Nov. 1, 1966 S. P. SKOLI ETAL 3,282,398

LAYDOWN UNSTACKER

Filed June 23, 1964 3 Sheets-Sheet 1

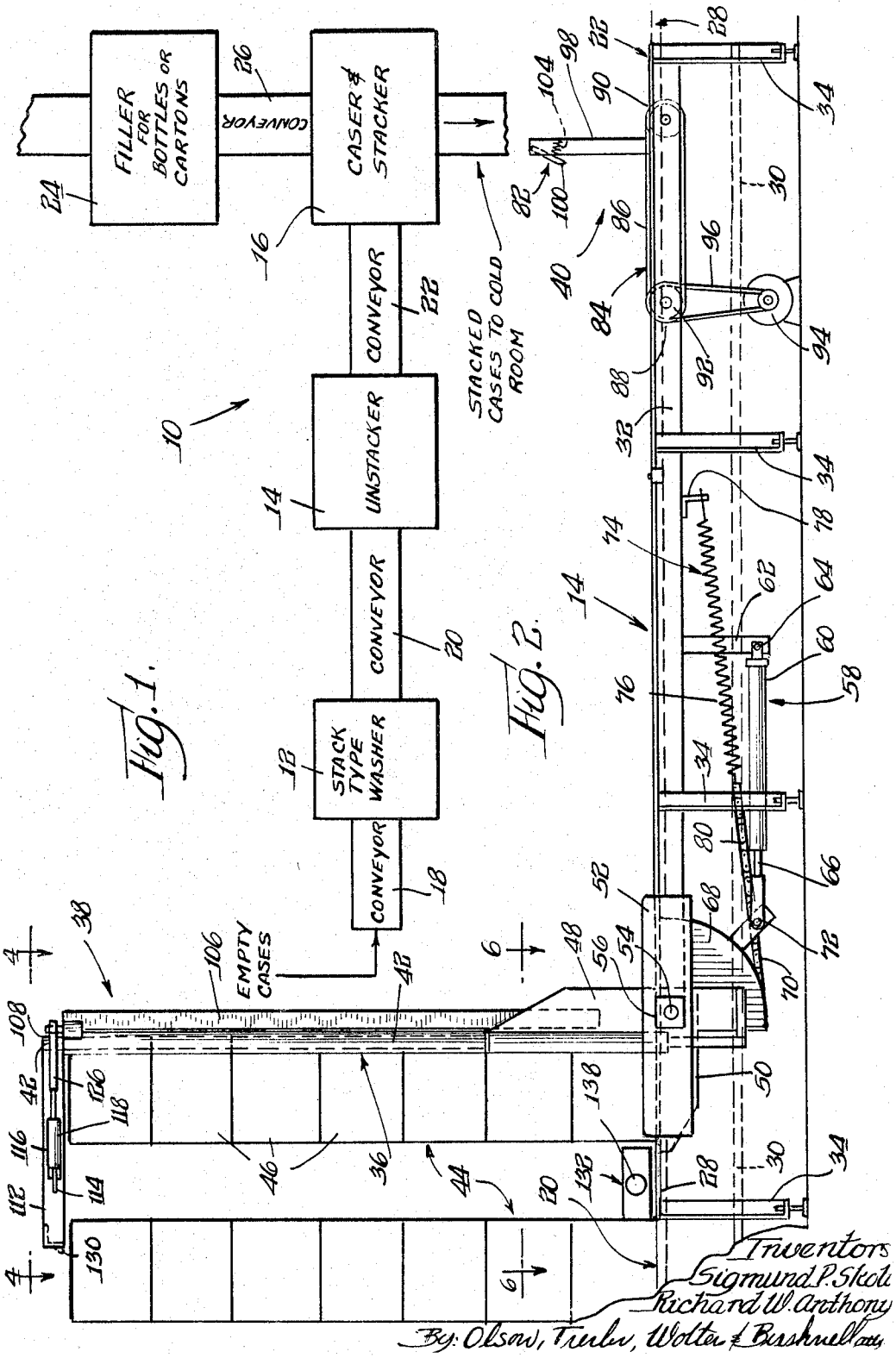


Fig. 1.

Fig. 2.

