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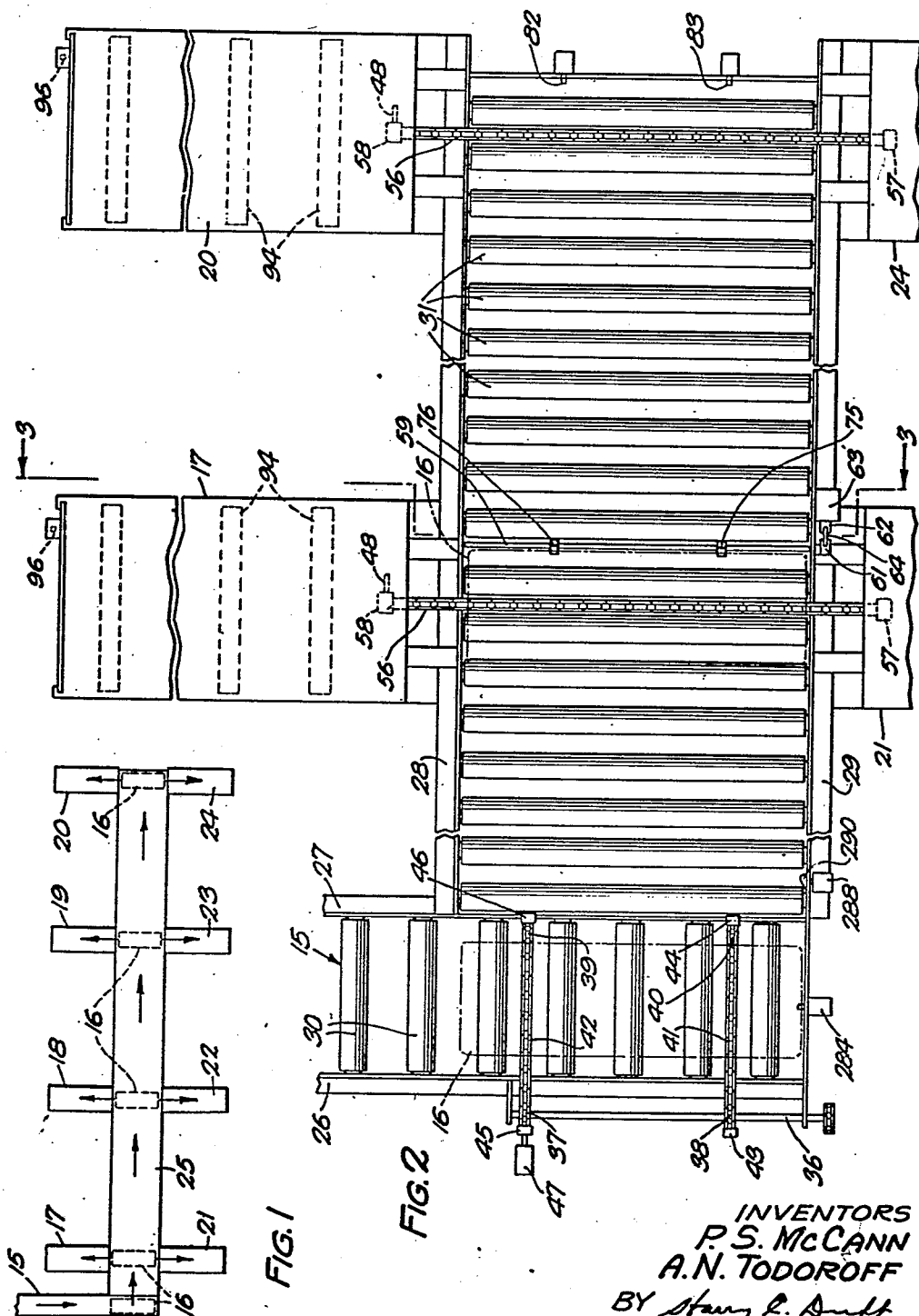
P. S. McCANN ET AL

