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BOX TRANSFER MECHANISM

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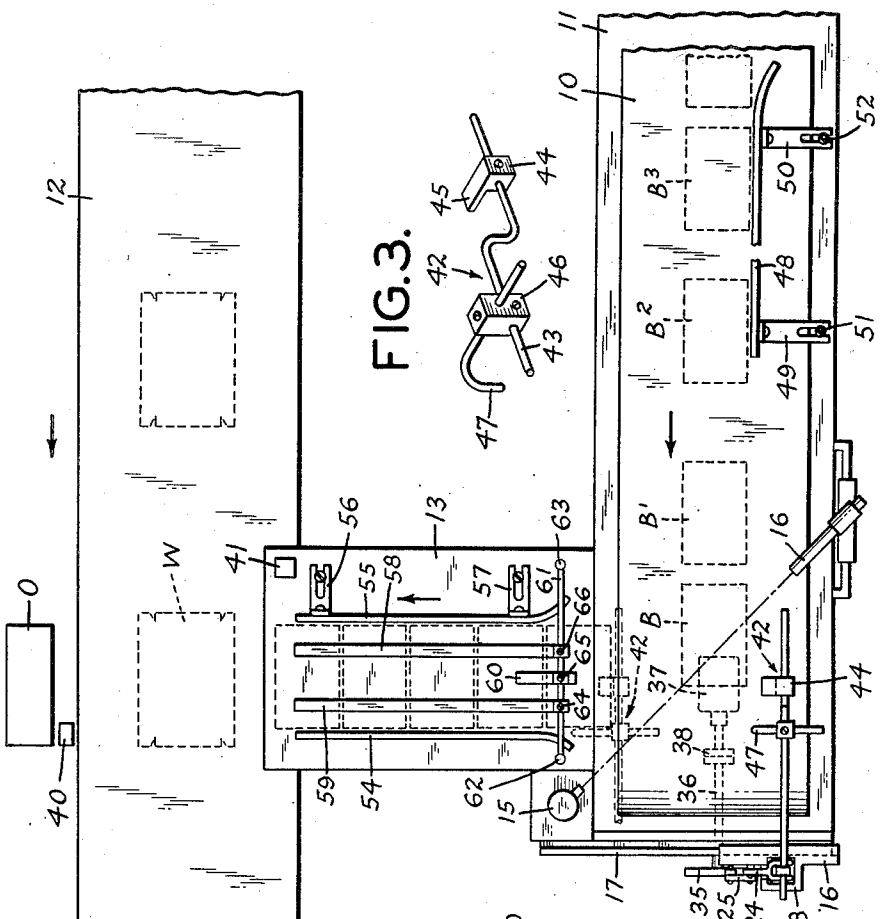


FIG. 3.

FIG. 1.

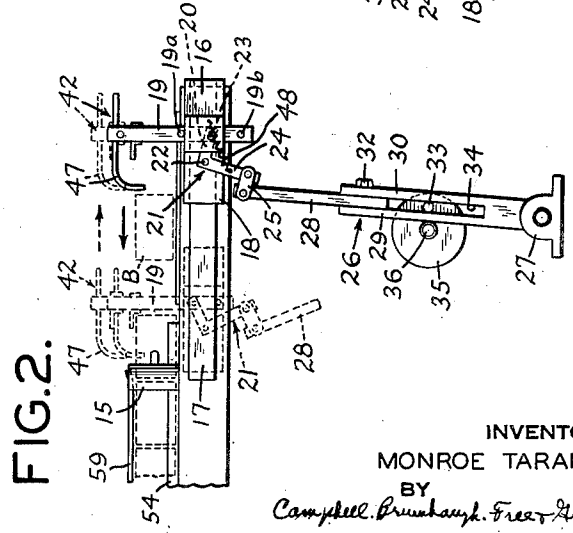


FIG. 2.

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BOX TRANSFER MECHANISM

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4 Claims. (Cl. 198—21)

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This invention relates to improvements in transfer and conveying devices, and it relates particularly to devices for transferring set-up cardboard boxes from a box folding or forming machine to the operator of a semi-automatic box wrapping machine.