Inventors
Sigmund P. Skoli
Richard W. Anthony
By: Olson, Trexler, Wolter & Bushnell

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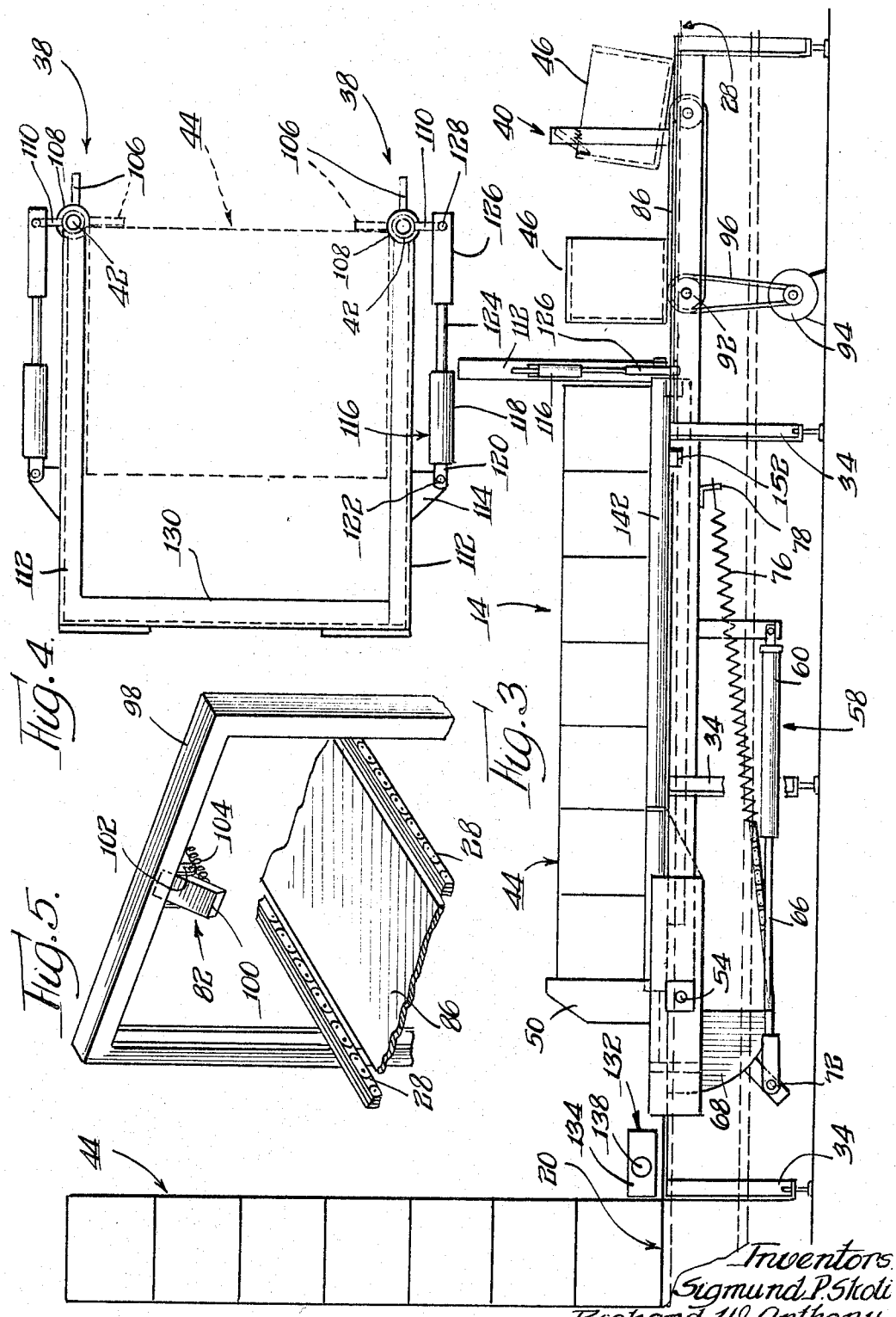


Fig. 4.

Fig. 5.

Fig. 3.

Inventors
Sigmund P. Skoli
Richard W. Anthony
By: Olson, Trexler, Wolters & Bushnell attys

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Fig. 6.