2,362,079

CONVEYER APPARATUS

Filed Dec. 12, 1942

6 Sheets-Sheet 1



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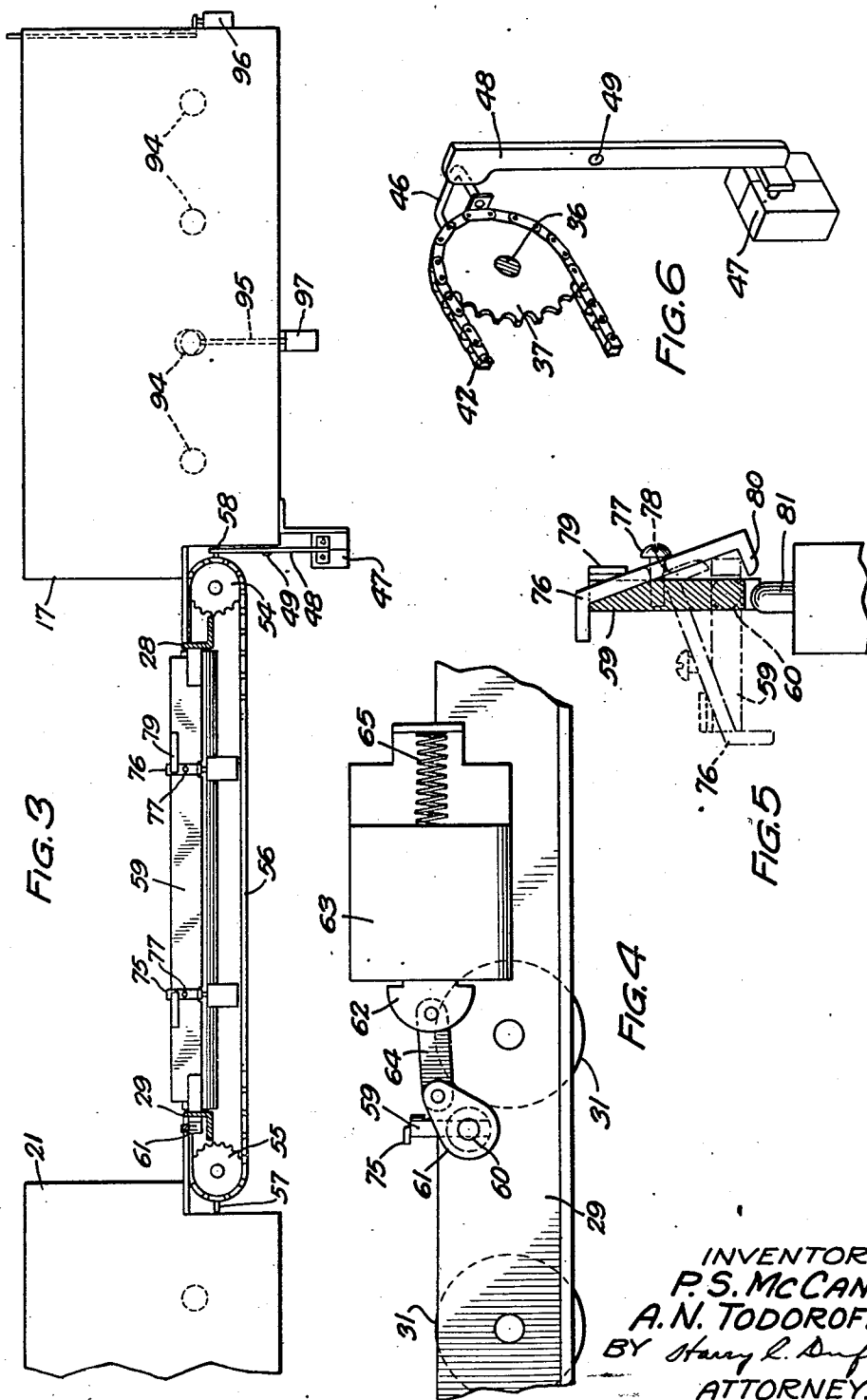
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CONVEYER APPARATUS

