

Sept. 8, 1942.

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2,295,232

CONTROL APPARATUS

Filed Nov. 22, 1939

3 Sheets-Sheet 1

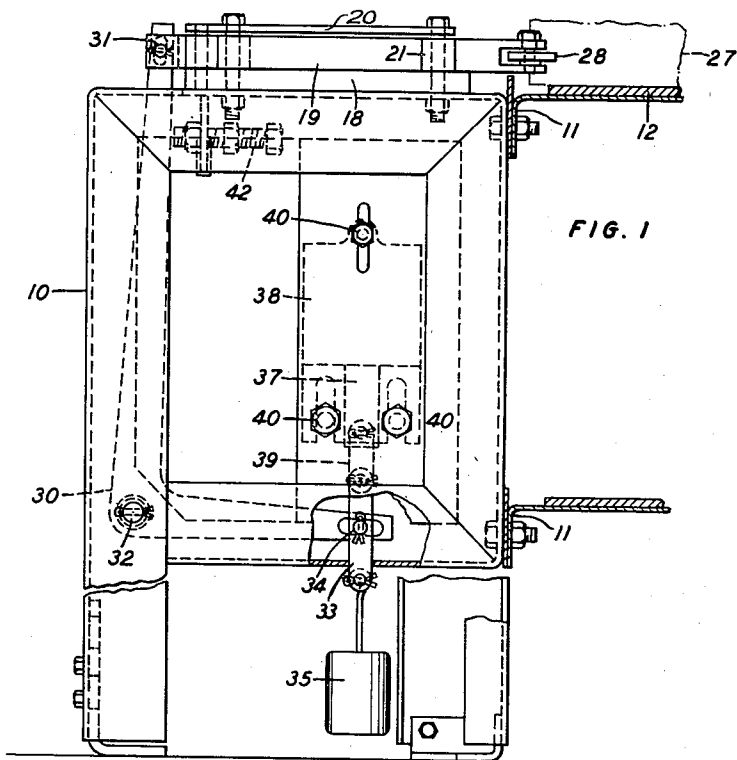