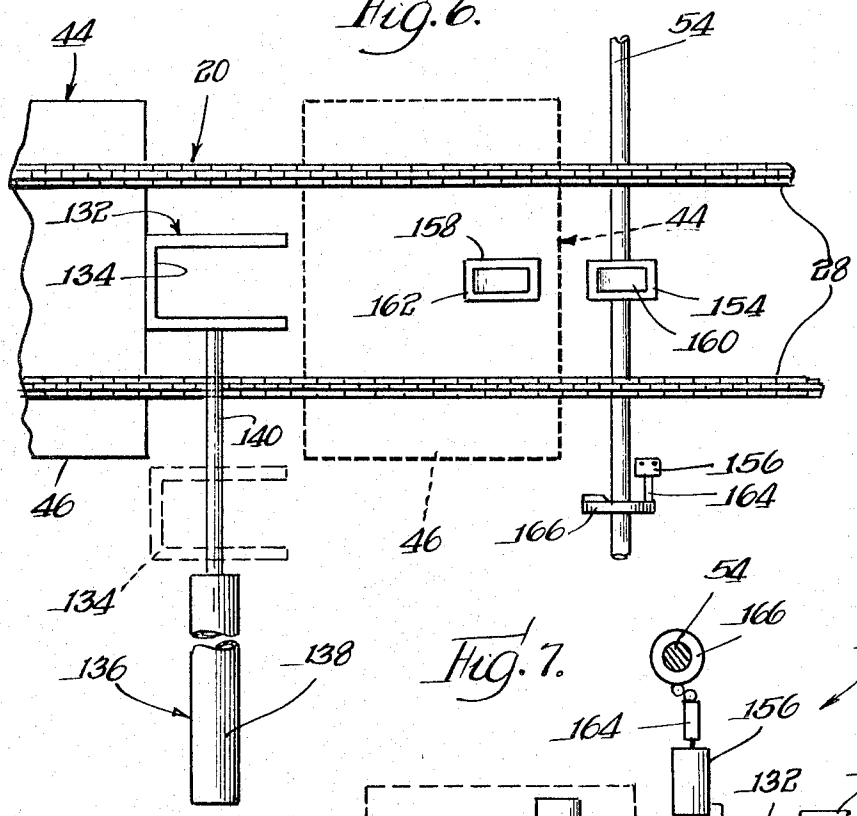
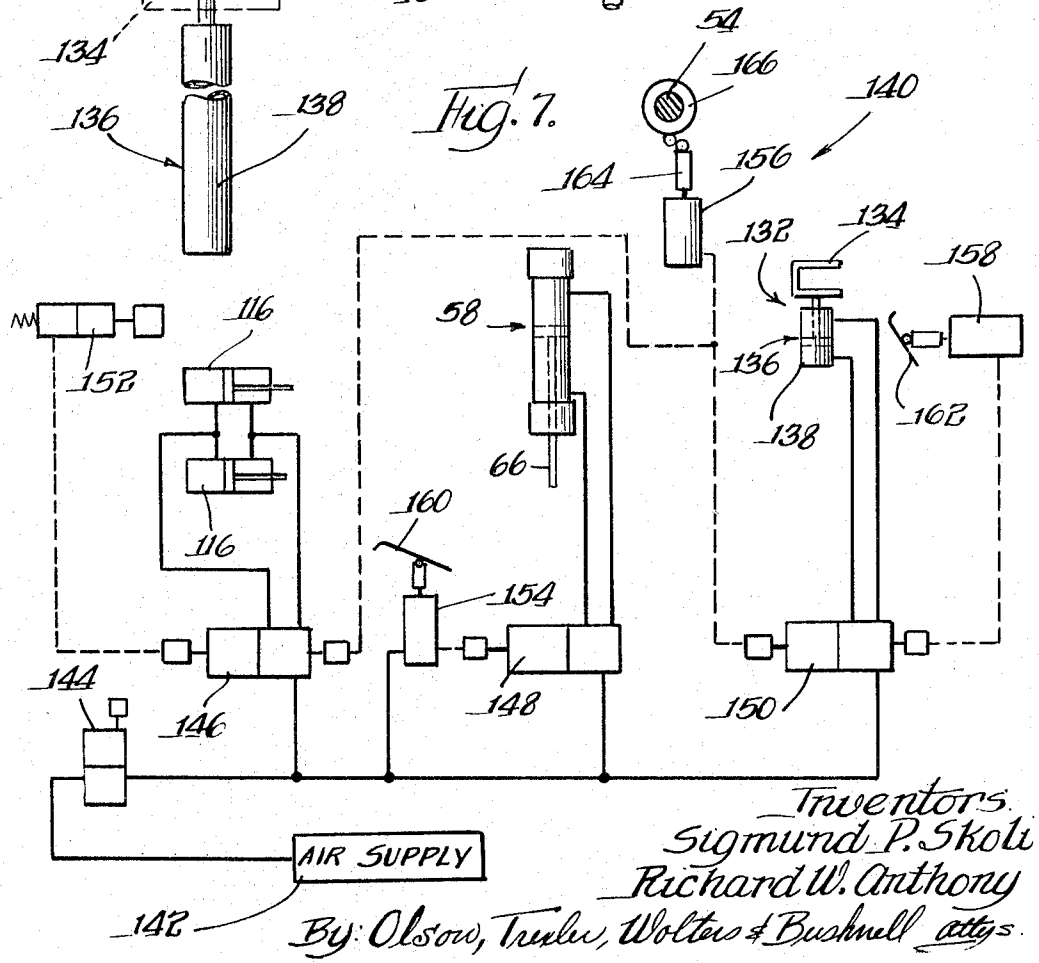