Filed Dec. 12, 1942

6 Sheets-Sheet 2



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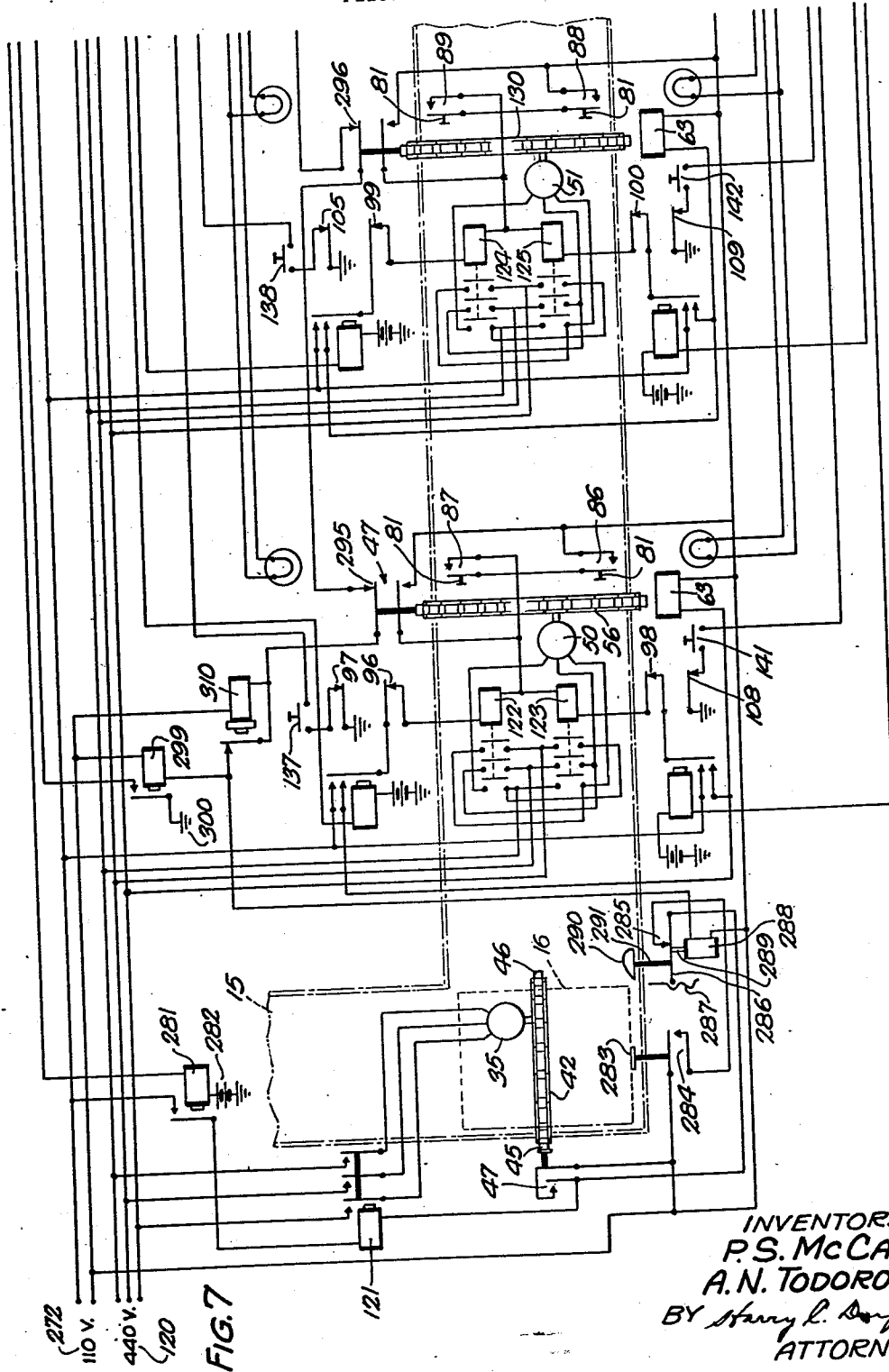
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CONVEYER APPARATUS