FIG. 1

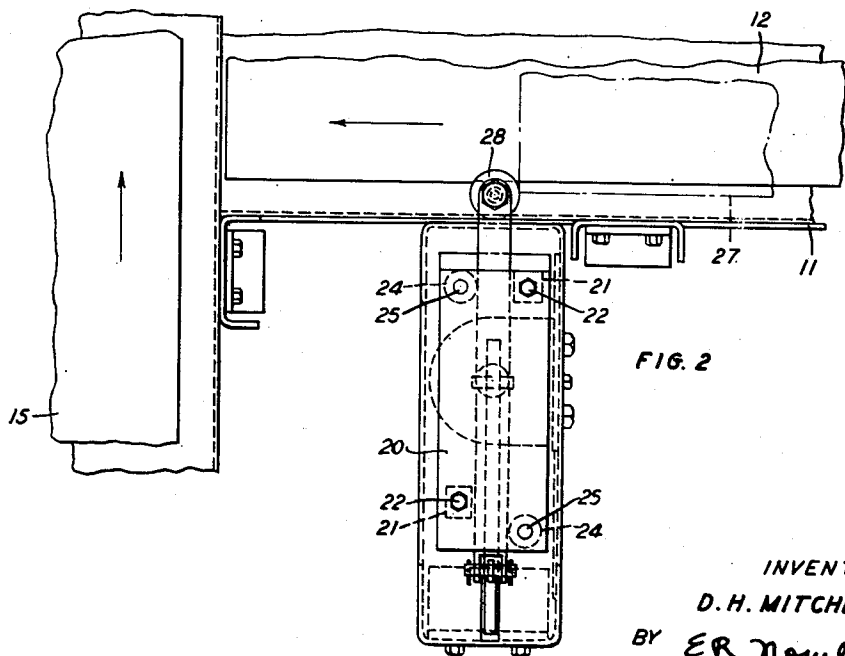


FIG. 2

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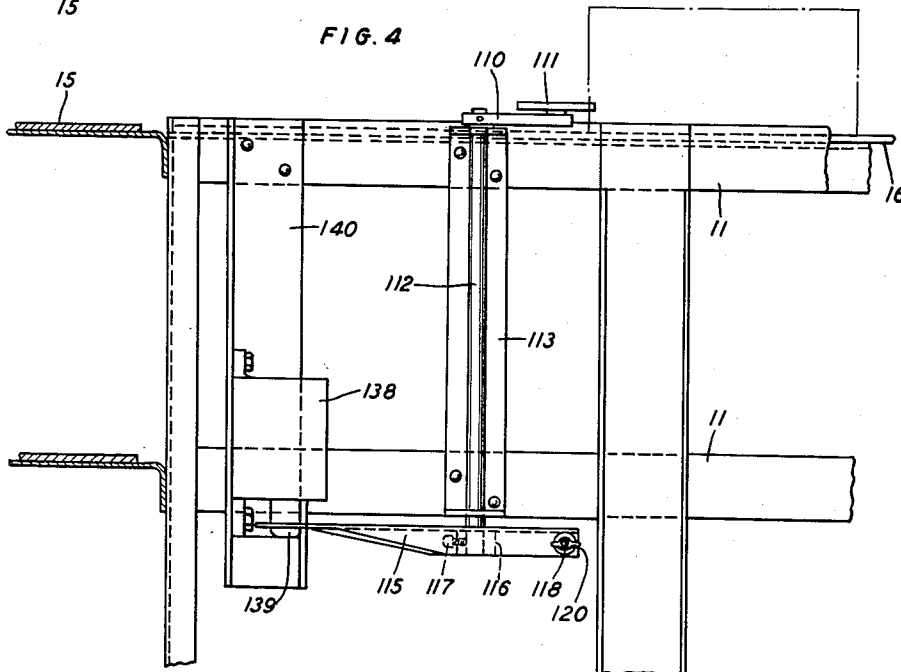
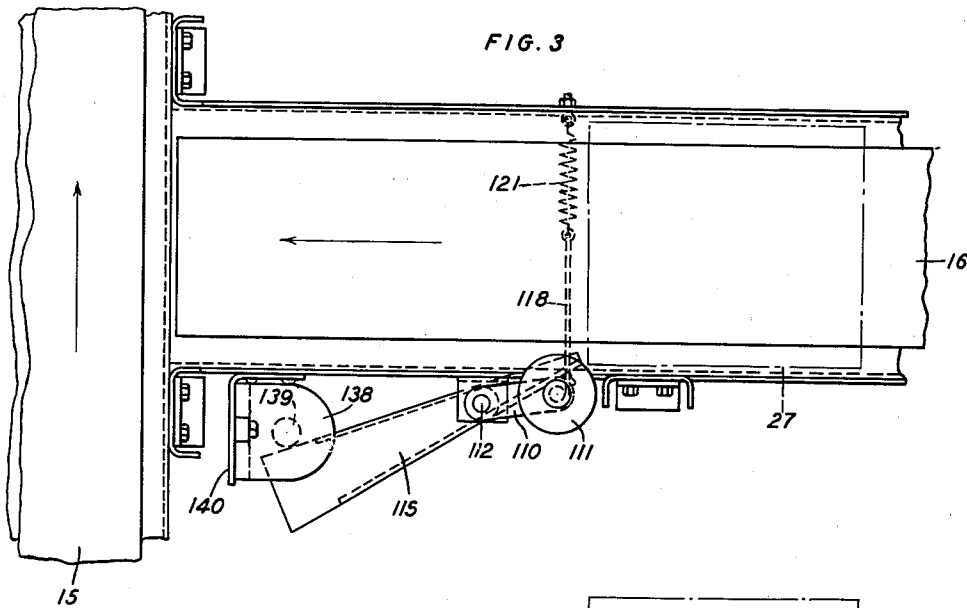