Fig. 7.



Inventors.
Sigmund P. Skoli
Richard W. Anthony
By: Olson, Trexler, Wolters & Bushnell attys.

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LAYDOWN UNSTACKER

Sigmund P. Skoli, Elmwood Park, and Richard W. Anthony, Chicago, Ill., assignors to Mojonnier Bros. Co., Chicago, Ill., a corporation of Illinois

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2 Claims. (Cl. 198—35)

This invention relates generally to the packaging arts and more particularly to the systems and the equipment employed in handling re-usable cases for packaging bottled and cartoned milk.

In order to reduce the length of the conveyors incorporated in case packaging systems and thereby conserve plant space, it is common practice to stack the cases in units as much as eight or nine cases high. However, filling of the cases cannot take place while they are so stacked. Therefore, various devices have been developed for unstacking the cases prior to the insertion of filled milk bottles or analogous product elements; and a general object of the present invention is to provide new and improved apparatus for unstacking cases.

Another object of the invention is to provide new and improved case unstacking apparatus of the laydown type.

Prior art unstackers of the laydown type have characteristically caused certain delays in movement of the cases and have been unsatisfactory in that respect. Applicants have discovered that many of these delays can be avoided by raising the tilt or carrier frame of the unstacker before the last case of the laid down stack has cleared the end of the frame. Applicants have also discovered that more efficient movement of the cases can be achieved by preventing case jams at the tripper which is used in righting the laid down cases.

Accordingly, a further object of the invention is to provide a laydown unstacker that is arranged to promote efficient movement of the handled cases.

A still further object of the invention is to provide a laydown unstacker in which the tilt frame has side support arms which are releasable from engagement with the cases.

These and other objects and features of the invention will become more apparent from a consideration of the following descriptions.

A materials handling system in accord with the invention includes a conveyor that is operable in a straight line path through an unstacking station together with a carrier frame which is disposed at the unstacking station and which is mounted to be swung in a vertical arc between a substantially vertical position where it can receive a stack of cases being transported by the conveyor and a substantially horizontal position where it can release the received cases individually to the conveyor. The system in accord with the invention further includes a selectively operable stack-retention arrangement on the carrier frame for receiving and holding a stack of cases in assembled relationship during swinging of the frame from the vertical position to the horizontal position and for releasing the cases thereafter.

The invention, both to its construction and mode of operation, will be better understood by reference to the following disclosure and drawing forming a part thereof, wherein:

FIG. 1 is a schematic block diagram of a portion of a materials handling system incorporating case-unstacking apparatus in accord with the invention;

FIG. 2 is a side elevational view of the unstacking apparatus indicated schematically in FIG. 1, the tilt or carrier frame of the apparatus being illustrated in its vertical position for receiving a stack of cases being transported by the conveyor;

FIG. 3 is a side elevational view similar to the showing of FIG. 2 but illustrating the tilt or carrier frame in its horizontal position for releasing the received cases individually to the conveyor;

FIG. 4 is an enlarged, top elevational view taken substantially along the line 4—4 of FIG. 2, showing the cases in broken outline and illustrating the stack-retention means of the invention;

FIG. 5 is an enlarged perspective view of the case uprighting arrangement incorporated in the apparatus of FIGS. 2 and 3;

FIG. 6 is an enlarged plan view taken substantially along the line 6—6 of FIG. 2 with the carrier frame removed for clarity of illustration and showing both the extended and retracted positions of the case stop, further illustrating the cam and switch arrangement used in operating the arms of the stack-retention means of FIG. 4; and

FIG. 7 is a schematic circuit diagram illustrating the control arrangement used in the apparatus of FIGS. 2 and 3.