Filed Dec. 12, 1942

6 Sheets-Sheet 3



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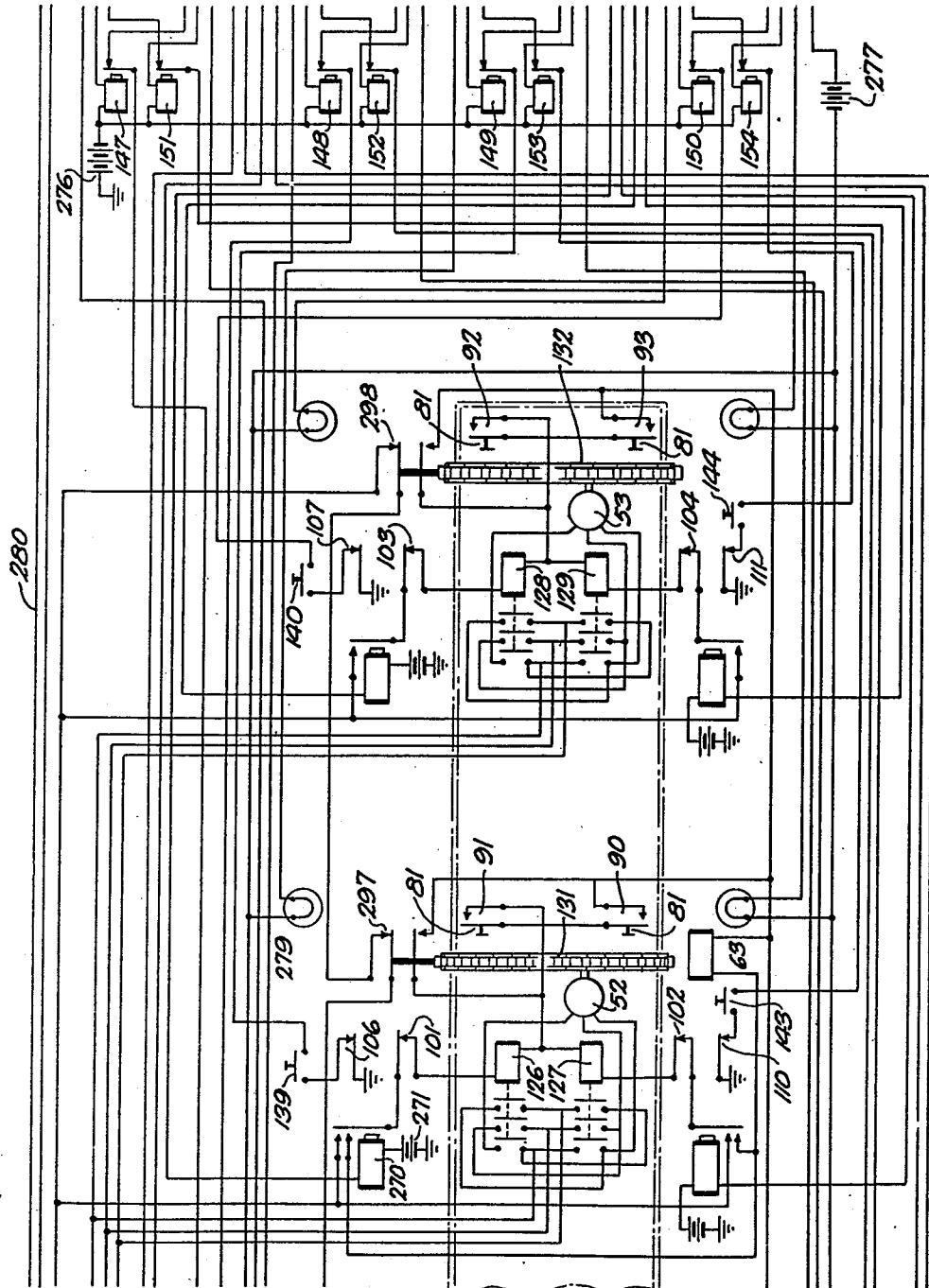
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CONVEYER APPARATUS