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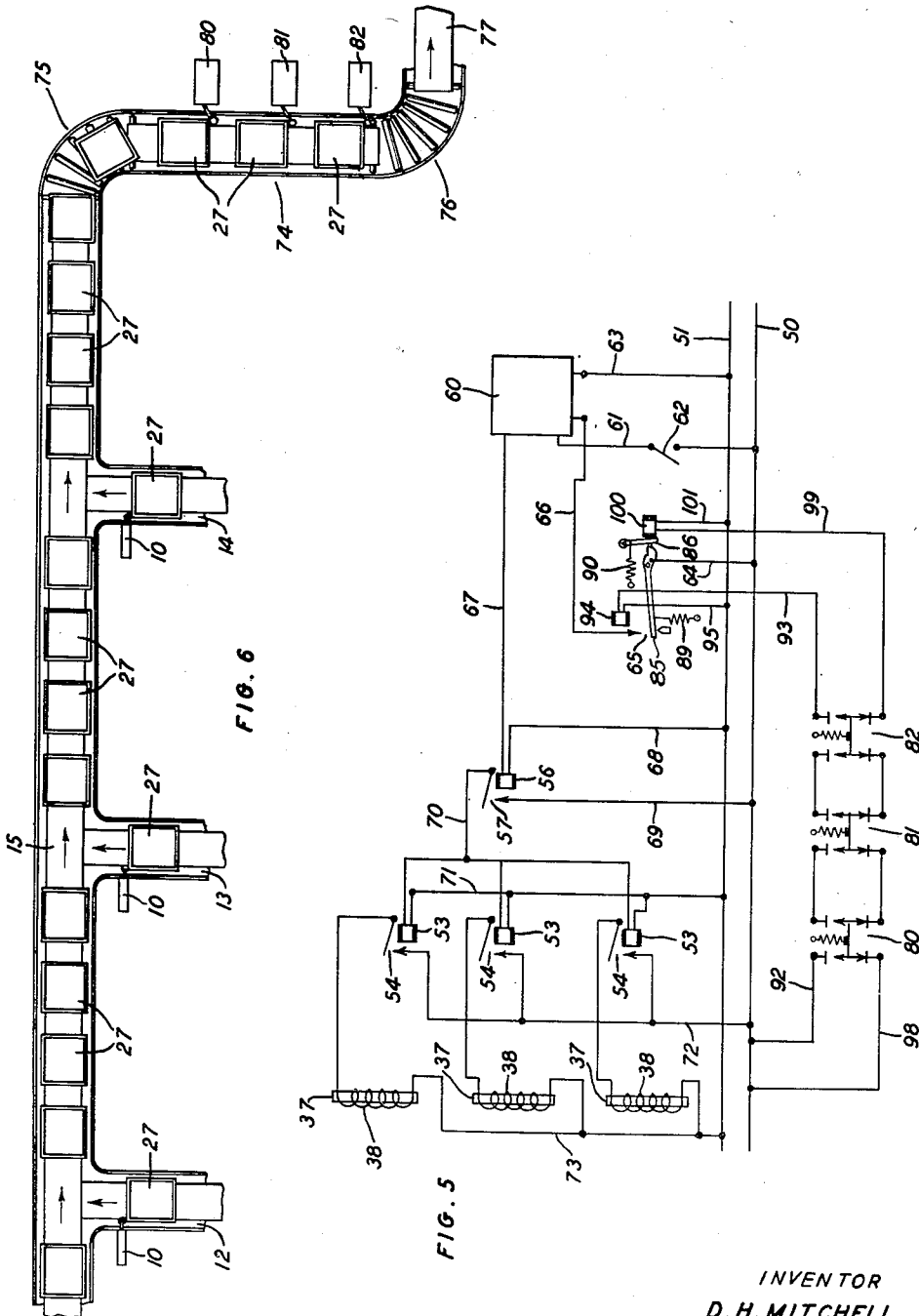
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CONTROL APPARATUS