Referring now in detail to the drawings and giving initial consideration to FIG. 1, a portion of materials handling system that is particularly adapted for handling re-usable cases is indicated generally by the reference numeral **10**. This case handling system is embodied for use in a milk packaging facility for purposes of illustration only. Included in the system are a case washer **12** of the stack-type, a case separator or unstacker **14** and a caser and stacker arrangement **16**. These components are intercommunicated by conveyor sections **18, 20** and **22**. In accordance with conventional practice, the conveyor sections **18, 20** and **22** are parallel-run conveyors of the endless-chain type; and these conveyor sections are fashioned to be either interconnected conveyor sections or separate conveyor sections having suitable transfer devices, in accordance with the particular requirements of the given installation. However, these conveyor sections are provided with suitable power units, not shown, for substantially continuous operation in compliance with conventional practice; and in accordance with the invention, the conveyor sections **18, 20** and **2** are caused to operate at a predetermined speed and in a straight-line path through the unstacking station defined by the unstacker **14**.

Empty cases of wood, wire or metal construction are fed in stacks to the conveyor section **18** which forms thereby the case input to the illustrated portion of the overall system. The empty cases may be collected in stacks of any suitable height, heights of from five to nine cases being common. The stacks of cases are transported to the unstacker **14** at spaced intervals; and since the stacked cases are separated at the unstacker **14**, individual cases progress down the conveyor **22** to the caser and stacker **16**. At the caser and stacker **16**, filled bottles or cartons of milk are received from a filler station **24**, a conveyor section **26** being employed to deliver these product elements to the caser and stacker **16**. As the individual cases are filled with the bottled or cartoned milk, they are stacked; and in accordance with conventional practice, the stacked cases pass from the caser and stackers **16** to a cold storage room.

Turning to FIG. 2 for a more detailed description of the case separator or unstacker **14**, the conveyor sections **20** and **22** will be seen integrated forming a continuous conveyor that is operative through the unstacking station which is defined by the apparatus **14**. Specifically, the integrated conveyor sections **20** and **22** include parallel upper chain runs **28** which are caused to move in the general direction from left to right as viewed in FIG. 2, the integrated conveyor sections further including lower chain runs **30** that are caused to move in the opposite

direction. The integrated conveyor sections 20 and 22 also include laterally spaced side bars 32 which are elevated on vertically adjustable, longitudinally spaced legs 34.

The unstacker apparatus 14 inself includes a carrier or tilt frame 36 which constitutes a repositioning device, a stack-retention arrangement 38, and a case-uprighting arrangement 40. The carrier frame 36 includes a pair of cylindrical side members 42 which are spaced apart by a distance that is appropriate to admitting a stack 44 of cases 46 freely therebetween. A bottom plate 48 and a foot plate 50 are rigidly connected to each of the side members 42 adjacent the lower ends thereof and in right angular relationship relative to each other. Reinforcing guide plates 52 are fastened to the side bars 32 of the integrated conveyor sections 20 and 22; and in order to mount the carrier frame 36 for swinging movement in a vertical arc overlying the integrated conveyor sections, a tilt shaft 54 is rotatably secured between the spaced plates 52 using journal blocks 56. The tilt shaft 54, being rotatable, is rigidly fastened to the carrier frame at a suitable position such as the bottom plates 48.

Drive means are provided for swinging the carrier frame 36 between a substantially vertical position where it can receive a stack of cases 44 being transported by the conveyor section 20 and a substantially horizontal position where it can release the received cases individually to the conveyor section 22. The drive means, in the illustrated embodiment, comprise a pneumatic jack 58. The jack 58 includes a cylinder 60 which is swingably mounted to the integrated conveyor sections by means of a bracket 62 and a pivot coupling 64. The jack 58 additionally includes an extensible and retractable piston rod 66 which is pivotally mounted to the frame 36 by means of a sector plate 68, an extension bracket 70 and a pin-type coupling 72. Motive force is provided the pneumatic jack 58 by a control system to be described hereinafter. In addition, a booster spring arrangement 74 is advantageously incorporated with the pneumatic jack 58 in order to bias the carrier frame 36 toward its vertical position and thereby aid and accelerate return of the carrier frame from its horizontal position. The booster spring arrangement 74 comprises a tension spring 76 which is connected to the rigid framework of the integrated conveyor sections 20 and 22 by means of a bracket 78, the booster spring arrangement 74 additionally comprising a chain 80 or other flexible coupling for connecting the otherwise free end of spring 76 to the sector plate 68.