Filed Dec. 12, 1942

6 Sheets-Sheet 4



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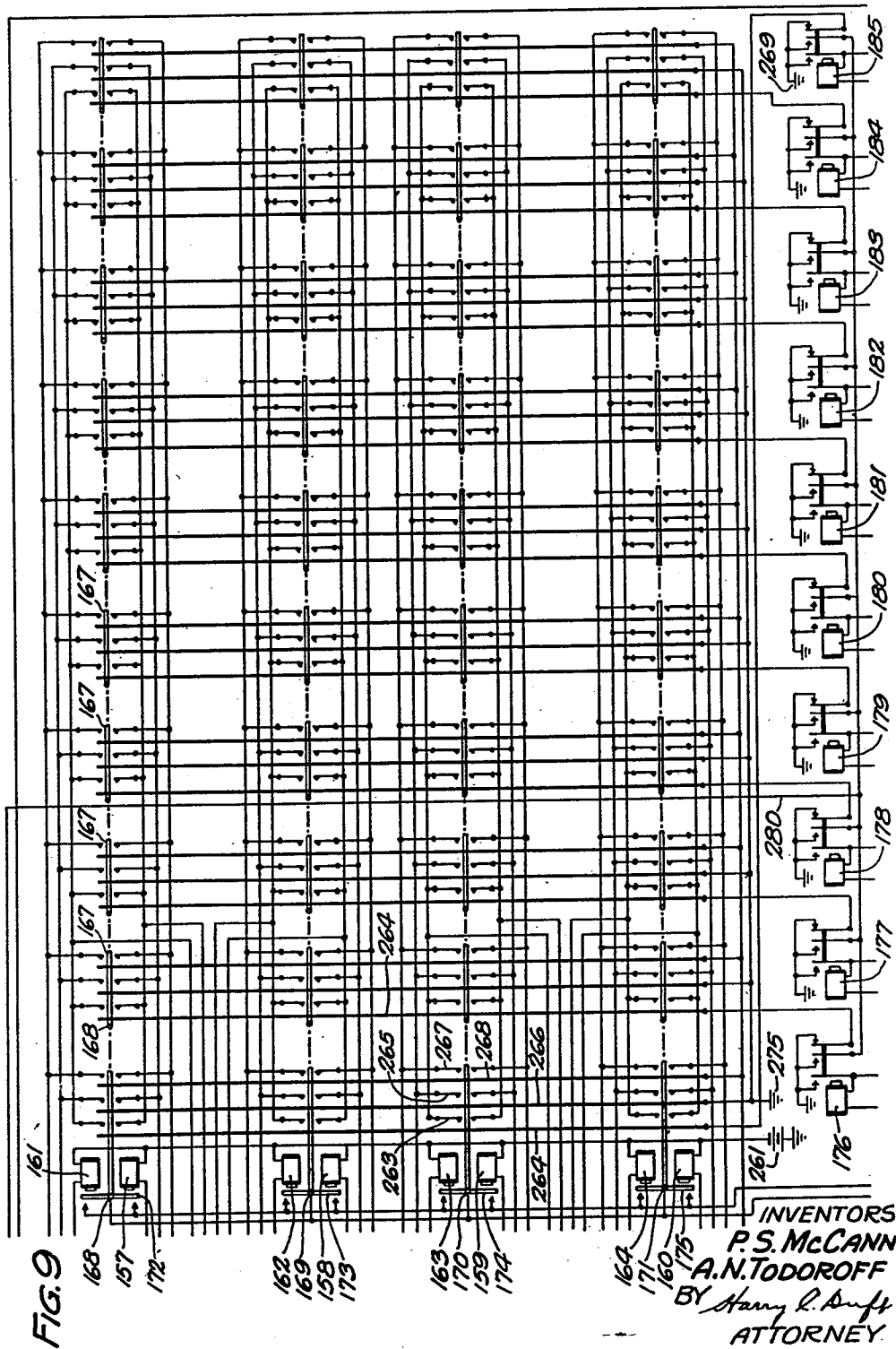
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Filed Dec. 12, 1942