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3 Sheets-Sheet 3



UNITED STATES PATENT OFFICE

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CONTROL APPARATUS

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Application November 22, 1939, Serial No. 305,614

11 Claims. (Cl. 198—79)

This invention relates to a control apparatus, and more particularly to an apparatus for controlling articles on conveyors.

In conveyor systems, particularly those including a plurality of branch conveyors feeding articles to a main conveyor, it is frequently desirable to control the feeding of the articles so as to maintain the main conveyor at maximum capacity, to open the branch lines at predetermined intervals and to avoid jamming of the articles being fed to the main conveyor.

An object of the invention is to provide a simple, efficient and practical apparatus for controlling the movement of articles on conveyors.

With this and other objects in view, two embodiments of the invention comprise roller carrying arms normally held in the path of articles on branch conveyors and each associated with a solenoid conditioned to be operated at predetermined intervals for actuation of the arms to free the articles from the branch conveyor to a main conveyor.

Other objects and advantages will be apparent from the following detailed description taken in conjunction with the accompanying drawings, wherein

Fig. 1 is a side elevational view of one embodiment of the invention;

Fig. 2 is a top plan view of the embodiment illustrated in Fig. 1 associated with conveyors;

Fig. 3 is a top plan view of another embodiment of the invention associated with conveyors;

Fig. 4 is a side elevational view of the embodiment shown in Fig. 3;

Fig. 5 is a wiring diagram illustrating the control circuit for either embodiment, and

Fig. 6 is a schematic fragmentary top plan view of a conveyor system illustrating the invention.

Referring now to the drawings, particularly Figs. 1 and 2, the embodiment of the invention shown therein comprises a frame 10 formed mainly of sheet metal members U-shaped in cross section. The frame is secured at any desired position to a frame 11 of a conveyor, for example, a branch conveyor 12. Referring for the moment to Fig. 6, it will be noticed that a frame 10 is secured to each of the branch conveyors 12, 13, and 14 adjacent their junctures with a main conveyor 15.

Referring again to Figs. 1 and 2, a description will be given regarding the construction of one control apparatus or unit and it should be understood that the same structure applied thereto will be applied to the schematic illustrations

in Fig. 6. A support 18 in the form of a plate is mounted upon the top of the frame 10 for slidably supporting an arm 19. A retaining plate 20 is positioned above the arm 19 by spacing blocks 21 through which bolts 22 extend, these bolts also extending through the plate 20, the support 18 and the frame 10 to secure these members to the frame. Rollers 24 are positioned between the support 18 and the plate 20 and rotatably mounted upon pins 25 to hold the arm 19 against displacement and to condition the arm for movement freely into and out of the path of articles such as trays 27 on the conveyor 12. The inner end of the arm adjacent the conveyor 12 rotatably supports a roller 28 for engaging the trays to hold them against movement on the conveyor.

The outer end of the arm 19 is operatively connected to a vertical arm of a bellcrank lever 30 through the aid of a pin 31 carried by the arm 19 and extending through a slot in the lever. The lever is pivotally mounted upon a pin 32 supported by the frame 10 and has its horizontal arm operatively connected to a link 33 through a pin 34 extending through an elongated aperture in the adjacent arm of the lever 30. The lower end of the link 33 supports a weight 35, while the upper end thereof is operatively connected to a core 37 of a solenoid 38 through another link 39. The solenoid is rigidly mounted in an adjustable manner on the frame 10 through the aid of machine screws 40, each of which is positioned in slots in a bracket portion of the solenoid to permit vertical adjustment of the solenoid with respect to the frame 10 to vary the movement of the arm 19 relative to the conveyor associated therewith. An adjustable stop 42 carried by the frame 10 and positioned to be engaged by the vertical arm of the lever 30 limits the inward movement of the arm 19, that is, movement of the arm toward the conveyor, and serves to vary this movement.

