conveyor, said platform being of less length than the conveyor and adapted to support on its horizontal portions the cases moved by the conveyor, said conveyor having a portion adapted to engage an end of the case and move it along said platform, said arrangement being adapted to invert said case to permit bottles contained therein to drop by gravity from the case, movable support means for controlling the release of bottles from the inverted case in predetermined sequence, rotatable conveyor means for receiving the released bottles in an inverted position from the release-controlling means and moving them from an inverted to a non-inverted position and for thereafter releasing said bottles with their bottom ends resting on a substantially horizontal conveyor, and means for directing the emptied cases to another conveyor by which they are removed from the mechanism.

2. Structure according to claim 1 in which the continuous main conveyor comprises two flexible members disposed parallel to but spaced from each other in the same horizontal plane a distance slightly greater than the width of a case, and a plurality of transverse members connected between said flexible members, said transverse members being spaced from each other a distance slightly greater than the length of a case to be carried therebetween.

3. Structure according to claim 1 in which the conveyor means for moving bottles from their inverted to their non-inverted position comprises separate rotatably driven conveyors having parallel horizontally-aligned axes, said conveyors being disposed between the upper and lower horizontal portions of the case conveyor.

4. Structure according to claim 3 in which a separate movable support means is provided to carry inverted bottles from the case to each of said rotatable conveyors.

5. Structure according to claim 3 in which means are associated and disposed adjacent the upper horizontal portion of the case conveyor near the point of discharge of bottles from the case for stepping said conveyor in the event a bottle becomes jammed as it falls from the case.

6. Structure according to claim 3 in which movable means is disposed adjacent the lower end of each rotatable conveyor for stopping the main conveyor to the event a bottle becomes jammed or misaligned in the conveyor during its passage to the lower portion thereof.

7. Structure according to claim 3 in which the rotatable conveyors each comprise a pair of discs attached to and rotatable with a shaft disposed at the center of the discs, said discs being adjustable spaced from each other, a flexible flange member attached to the inner surface of at least one of said discs adjacent the periphery of the disc, said flange member extending outwardly beyond the periphery of the disc to which it is attached, a stationary plate having a generally circular configuration disposed outside and spaced slightly from each disc, each of said plates having a cut-away portion adjacent its lower end, and resilient means disposed at spaced intervals around the curved peripheral portion of the stationary plate adjacent a disc having a flexible flange member comprising a plurality of spaced pressure-producing shoe members each having a surface bearing.
against the adjacent surface of said rotatable flexible member whereby said flexible member is urged toward an adjacent disc to grasp an inverted bottle therebetween and carry it downwardly to the cut-away portion of said stationary plates.

8. Structure according to claim 7 in which separate resilient means are attached to one of said plates adjacent the lower part of said cut-away portion to retard the discharge of bottles from said conveyor wheel.

9. Structure according to claim 1 in which the portion of the platform for guiding the case from its lower horizontal position to its upper inverted position comprises a curved portion hingedly attached to the lower horizontal portion of said platform and in which resilient means is provided attached to said curved portion for urging said portion against the bottom of said case.

10. Structure according to claim 1 in which a portion of the platform adjacent the lower horizontal portion of the main conveyor comprises a separate continuous infeed auxiliary conveyor.

11. Structure according to claim 10 in which said auxiliary conveyor is unbalanced so that its infeed end normally tends to drop below a horizontal plane, and resilient means tending to move said unbalanced end upwardly to the horizontal plane.

12. Structure according to claim 11 in which means is provided adjacent the infeed end of the auxiliary conveyor for controlling the admission of cases to said conveyor.

13. Structure according to claim 12 in which said admission controlling means includes a member having a cam-like contour, said member being disposed adjacent and beneath the infeed end of said auxiliary conveyor.

14. Structure according to claim 13 in which the cam-like member is surrounded by a continuous roller chain.

15. Structure according to claim 14 in which the auxiliary conveyor comprises two horizontally-spaced parallel flexible continuous members, transverse members joining said flexible members at spaced intervals, said transverse members being spaced apart a distance equal to that of like members on the main conveyor, a stop member operated by said cam-like member, said transverse members contacting the upper surface of said cam-like member at periodic intervals in their passage toward the infeed end of said auxiliary conveyor whereby to deflect the unbalanced end of said auxiliary conveyor together with said stop member, upwardly and prevent admission of a case to said auxiliary conveyor at periodic intervals.

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