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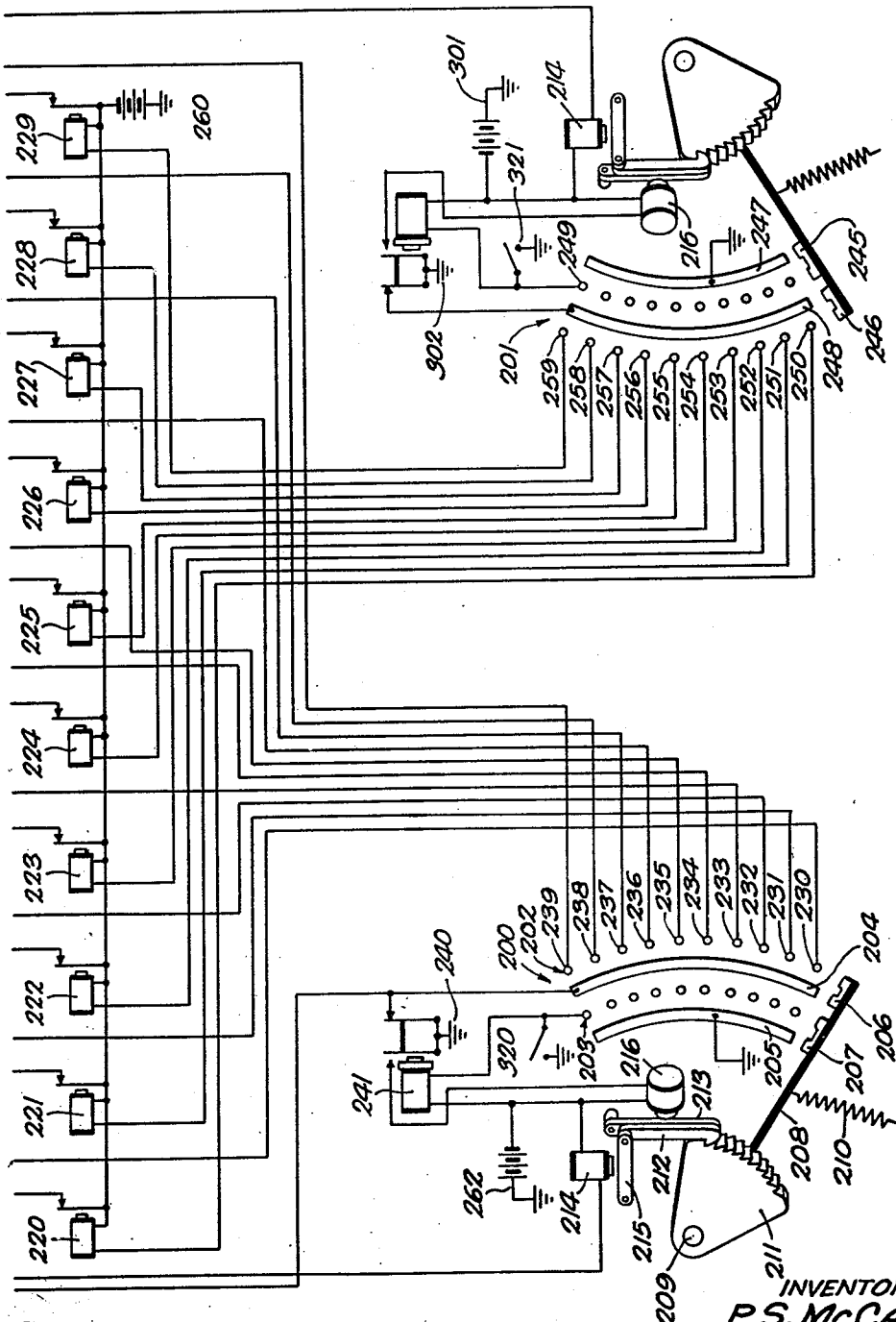


FIG. 10

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UNITED STATES PATENT OFFICE

2,362,079

CONVEYER APPARATUS

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Application December 12, 1942, Serial No. 468,790

14 Claims. (Cl. 214—11)

This invention relates to a conveyer apparatus and more particularly to apparatus for controlling the delivery of articles to a plurality of stations in the order in which the stations call for them.

It is an object of the present invention to provide an apparatus for sequentially controlling the destination of articles on a conveyer.

In accordance with one embodiment of the invention, as applied to a conveyer for transporting trays of articles to a series of processing ovens, there is provided a call button adjacent each oven, which, when operated, will register the call and initiate the operation of automatic circuit connections to cause articles to be delivered to stations in the sequence in which the call buttons associated therewith are operated. The circuits set up upon operation of the call buttons are arranged to register the order of operation of the call buttons and then control various motor controlling switches adjacent the ovens in a variable sequence to cause the conveyer to deliver articles to the proper ovens in accordance with the sequence in which the call buttons were operated.

A better understanding of the invention may be had by reference to the following detailed description when considered in conjunction with the accompanying drawings, wherein

Fig. 1 is a schematic diagram of a conveyer system which the apparatus of the present invention is adapted to control;

Fig. 2 is an enlarged fragmentary plan view of a portion of the conveyer system shown in Fig. 1; parts being broken away to conserve space;

Fig. 3 is a vertical sectional view taken substantially along the line 3—3 of Fig. 2 in the direction of the arrows;

Fig. 4 is a detail view of a solenoid actuated stop utilized in the operation of the control mechanism;

Fig. 5 is an enlarged fragmentary sectional view through one of the solenoid actuated stops showing a switch mechanism forming a part of the control circuit;

Fig. 6 is a fragmentary detail view in perspective of a portion of the conveyer mechanism and a switch associated therewith for controlling parts of the control circuit;

Figs. 7 and 8 are circuit diagrams showing portions of the various control circuits for the apparatus, the relative position of the conveyer per se being shown in dot and dash lines and when Figs. 7 and 8 are placed side by side, with Fig. 8 to the right of Fig. 7, they show that por-

tion of the circuit particularly associated with the oven positions along the conveyer; and

Figs. 9 and 10 show further details of the circuit and when Fig. 9 is placed at the right of Fig. 8 and Fig. 10 is placed beneath Fig. 9, the combination of Figs. 7, 8, 9 and 10 illustrates the entire circuit comprising one embodiment of the control apparatus constituting the present invention.