A great many manufacturers of fancy wrapped or covered cardboard boxes used for packaging candies, cakes, and other confections, cosmetics and other articles are equipped with the so-called "quad" staying machines by means of which a box blank is folded or set-up into box-like form. These set-up boxes are transferred by means of a conveyor to an operator, who picks up the boxes and places and centers them on wrappers with which the boxes are to be covered. The boxes and wrappers are then conveyed to a box wrapping machine where the wrapper is folded around and glued to the box. Usually, the operation of the wrapping machine is controlled by means of a switch actuated by the box forming machine so that their operating speeds are related to each other.

Fully automatic machines are available for both setting up the boxes, placing them on the wrappers and feeding the assembly to the wrapping machine. In many instances, however, the cost of replacement of the semi-automatic machines with fully automatic machines, is so great that it cannot be justified by the increased rate of production possible with automatic machines.

The principal difference in the rate of operation of the fully automatic machines and the semi-automatic machines resides in the human factor, namely, the operator or feeder of the semi-automatic wrapping machine. Considerable manual dexterity and skill are required to pick up the boxes and center them accurately on the wrappers as they move past the operator's station. The movements of the operator are further dependent upon the position of the set-up boxes with respect to the operator. With the usual conveyor arrangement, it is necessary for the operator to reach across the conveyor which feeds the wrapping machine and pick up a box from the conveyor leading from the "quad." Inasmuch as the operator must reach across the conveyor to pick up the boxes, the speed of the operator is decreased. Moreover, the constant reaching and stretching for the boxes is very tiring so that the operator can work for only a relatively short period of time. This requires the service of another operator or shutting down of the machines.

I have found that when the set-up boxes are

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fed into a position which is closer to the operator and more conveniently located with respect to the conveyor for feeding the wrapping machine, the efficiency of the operator is greatly increased, the work is made less tiresome and the output of wrapped boxes can be increased to such an extent that it is closely comparable to that of the fully automatic machines.

The present invention, therefore, has as its principal object the provision of a device which can be used with box forming and semi-automatic wrapping machines to transfer the set-up boxes from the conveyor of the box-forming machine into a position which enables the operator to pick up and place the boxes on the wrappers with a minimum of reaching and resulting fatigue.

Other objects of the invention, and the advantages thereof, will become apparent from the following description of a typical device embodying the present invention.

In accordance with the present invention, I have provided an article-controlled transfer mechanism, by means of which the boxes being advanced by the conveyor of the box-forming machine, are transferred into a position in front of the operator of the wrapping machine and closely adjacent to the wrappers carried by the feed conveyor of the wrapping machine so that the operator can pick up the boxes and transfer them directly to the wrappers with a minimum of reaching and other movements.

More particularly, the transfer mechanism includes a pusher member controlled by means of an "electric eye" which pushes the set-up boxes from the conveyor from the box-forming machine on to a table or platform to form an advancing row of boxes, the nearest one being directly in front of the operator so that it can be picked up by the operator and transferred to the conveyor of the wrapping machine.

Moreover, the transfer mechanism can be controlled independently by the operator to render it ineffective when a damaged or improperly formed box is discharged from the box former, or to by-pass and accumulate boxes when the wrapping machine is shut down for reloading, adjustment or the like.

My transfer mechanism has been found to increase greatly the rate of production of the wrapped boxes so that the production rate is comparable to that of a fully automatic machine, while, at the same time, it is considerably less tiring to the operator.

For a better understanding of the present in-

vention, reference may be had to the accompanying drawings in which:

Figure 1 is a plan view of a transfer mechanism embodying the present invention shown with a portion of the conveyor for transferring the boxes from the box staying or forming machine and a portion of the conveyor for feeding the boxes and wrappers to the box wrapping machine;

Figure 2 is a side view of the transfer mechanism; and

Figure 3 is a perspective view of the pusher member for the transfer mechanism.