Upon considering the operation of this species or embodiment of the invention it will be observed that when the solenoid 38 is deenergized the weight 35 will move the lever 30 clockwise about its pivot pin 32 and thus move the arm 19 inwardly to position the roller 28 in the path of the trays on the conveyor. The trays on the conveyor will thus be held against movement toward the main conveyor 15 until the arm has been removed a sufficient distance to free the trays. The arm may be removed by energization of the solenoid which will cause the core 37 to move upwardly, moving with it the links 39 and

33 together with the weight 35. The operative connection of the lever 30 with the solenoid will cause the arm 19 to be moved outwardly to move the roller 28 free of the trays. It will be noted that the pressure applied to the arm 19 by the trays tending to move with the conveyor will be applied directly to the rollers 24, these rollers, therefore, providing substantially frictionless bearings to decrease the force necessary to move the arm 19 free of the trays to a minimum.

With this structure in mind attention is now directed to Figs. 5 and 6. In Fig. 5 the electrical circuit includes supply lead lines 50 and 51 included in a circuit (not shown) connected with a suitable source of electrical energy. It should be understood that this circuit may include control means for any desired number of control apparatuses or units shown in Figs. 1 and 2, the present illustration, however, including control means for only three units, shown at the right of the wiring diagram. The solenoids 38 and their cores 37 for three units shown in Fig. 6 are schematically illustrated. For each solenoid there is a relay 53 associated with make contacts 54 to complete circuits through their respective solenoids, as will hereinafter be described. All of the relays 53 are controlled by a main relay 56 associated with a make contact 57 and this relay is controlled through a timer 60. The timer 60 may be any suitable electrical unit capable of adjustment for closing a circuit through the relay 56 at predetermined intervals and maintaining the circuit closed for a variable predetermined length of time. Let it be assumed, therefore, that the timer is set in operation through the closing of a circuit thereto including a conductor 61 having a switch 62 therein and a conductor 63. The timer controls a circuit which may be traced from the lead 50 through a conductor 64, through a closed contact 65, which will hereinafter be described, through a conductor 66 into the timer and from the timer through a conductor 67, the relay 56, a conductor 68, to the lead 51. Energization of the relay 56 will make the contact 57, completing a circuit including the relays 53, which circuit may be traced from the lead 50 through a conductor 69, contact 57, a conductor 70, which extends to each of the relays 53. This circuit may be continued through the relays 53, a conductor 71 connected electrically to all the relays 53, which conductor is electrically connected to the lead 51. Energization of the relays 53 will make the contacts 54, completing the solenoid circuits from lead 50 through a conductor 72, the contacts 54 to their respective solenoids 38, through the solenoid and through a conductor 73 to the lead 51.

Thus far the wiring diagram illustrates control means for the control apparatus associated with each branch conveyor and through this control means the branch conveyors may be opened for movement of their trays onto the main conveyor 15 simultaneously. With this arrangement the length of time the timer 60 is effective in maintaining the circuit closed for energizing the solenoids 38 may be determined by the speed of travel of the trays on the branch conveyor as well as the main conveyor, the dimensions of the trays, their spaces from each other, and the distance the branch conveyors are disposed from each other, to determine the number of trays that can be moved onto the main conveyor from the branch conveyors simultaneously. In the present instance four trays are moved from each branch conveyor onto the main conveyor, after 75

which the circuits are opened, allowing the weights 35 of each apparatus or unit to move their respective arm 19 into the path of the trays on the branch conveyor associated therewith.

5 This condition is maintained until the last tray on the main conveyor passes the branch conveyor 14, the time required for which has been determined and the timer set so that the circuits are again closed to energize the solenoids 38 to actuate the mechanisms for moving the arms 19 free of the trays on the branch conveyor and allow them to feed simultaneously on the main conveyor.