Continuing with reference to FIG. 2, the case-uprighting arrangement 40 is seen to include a trip device 82 and an auxiliary conveyor 84. The auxiliary conveyor 84 comprises an endless conveyor belt 86 which is disposed between the upper chain runs 28 and which is passed over a powered roller 88 and an idler roller 90. A pulley 92 is coaxially attached to one end of the roller 88, and drive force is transmitted from the output shaft of a suitably energized motor 94 to the pulley 92 and to the roller 88 by means of a flexible belt 96. In compliance with the invention, the motor 94 is arranged to drive the belt 86 at a greater linear speed than the chain runs 28. Thus, the auxiliary conveyor 84 is able to accelerate temporarily the case approaching the trip device 82. Ample clearance is thereby achieved between the case approaching the trip device and a succeeding case.

Considering FIG. 5 in conjunction with FIG. 2, the trip device 82 is seen to be mounted overlying the belt 86 by means of an inverted U-frame 98, the trip device 82 being suspended from the cross-bar of this U-frame to contact the uppermost edge of a case being transported by the belt 86. The trip device 82, in the illustrated embodiment comprises a trip plate or finger 100 which is swingably mounted to the cross-bar of the U-frame 98 by means of a pin and bracket arrangement 102. Furthermore, a compression spring 104 is disposed to bias the finger 100 in a generally upstream direction while permitting downstream deflection of the finger. It is to be recognized that the cases passing to the case-uprighting arrangement 40 may vary in dimension from one style of case to another; and therefore, the trip device 82 will be adjustably disposed a suitable height above the belt 86 for engaging the upper edge of an oncoming case and for forming a temporary obstruction so as to rotate the case in a vertical arc of ninety degrees. The trip device 82 thus cooperates with the rapidly moving belt 86 in turning the cases from a position in which they are traveling on their sides to a position in which they are traveling on their bottoms and in proper position for receiving bottles of milk or other product elements.

In accordance with an important feature of the invention, stack-retention means are arranged with the carrier frame 36; and turning to a consideration of FIGS. 2 and 4, the stack-retention arrangement 38 is seen to include a pair of blade-like side support members or arms 106. Each arm 106 is rotatably mounted on the carrier frame 36 by means including a tube 108, and each of the tubes 108 slidably and rotatably receives a cylindrical side member 42. In order to support all of the cases in a stack 44, the arms 106 extend from a position confronting the uppermost case in the stack to a position confronting at least the upper portion of the lowermost case in the stack. L-shaped brackets 110 are mounted rigidly to the tubes 108 in radial relationship to act as power transmitting elements for use in rotating the arms 106.

Top frame members 112 are individually connected to the top ends of the side members 42 in right angular relationship therewith to extend therefrom in a generally upstream direction when considering the upright or vertical position of the carrier frame 36. The top frame members 112 support the drive means used in rotating the arms 106. Specifically, an ear or bracket 114 is affixed to each of the top frame members 112 to extend laterally outwardlly therefrom in rigid relationship. A pneumatic jack 116 is employed as the motivating member in causing the rotation of each of the arms 106; and each of the jacks 116 includes a housing or cylinder 118 which is swingably mounted to the corresponding bracket 114 by means of a bifurcated coupling 120 and a pivot pin 122. The pneumatic jack 116 also includes an extensible and retractable piston rod 124 which carries a coupling block 126 on its free end, the coupling block 126 being perforated with a vertical bore 128 for receiving the upturned end of the L-shaped bracket 110. Advantageously, a brace bar 130 joins the cantilevered ends of the top frame members 112 in order to develop a comparatively rigid structure. It will be observed that the arms 106 are laterally retractable by being rotatable and are disposed adjacent the downstream edge of the side members 42. In addition, the top frame members 112 are fashioned to be of sufficient length to accommodate therebeneath cases of any dimension that might be expected to be encountered in the use of the case handling system since the top frame members 112 and the brace bar 130 must define an opening of such shape and dimension as to permit the cases 46 to pass therethrough after the carrier frame 36 has been disposed in its substantially horizontal position.