Referring now to Figure 1, the set-up or formed boxes from the box staying or forming machine are transferred to the left by means of a conveyor belt 10. A series of the boxes B, B1, B2, B3 and so forth are shown in dotted lines on the conveyor. As indicated, the boxes usually are placed on the conveyor in fairly uniformly spaced relation, a matter which is important in the timing of the box forming machine to the box wrapping machine. The conveyor 10 is supported by means of rollers (not shown) carried rotatably by a platform or frame 11. Adjacent to, and parallel with the conveyor 10, is a second conveyor 12 which supplies the wrappers W and the boxes centered thereon to a box wrapping machine of conventional type, not shown. The conveyor 12 is advanced step by step under the control of a switch (not shown) which is actuated by the box forming machine. The switch and associated structure are conventional.

The new box transfer mechanism is interposed between the conveyor 10 and the conveyor 12 and is utilized to transfer the boxes, B, B1, B2, etc. to a table 13 within convenient reaching distance of the operator at the station O. The table 13 extends from the edge of the table or frame 11 to a location overlying the edge of the conveyor 12 so that the operator has to reach only a short distance above and beyond a wrapper W to remove a box from the table 13 and place and center it on the wrapper W.

The transfer mechanism disclosed herein is actuated by means of a photoelectric cell and amplifier 15 which is energized by a light source 16 situated at the opposite side of the conveyor 10 from the photoelectric cell and so positioned vertically with respect to the conveyor 10 that the light beam is intercepted by the boxes as they are advanced by the conveyor. The impulses generated by energizing and deenergizing of the photoelectric cell are utilized to control the operation of the transfer mechanism, now to be described. As best shown in Figure 2, the transfer mechanism includes a slide member 16 which is mounted on a guide rail 17 at the end of the frame or table 11 for reciprocation transversely of the frame or table. The slide member 16 has a lateral extension 18 thereon provided with a vertical opening to receive a vertically movable bar or rod 19. The bar 19 is connected to one arm 20 of a bell crank lever 21 which is supported on the slide 16 by means of a pivot pin 22. The arm 20 of the bell crank extends through a slot in the side of the extension 18 and has a pin and slot connection 23 with the bar 19 so that rocking movement of the bell crank 21 will produce vertical movement of the bar 19. Vertical movement of the bar may be controlled by the length of the slot through which the lever arm 20 extends or by means of pins 19a and 19b on the bar 19, above and below the extension 18. The other arm 24 of the bell crank is connected by means of the link 25 to the upper end of a lever 26 which is

supported pivotally on a bracket 27 mounted on the floor or other support near the base of the frame or table 11. The lever 26 may be of two-piece construction in which the upper end portion 28 of the lever is slidably mounted between the parallel arms 29 and 30 of the lower portion 31 of the lever and may be held in adjusted position lengthwise thereof by means of a bolt or screw 32. Adjustment of the length of the lever 26 permits adjustment of the movement of the slide 16.

The lever 26 is rocked back and forth by means of a crank pin 33 engaging in the slot 34 between the arms 29 and 30 of the lever 26. The crank pin 33 is mounted on a crank disc 35 which is driven by means of a shaft 36 to which it is fixed. The shaft 36 is connected to a source of power such as an electric motor 37 by means of a single revolution electrically controlled clutch 38 of conventional type. The clutch is provided with electrical means for tripping it so that it will connect the shaft 36 to the motor 37 for a single revolution and then will disconnect the motor from the shaft. The clutch 38 is energized and controlled by the photoelectric cell 15. Thus, while the light beam impinges on the cell, a current is generated which keeps the clutch disengaged. When the beam from the light source 16 is interrupted, the clutch 38 engages and drives the crank disc 35 through one revolution, thereby moving the slide plate 16 from the position shown in full lines in Figure 2 to the dotted line position and then back to the full line position.

The motor 37 can be shut off by the operator by means of either of two switches 40 and 41. The operator has a foot-controlled switch 40 on the floor and a hand-controlled switch 41 on the table 13 connected in series with the motor 37. The operator can open the hand-controlled switch 41 if the boxes are to be allowed to accumulate while the wrapping machine is being adjusted or reloaded with wrappers. The foot-controlled switch can be opened to by-pass defective boxes or for any other reason. It will be understood that the switches may also be connected in the amplifier and clutch circuit to prevent operation of the clutch, if desired.