In Fig. 6 the controlling portion 74 of the main conveyor between the bends 75 and 76 represents a station where the trays are to be removed or to be examined and passed on to another conveyor, 77. To eliminate the possibility of the trays jamming at the juncture of the branch and main conveyors, which might occur if the trays at the control portion 74 are not removed with sufficient rapidity, a further control means is conditioned to render the timer 60 ineffective to hold the circuit through the relay 56 closed for the said predetermined period of time. This means consists of switches 80, 81 and 82 connected in series to control a locking relay means for making and breaking the contact 65. This locking relay means is shown schematically in Fig. 5 and consists of a lever 85, which is conditioned to continue the circuit from conductor 64 to the contact 65 at one end thereof while the other end of the lever has a cam latch formation as shown. By the term "cam latch formation" it is meant that the lever has a flat upper surface conditioned to engage a lug carried by a latch 86, while the lower portion thereof is curved in the form of a cam surface to engage the lug of the latch also when the latch has been moved into open position to release the lever 85. It will be noted that the lever 85 is pivoted adjacent the latch engaging end, while the latch is pivoted adjacent the end farthest from the lever. Springs 89 and 90 are respectively connected to the lever 85 and the latch 86, the spring 89 tending to move the lever into open position, that is, to move the lever away from the contact 65, while spring 90 normally urges the latch 86 into closed position.

The switches 80, 81 and 82 are of the spring actuated type, to normally close the upper contacts thereof (Fig. 5) to complete a circuit from the lead 50 through a conductor 92 through the upper contacts of the switches 80, 81 and 82, respectively, through a conductor 93, a relay 94, and through a conductor 95 to the lead 51. Therefore, let it be assumed that there are no trays 27 in the control portion 74 and that all of the switches 80, 81 and 82 are in their normal positions with the upper contacts closed, completing the circuit to energize the relay 94 to move the lever 85 about its pivot to close the circuit at the contact 65 and render the latch 86 operable to hold the lever 85 against movement, the end of the lever engaging the lug on the latch. As the trays move into the controlling portion 74 the switch 80 is first actuated, but this will have no effect on the locking relay means associated with the contact 65, due to the fact that all three switches 80, 81 and 82 must be actuated at the same time by trays, as shown in Fig. 6, to complete a circuit from the lead 50 through a conductor 98, the lower contacts of the switches 82, 81 and 80, respectively, through a conductor 99 to a relay 100 and a conductor 101 to the lead 51, resulting in the movement of the latch 86,

due to the energization of the relay 100, to release the lever 85 for movement by its spring 89 to break the contact 65. Therefore, with this arrangement the mechanism may be conditioned for operation when all of the trays at the control position have been removed and trays may be fed at definite intervals from the branch conveyors to the main conveyor through the operation of the control apparatus at each branch, as long as the trays are removed from the control position with sufficient rapidity to avoid operation of all three switches 80, 81 and 82. However, should the operator fail to remove the trays at the control position and all three switches should be operated by the trays at that position, the contact 65 will be broken through the energization of the relay 100, thus deenergizing the solenoids 38 to the various control apparatuses to stop further trays from moving on to the main conveyor regardless of whether or not the timer 60 has completed its cycle. The conveyors will continue to operate, however, moving the trays which are on the main conveyor to the control position, causing repeated actuation of the switches 80, 81 and/or 82 until all of the trays have been removed from the main conveyor before the contact 65 can again be made to energize the solenoids 38 of the control apparatuses. This control means, therefore, eliminates any possibility of the trays jamming, as they enter the main conveyor, and by having three or more switches in the control portion of the main conveyor it is not possible for the operator to condition the apparatus to allow other trays to enter the main conveyor until all of the trays on the main conveyor have been removed, due to the fact that the continued movement of the main conveyor causes the trays thereon to actuate the switches in the control portion faster than it is possible for the operator to remove the trays to release the switches.

The embodiment or species shown in Figs. 3 and 4 consists of an arm 110 supporting a roller 111 at one end thereof and mounted upon the upper end of a vertical shaft 112 at the other end thereof. The shaft 112 extends through bearings of a bearing bracket 113 secured to the frame 11 of one of the branch conveyors. A lever 115, which in the present instance is formed of sheet metal of the general contour shown in Figs. 1 and 2, is mounted upon the lower end of the shaft 112. The mounting means for the lever consists of a sleeve 116 fixed to the lever adjacent the aperture through which the shaft 112 extends and carrying a set screw 117 to secure the lever to the shaft. The end of the lever beneath the roller 111 has a threaded rod 118 extending through an aperture therein and held in any desired adjusted position relative to the lever by means of a wing nut, or the like, 120. The inner end of the rod 118 is connected to one end of a spring 121, the other end of the spring being fixed to the frame 11 of the conveyor. The tension of the spring may be varied by adjusting the nut 120 on the rod 118.