In FIG. 2, a case stop arrangement 132 is shown situated in conjunction with the conveyor section 20; and this case stop arrangement is employed in arresting movement of the stacks 44 before they enter the unstacking station. With reference to FIG. 6, the case stop arrangement 132 is seen to include a U-shaped stop member 134 which is disposed with the legs thereof disposed horizontally and with the open end thereof facing in a generally downstream direction. The stop member 134 is repositionable from a case-obstructing position shown in solid outline to a case-passing position shown in broken outline; and the repositioning of the stop member 134 is accomplished by means of a pneumatic jack 136. Specifically, the jack 136 includes a housing or cylinder 138 which is fixed in position laterally of the conveyor section 20, the jack

136 additionally including an extensible and retractable piston rod 140 which carries the stop member 134 on its free end. If desired, a mechanically operated case stop may be used in conjunction with the case stop arrangement 132 in order to insure a rapid and efficient separation of the stacked cases.

The control arrangement that is utilized in operating the pneumatic jacks 58 and 116 will now be described with principal reference to FIG. 7 and with secondary reference to FIGS. 3 and 6. In FIG. 7, a control unit indicated generally by the numeral 140 is shown receiving air under pressure from a suitable source 142. A master manual switch 144 regulates the flow of pressurized air from the source 142 to three operating valves, valves 146, 148 and 150. Valves 146 and 150 are of the double pilot bleed type with speed control, and valve 148 is of the single pilot pressure type with speed control. Operation of the valves 146, 148 and 150 is controlled by position responsive switches 152, 154, 156 and 158. It will be observed that valve 146 is actuated by switch 152 and controls, in turn, the operation of the pneumatic jacks 116 which are incorporated in the stack-retention arrangement 38. Position responsive switch 152 is located toward the downstream end of the unstacking station, as is shown in FIG. 3, where it is capable of sensing the presence of a stack of laid down cases.

In somewhat similar manner, the valve 148 regulates operation of the pneumatic jack 58 which is used in raising and lowering the carrier frame 36, valve 148 being actuated by means of switch 154. As is shown in FIG. 6, position responsive switch 154 is located between the upper conveyor chain runs 28 at a position approximately overlying the tilt shaft 54. The switch 154 includes a sensing foot 160 which is employed in determining the presence of one or more of the cases 46 at the bottom of the carrier frame 36. The valve 150 controls operation of the case stop jack 136, valve 150 being actuated by switch 158. Position responsive switch 158 includes a sensing foot 162 which is disposed upstream from the sensing foot 160 of switch 154 as is shown in FIG. 6. Thus, switch 158 is employed in detecting the presence of a stack of the cases 46 entering the carrier frame 36 after the same have been passed by the case stop arrangement 132.

Additional sensing and regulation is achieved by means of switch 156 which is advantageously selected to be of the one-way trip type. As is shown in FIG. 6, switch 156 includes an operator finger 164 which serves as a follower in cooperation with a cam 166, cam 166 being secured to the tilt shaft 54. So positioned and arranged, switch 156 is capable of sensing the rotation of shaft 54 and thereby the return of carrier frame 36 from its generally horizontal to its substantially vertical position. This latter information is used in regulating valves 146 and 150; and accordingly switch 156 is connected in fluid control circuit with valves 146 and 150. It is to be recognized that additional control circuitry including position responsive switches and appropriate valving may be incorporated in the control unit 140 to prevent jack 58 from lowering the carrier frame 36 with a load of stacked cases in the event that a case should become jammed or stuck on the conveyor section 22 or in the case-uprighting arrangement 40.

For purposes of affording a more complete understanding of the invention, it is advantageous now to provide a functional description of the mode in which the component parts cooperate. For facility in description, it is assumed that the conveyor sections 20 and 22 are running, that the case stop arrangement 132 is in its open or non-obstructing condition, that the case-uprighting arrangement is operating, that the carrier frame 36 is in its vertical or raised position and that the arms 106 have been disposed in their closed position immediately in front of an advancing stack 44 of cases 46. As the stack 44 of cases 46 passes into the carrier frame 36, the lowermost of the cases engages the sensing foot 162 of position responsive switch 158 actuating the switch to energize jack 136 whereby to cause the jack to move the case stop 134 into position between the upper conveyor chain runs 28 for obstructing the passage of a second stack of the cases. The two positions of case stop 134 are indicated in FIG. 6.