The vertically reciprocable bar 19 carries a pusher member 42 for advancing the boxes one by one on to the table 13. As shown in Figure 3, the pusher 42 may consist of a rod 43 which is bent downwardly and then laterally to position it properly with respect to the conveyor so that it will engage near the lower part of the side wall of a box as the pusher moves from the full line position to the dotted line position shown in Figure 2. The lower portion of the rod 43 is provided with a block 44 having a forwardly projecting flange 45 which overlies the edge of the box and prevents it from tipping as it is being pushed off the conveyor 10. The upper portion of the rod 43 may also have a block 46 held thereon by means of a screw which supports a generally L-shaped limit stop arm 47. The arm 47 is normally out of the path of the advancing row of boxes and permits the leading box to pass beyond the pusher member 42 and off of the end of the conveyor 10 when either of the switches 40 and 41 is opened by the operator. The left-hand end of the pusher member 42 is adjustably mounted in a hole in the upper end of the bar 19 by means of a screw so that the pusher member moves up and down with the bar 19.

In operation, when a box intercepts the beam from the light source, the clutch 38 is actuated

to couple the motor 37 to the shaft 36 so that the lever 26 is first rocked in a counter-clockwise direction. Inasmuch as the lever is connected to the slide 16 by means of the bell crank 20, the force required to move the slide causes the bell crank to rock in a counter-clockwise direction. The rocking movement of the bell crank pulls the bar 19 and the pusher member 42 thereon downwardly behind a box B, before the slide begins to move to the left as viewed in Fig. 2. Movement of the slide and the pusher member 42 to the left pushes the box off the conveyor 10 and on to the table or platform 13, at which time the pusher 42 and associated elements has reached the lower position shown in dotted lines in Figures 1 and 2. At the end of the stroke of the lever 26 to the left, it is rocked in a clockwise direction. The clockwise movement of the lever 26 acts to rotate the bell crank 21 in a counter-clockwise direction as shown in dotted lines in Figure 2 of the drawing so that the bar 19 is pushed upwardly before the slide starts its return movement to the right, and, due to the elevated position of the pusher member 42, it will clear the top of the next adjacent box and allow it to continue to advance with the conveyor 10. At the end of the movement of the slide 16 to the right, the pusher mechanism is in a position to repeat the cycle to advance the next box carried by the conveyor 10 on to the table 13. During operation of the transfer mechanism, the slide 16 may have a slight overtravel to the right, due to inertia, in which case the pusher 42 will drop down into position for engaging and advancing the next box. In some instances, it may be found desirable to counterbalance the bar and the pusher 42 by means of a spring 48 connecting the lower arm 24 of the bell crank to the extension 18.

The bell crank connection between the actuating lever 26, the bar 19 and the slide 16 together with the inertia of these parts produces the necessary up and down movement of the pusher member 42 to advance the boxes on the forward stroke and to move in a path above the boxes on the return stroke.

In order to guide the boxes into proper relation to the pusher mechanism, the table or frame 11 may be provided with a guide rail 48 which overlies the conveyor 10 and may be adjusted transversely of the conveyor by means of the slotted adjusting and supporting brackets 49 and 50 which are retained in adjusted position by means of the screws 51 and 52.

The boxes being transferred to the table 13 may also be guided across the table by means of a fixed guide rail 54 carried by the table 13 and an adjustable guide rail 55 also carried by the table 13. The guide rail 55 may be supported by the adjustable brackets 56 and 57 so that boxes of different lengths may be accommodated therebetween.

The boxes on the table are prevented from tilting by means of metallic strips 58, 59 and 60 which are connected to a rod 61 extending transversely of the table 13 and above the boxes being transferred thereto. The rod 61 is rotatably supported in the standards 62 and 63 extending upwardly from the table 13. The spacing of the strips 58, 59 and 60 may be adjusted by loosening the set screws 64, 65 and 66 which secure them to the rod 61.