The other end of the lever 115 has a flat table-like surface for a purpose hereinafter described. A solenoid 138 having a core 139 is mounted upon a frame 140, which in turn is mounted upon the frame 11 of the conveyor.

The operation of this species is similar to the operation of the species shown in Figs. 1 and 2. As shown in Figs. 3 and 4, the apparatus is in closed position, with the roller 111 extending across the path of the trays 27 on the conveyor

to hold the trays against movement onto the main conveyor 15. Upon the energization of the solenoid 138 the core 139 will be moved upwardly, freeing the lever 115 for movement beneath the core. When the core 139 is withdrawn from engagement with the lever the force of the trays against the roller 111 is sufficient to move the roller outwardly, move the arm 110 clockwise (Fig. 3), and impart a similar movement to the shaft 112 and the lever 115 against the force of the spring 121. The force of the spring 121 is, therefore, not sufficient to interfere with the movement of the trays on the branch conveyor once the core 139 has been moved free of the lever 115, and this operation takes place as soon as the core is removed by the energization of the solenoid. As shown in Fig. 6, the trays are spaced upon the conveyors, this spacing existing on the branch conveyors as well as on the main conveyors, and after each tray on the branch conveyor has passed the roller 111, the roller riding upon the adjacent surface of the tray, the tray will free the mechanism so that the spring 121 will return it to the position shown in Fig. 3. The roller, the arm, the shaft and the lever, therefore, move into and out of closed position during the movement of the trays on the branch conveyor until the solenoid 138 is deenergized, allowing the core 139 to drop into the position to hold the lever 115 and the associated parts against further movement. If the solenoid 138 should be deenergized during the time the lever is positioned therebeneath the solenoid will drop upon the lever but will not interfere with its movement until the tray, which has caused the lever to move into this position, has moved past the roller 111, freeing the mechanism so that the spring 121 can return it to its normal position shown in Fig. 3. The core 139 will, therefore, ride upon the lever 115 until the lever and the associated parts are returned to their normal position, at which time the core will drop alongside the lever as shown in Fig. 4, preventing further movement of the apparatus and holding the roller 111 against movement and in the path of the next approaching tray.

The apparatus shown in Figs. 3 and 4 may be substituted for the apparatus shown in Figs. 1 and 2 in the illustrations shown in Figs. 5 and 6. Therefore, if an apparatus as shown in Figs. 3 and 4 is mounted upon each branch conveyor adjacent the juncture thereof with the main conveyor 15 and the solenoid of each apparatus connected in the circuits shown in Fig. 5 in place of the solenoids 38 and their respective cores 37, the same results may be accomplished as set forth in the foregoing description regarding the operation of the apparatus shown in Figs. 1 and 2.

The embodiments of the invention herein disclosed are illustrative only and may be modified and departed from in many ways without departing from the spirit and scope of the invention as pointed out in and limited only by the appended claims.

What is claimed is:

1. An apparatus for controlling the movement of articles from a plurality of moving branch conveyors onto a moving main conveyor comprising a control unit for each branch conveyor, an element in each unit movable into and out of the path of the articles on its respective branch conveyor to hold the articles thereon against movement, and a timing unit operable to render the elements ineffective at predetermined intervals of time to free a definite number of articles for

movement from each of the branch conveyors to the main conveyor.

2. An apparatus for controlling the movement of articles from a plurality of moving branch conveyors onto a moving main conveyor comprising a control unit for each branch conveyor, an element in each unit movable into and out of the path of the articles on its respective branch conveyor to hold the articles thereon against movement, and means to simultaneously render the elements effective at predetermined intervals of time to free the articles for movement from their branch conveyors to the main conveyor.