As the advancing stack of cases penetrates the carrier frame 36, the lowermost of the cases eventually engages the sensing foot 160 of position responsive switch 154 signifying that the stack of cases has reached its ultimate position in the carrier frame. Switch 154 thereupon operates valve 148 to actuate jack 58. This actuation of the jack 58 results in an extention of the rod 66 and a concomitant rotation of the carrier frame 36 from its substantially vertical position shown in FIG. 2 to its substantially horizontal position shown in FIG. 3.

Upon the carrier frame 36 reaching its horizontal position, one of the cases 46 in the stack 44 will operatively engage the position responsive switch 152, and switch 152 thus actuated will serve to operate valve 146 so as to energize the jacks 116. The jacks 116, in turn, will rotate the tubes 108 repositioning the arms 106 from the closed to the open position. The two positions of the arms 106 are illustrated in FIG. 4. This opening of the arms 106 deposits the cases 46 on the conveyor chain runs 28, and the movement of these chains transports the released cases toward the case-uprighting arrangement 40.

It is to be recognized that the arms 106 are in their open position as the cases are being transported toward the case-uprighting arrangement. Thus, the carrier frame 36 is free of the cases and may be returned to its vertical position. Accordingly, as the lowermost case 46 in the laid down stack exits from the vicinity of tilt shaft 54, the switch 154 is released from operative engagement with the cases, switch 154 responding by actuating valve 148 so as to energize jack 58 for raising or returning the carrier frame 36 from its horizontal to its vertical position. During this raising of the carrier frame, the corresponding rotation of tilt shaft 54 will cause cam 166 to engage the finger 164 of value 156. Thus, actuated, the valve 156 will operate valve 150 to energize jack 136 for withdrawing the case stop member 134 from its conveyor-obstructing position. Simultaneously, switch 156 will actuate valve 146 to re-energize the jacks 116 for closing the arms 106 behind the stack of cases which have been thus released by the case stop arrangement 132.

From the foregoing descriptions, it will be apparent that the return of carrier frame 36 from its horizontal to its vertical position need not be held up pending passage of the lowermost of the stacked cases 46 from the end of the stack-retention arrangement 38. Thus, the carrier frame may be readied for a second downard movement while the last of the previously laid down cases is passing to the case-uprighting arrangement 40. Efficient movement of the handled cases results from arranging the arms 106 to be releasable from the cases in the horizontal position of the carrier frame.

The specific example herein shown and described is to be considered as being primarily illustrative. Various changes beyond those described will, no doubt, occur to those skilled in the art; and such changes are to be understood as forming a part of this invention insofar as they fall within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. For use in a materials handling system, the combination comprising: conveyor means continuously operable in a straight line path through an unstacking station; carrier frame means located at said station and mounted to be swung in a vertical arc between a substantially vertical position where it can receive a stack of cases being transported by said conveyor means and a substantially horizontal position where it can release the received cases individually to said conveyor means, said carrier frame means including a plurality of rigidly interconnected ele-

ments; selectively operable stack-retention means on said carrier frame means for receiving and holding a stack of cases in assembled relationship during swinging of said frame means from said vertical position to said horizontal position and for releasing said cases thereafter, including a pair of arms rotatably mounted on said rigidly interconnected elements to be pivoted about respective axes parallel with the longitudinally axis of said carrier frame means, said arms being pivotally convergible to inward positions obstructing passage of cases and being pivotally retractable to lateral positions free of said cases whereby to permit swinging of said frame means back to its vertical position before the final case of a laid down stack has been cleared from the downstream end of said frame means by said conveyor means; fluid-actuated jack means mounted on said carrier frame means and connected to said arms for rotating said arms; and control means for said jack means, including first position responsive switch means disposed to be actuated by the situation of said frame means in its substantially horizontal position and

second position responsive switch means disposed to be actuated by the return of said frame means to its vertical position, said first and second switch means being connected in fluid circuit with said jack means for operating said jack means.

2. For use in a materials handling system, the combination according to claim 1 which further comprises fluid-actuated jack means for swinging said frame means and control means for said last mentioned jack means, including position responsive switch means disposed to be actuated by the presence of a stack of cases in upright position at said unstacking station and ready to be laid down.

References Cited by the Examiner

UNITED STATES PATENTS

2,716,500	8/1955	Criger	214—8.5 X
3,160,260	12/1964	Holland	198—35

MARVIN A. CHAMPION, *Primary Examiner.*