The provision of the table 13 makes it possible to deliver the boxes from the conveyor 10 into a position where the operator requires only a very short movement of the hand to lift the box from the table and center it accurately on the wrapper W. The stayed or formed boxes can be accumulated by opening the switch 41, if it is necessary to shut down the wrapping machine for short periods of time. This accumulation will amount to several thousand boxes on a long run which is advantageous as it permits the box former to be set while the accumulated formed boxes are being used by the operator. This results in a saving of nearly one-half of the change-over time of the complete unit.

All in all, the transfer mechanism greatly eases the task of the operator and speeds up the operation of placing the boxes on the wrappers so that the box forming and the box wrapping machines can be speeded up without overburdening the operator. Moreover it keeps the box forming and wrapping machines in operation over longer periods of time. As a result, the output of the machines can be greatly increased and the operator can work for longer periods of time with greater comfort and less fatigue than with the prior machine setups.

It will be understood that the transfer mechanism is susceptible to modification such as, for example, in the length of the stroke of the pusher mechanism, the design of the pusher member and in the length and arrangement of the transfer table and the like. Therefore, the form of the invention disclosed herein should be considered illustrative and not as limiting the scope of the following claims.

I claim:

1. A device for transferring boxes and the like from a conveyor to an operator's station where the boxes are placed manually on wrappers for transfer to a wrapping machine, comprising a slide member mounted for movement transversely of said conveyor, a bar member mounted for substantially vertical movement on said slide member and movable transversely therewith, a pusher overlying and extending substantially lengthwise of said conveyor, said pusher member being fixed to and movable with said bar member for movement up and down with respect to said conveyor and transversely thereof, a bell crank lever pivotally mounted on said slide member and having one arm pivotally connected to said bar member to move it up and down in response to pivoting movement of said bell crank lever, driving means movable back and forth in a plane transversely of said conveyor and connected to the other arm of said lever to rock it and move the slide member, thereby to cause said pusher member to move through a generally rectangular path in a vertical plane, and means responsive to the presence of a box on said conveyor to initiate operation of said driving means.

2. The device set forth in claim 1 in which said driving means comprises a motor, a crank, a single revolution clutch connecting said crank to said motor, a lever pivotally mounted and connected to said crank for oscillation thereby, and means connecting said lever to said other arm of said bell crank lever.

3. A device for transferring set-up boxes from a first conveyor to a table at an operator's station where the boxes are placed on wrappers for transfer to a wrapping machine, comprising a slide member mounted for horizontal movement transversely of and adjacent to one end of said first conveyor, a movable member mounted on said slide member for substantially vertical movement, a pusher member fixed to said vertically movable

member and overlying a portion of said first conveyor, a rockable element pivotally mounted between its ends on said slide member and pivotally connected at one end to said vertically movable member, an oscillatable member connected to the other end of said rockable member and movable transversely of said first conveyor to rock said rockable member and move said slide, and means responsive to the presence of a box on said first conveyor for moving said oscillatable member through one cycle to cause said pusher member to engage and push said box from said first conveyor on to said table and then move upwardly and return to an initial position.

4. A device for transferring boxes and the like from a first conveyor to an operator's station where the boxes are placed manually on wrappers carried by a second conveyor for feeding them into a wrapping machine, comprising a table adjacent to said first conveyor and extending over the edge of said second conveyor at the operator's station, means to move said first conveyor continuously, a pusher member overlying said first conveyor in an initial position out of the path of the boxes carried thereby, means supporting said pusher member for movement transversely of said first conveyor from the initial position to push a box therefrom on to said table, means responsive to the presence of a box on said first conveyor in front of said pusher member to move said pusher member transversely of said

table from said initial position and return it to said initial position, a limit stop member mounted on said pusher member and extending transversely of said first conveyor out of the path of boxes carried by said first conveyor, said stop member being movable with said pusher member to stop said boxes from being carried past said pusher member by said first conveyor when said pusher member is moved transversely of said first conveyor, and manually controlled means at said operator's station to render the means to move said pusher member ineffective to move said pusher member out of said initial position and to retain said stop member out of the path of said boxes to enable said first conveyor to carry said boxes past said pusher member for discharge at the end of said first conveyor.

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