3. An apparatus for controlling the movement of articles from a plurality of moving branch conveyors onto a moving main conveyor comprising a control unit for each branch conveyor, an element in each unit movable into and out of the path of the articles on its respective branch conveyor to hold the articles thereon against movement, electrically operated means in each unit to control the respective elements, and a timing unit operable to cause energization of the electrically operated means at definite intervals of time to render the elements ineffective at predetermined intervals of time to free the articles for movement from their branch conveyors to the main conveyor.

4. An apparatus for controlling the movement of articles from a plurality of moving branch conveyors onto a moving main conveyor comprising a control unit for each branch conveyor, an element in each unit movable into and out of the path of the articles on its respective branch conveyor to hold the articles thereon against movement, and means to energize the electrically operated means simultaneously to render the elements effective at predetermined intervals of time to free the articles for movement from their branch conveyors to the main conveyor.

5. An apparatus for controlling the movement of articles from a plurality of moving branch conveyors onto a moving main conveyor comprising an element movable into and out of the path of articles on each branch conveyor to hold articles thereon against movement, and means operable at definite time intervals to cause actuation of the elements to free the articles from the branch conveyors simultaneously for movement thereof to the main conveyor at predetermined like intervals of time.

6. An apparatus for controlling the movement of articles from a plurality of moving branch conveyors onto a moving main conveyor, the latter having a control portion, an element movable into and out of the path of articles on each branch conveyor to hold articles thereon against movement, an electrical unit for controlling each element, means to condition the electrical units for operation to cause the elements to free the articles on their respective branch conveyors for movement onto the main conveyor at definite intervals, and means actuated by the articles at the control portion of the main conveyor to render the said conditioning means ineffective.

7. An apparatus for controlling the movement of articles from a plurality of moving branch conveyors onto a moving main conveyor, the latter having a control portion, an element mounted for movement in the path of articles on the moving branch conveyors to hold the articles against

movement thereon, an electrical unit for controlling each element, means to condition the electrical units for operation to cause the elements to free the articles on their respective branch conveyors for movement onto the main conveyor at definite intervals, a plurality of switches normally operable in one direction disposed adjacent the said control portion and conditioned to be operated in another direction by the articles, and means controlled by the operation of all the switches in one direction to render the conditioning means ineffective for operation of the electrically operated means.

8. An apparatus for controlling the movement of articles from a plurality of moving branch conveyors onto a moving main conveyor, the latter having a control portion, an element movable into and out of the path of articles on each branch conveyor to hold articles thereon against movement, an electrical unit for controlling each element, means to condition the electrical units for operation to cause the elements to free the articles on their respective branch conveyors for movement onto the main conveyor at definite intervals, a plurality of switches normally operable in one direction disposed adjacent the said control position and conditioned to be operated in another direction by the articles, and means controlled by the operation of all the switches in one direction to render the conditioning means inoperative.

9. An electrical circuit for controlling the movement of articles onto a conveyor having a control station, the control circuit including solenoid operating means to control movement of articles onto the conveyor, a timer to cause operation of the solenoid operating means intermittently to free the articles for movement onto the conveyor at definite intervals, and a series of switches disposed at spaced positions adjacent the control station to render the timer ineffective upon actuation of all the switches by the articles.

10. An electrical circuit for controlling the movement of articles onto a conveyor having a control station, the control circuit including solenoid operating means to control movement of articles onto the conveyor, a timer to cause operation of the solenoid operating means intermittently to free the articles for movement onto the conveyor at definite intervals, an electrical unit to control the timer, and a series of switches disposed at spaced positions adjacent the control station to actuate the electrical unit to render the timer ineffective upon actuation of all the switches by the articles.

11. An electrical circuit for controlling the movement of articles onto a conveyor having a control station, the control circuit including solenoid operating means to control movement of articles onto the conveyor, a timer to cause operation of the solenoid operating means intermittently to free the articles for movement onto the conveyor at definite intervals, an electrical unit to control the timer, and a series of switches disposed at spaced positions adjacent the control station normally operable to actuate the electrical unit to render the timer effective and operable by the articles to actuate the electrical unit to render the timer ineffective.

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