Referring to the drawings, wherein like reference characters designate the same parts throughout the several views, particular reference being had to Figs. 1 to 6, inclusive, showing the mechanical equipment and arrangement of the conveyer and its associated switches, there is provided a main conveyer 15, down which trays 16 are to be fed for transference to ovens 17, 18, 19, 20, 21, 22, 23 and 24 by a cross conveyer 25. The conveyers 15 and 25 include frameworks composed of angle iron supports 26 and 27 and 28 and 29, which support driven rollers 30 and 31, respectively.

The tray 16 is substantially rectangular in configuration and will be fed down the main conveyer 15 to the position illustrated at the left side of Fig. 2 and if an operator at one of the stations 17 to 24 has signified that he wants a tray fed to him, as will be described hereinafter, a tray 16 will then be fed transversely of its length across the cross conveyer 25 to the oven, where an operator has signified his want for a tray. The structural features of the conveyers 15 and 25 are relatively unimportant herein and have not been shown in great detail, it being sufficient to know that the tray is fed longitudinally down the conveyer 15 to a position in alignment with the conveyer 25 and thereafter may be fed across the conveyer 25 a distance controlled by the control circuit to be described in detail hereinafter.

At the juncture of the main conveyer 15 and the cross conveyer 25, there is provided a mechanism which may be operated to push a tray 16 off the rollers 30 and onto the rollers 31 upon the operation of the proper circuit control. This mechanism includes a motor 35 (Fig. 7—not shown in Fig. 2) which drives a shaft 36 (Fig. 2). The shaft 36 (Fig. 2) is suitably journaled on the angle iron support 26 and drives a pair of sprockets 37 and 38. The sprockets 37 and 38 cooperate with idler sprockets 39 and 40 to support chains 41 and 42. The chains 41 and 42 are, in turn, equipped with feed dogs 43 and 44 and 45 and 46, which will drive the tray 16 off the rollers 30 and onto the rollers 31 when the motor

35 is operated. In Figs. 7 and 8, only one of the chains 41 and 42 is illustrated; that is, the chain 42, whose attached feed dogs 45 and 46, in addition to feeding the tray 16 across the conveyor 15 by sliding it on the rollers 30, control a switch 47 in the circuit of the apparatus. While the feed chains 41 and 42 may be of any suitable type, one form of chain is illustrated in Fig. 6, wherein the relation of the chain, sprocket and dog with a switch are illustrated. For purposes of illustration, the sprocket 37, chain 42, dog 46 and switch 47 have been chosen. As shown in this figure, the sprocket is fixed to the shaft 36 and the dog 46 engages a spring actuating lever 48, which is pivoted at 49 in any suitable manner and when engaged by the dog 46, will actuate the switch 47.

In the mechanical portion of the apparatus, which constitutes a part of the present invention, the trays 16, after being fed onto the cross conveyor 25, may be stopped adjacent any pair of ovens 17 and 21, 18 and 22, 19 and 23, or 20 and 24, and, when stopped adjacent the ovens, will be selectively pushed into the particular oven the operator of which has called for a tray. The mechanism for performing this operation is substantially the same adjacent all of the ovens, being of identical construction adjacent the first three sets of ovens and of slightly different construction adjacent the ovens 20 and 24. The motors for driving the apparatus at the ovens have not been shown in the mechanical portions of the drawings, but are indicated in the circuit, being designated 50, 51, 52 and 53. These motors are reversible and, depending upon the call button operated by an operator at a particular oven, will drive a sprocket 54 (Fig. 3) either clockwise or counter-clockwise. The sprocket 54 has cooperating with it a sprocket 55 for supporting a drive chain 56 carrying a pair of feed dogs 57 and 58 adapted to engage a tray which has been stopped above the feed chain 56 and feed it into either the oven 17 or the oven 21.

The mechanism for stopping the tray in position between any pair of ovens comprises a blocking plate 59 mounted upon an oscillatable shaft 60 and normally held below the upper level of the rollers 31, the shaft 60 being journaled for oscillation in the angle iron supports 28 and 29. The shaft 60 has fixed to it a lever 61, which is interconnected with a plunger 62 of a solenoid 63 by a link 64. As shown in Fig. 4, the solenoid 63 is energized and has drawn the plunger 62 to the right, thereby to move the blocking plate 59 into the path of a tray 16. In the deenergized position, the solenoid 63 will push the blocking plate 59 out of the path of the tray 16 since a spring 65 is provided for normally holding the plunger 62 in a position to the left of that shown in Fig. 4 as is usual in such apparatus.

As a tray moves across the cross conveyor 25, there is a possibility that it will not maintain proper alignment transversely of the conveyor, and, accordingly, each of the blocking plates 59 is equipped with a pair of spaced switch actuating levers 75 and 76. These switch actuating levers are loosely mounted on the blocking plate 59 by means of machine screws 77, which are threaded into the blocking plates 59 and enter into loose fitting apertures 78 in the levers 75 and 76 so that the levers may be rocked clockwise, as shown in Fig. 5, upon being engaged by a tray 16 moving along the conveyor. The levers 75 and 76 are urged to the position shown in Fig. 5 by leaf springs 79 fixed to the blocking plates 59 so that

the levers 75 and 76 are normally held in the position shown in Fig. 5, but may be rocked from that position to move their longest portions into a substantially vertical position. The lower ends of the levers 75 and 76 are bent over to form a camming portion 80, which, when its associated lever is rocked clockwise by a tray, will actuate a plunger 81 of a switch associated therewith. There is a blocking plate 59 associated with each pair of ovens 17 and 21, 18 and 22 and 19 and 23 and associated with the pair of ovens 20 and 24, there are two switch actuating plungers 82 and 83 extending into the cross conveyor 25 and adapted to be engaged directly by a tray 16 which travels to the end pair of ovens. This construction is provided since the pair of ovens 20 and 24 are located at the end of the cross conveyor 25 and there is no necessity for moving the switch actuating mechanism out of the path of a tray since any tray which reaches the end of the conveyor will be fed to either the oven 20 or the oven 24. The construction of the blocking plate 59 at each of the pairs of ovens is identical, and, accordingly, only the switches actuated by the trays at the ovens are shown in the circuit schematic. By reference to Figs. 7 and 8, it will be seen that the plungers 81 adjacent each pair of ovens control switches 86 to 93, the switches being located in pairs adjacent the pair of ovens.

As illustrated somewhat diagrammatically in Fig. 3, the oven 17 has rollers 94 positioned in it onto which a tray 16 may be pushed and one of the rollers 94 is positioned for movement by a tray 16 to actuate a switch operating plunger 95. When a tray enters the oven 17, in addition to the switch operating plunger 95, each of the ovens is provided with a rear door switch, the oven 17 having the rear door switch 96 associated with it. This switch will be closed when the oven door is closed and the oven is prepared to receive a tray. The switch actuating plunger 95 is duplicated in each of the ovens and the plunger 95 in the oven 17 controls a normally closed switch 97, which is opened to prevent an operator from calling for a tray when there is already a tray in his oven. The switch 96 serves the purpose of preventing the operation of the motor 50 (Fig. 7) when the oven door is open, and this switch is a normally open switch closed by the oven door. There is a switch similar to the switch 96 associated with each oven and these switches are indicated in Figs. 7 and 8 with the reference numerals 98, 99, 100, 102, 103 and 104 associated with the ovens 21, 18, 22, 19, 23, 20 and 24, respectively. Similarly there is an oven roller actuated switch similar to the switch 97 associated with each of the oven 18 to 24 and these switches are designated in Figs. 7 and 8 with the reference numerals 105, 106, 107, 108, 109, 110 and 111, respectively.

Power for driving the motor 35 at the mat conveyor and the motors 50, 51, 52 and 53 is supplied from a 440 volt A. C. source 120, the motor 35 always being driven in one direction as the power line from source 120 is connected to it through the make contacts of a relay 121, where as the motors 50, 51, 52 and 53, are reversible motors and have the power supply from the source 120 connected to them to drive them in opposite directions by the closure of contacts of relays 122, 123, 124, 125, 126, 127, 128 and 129. The motor 50 has the relays 122 and 123 associated with it and will be driven in one direction when relay 122 is energized and in the opposite direction when relay 123 is energized. The relay

124 and 125, 126 and 127 and 128 and 129 control the motors 51, 52 and 53, respectively, in a similar manner. When the motors 50, 51 and 52 or 53 operate under control of one of the reversing relays 122 to 129 associated with them, they will drive their associated drive chains 56, 130, 131 and 132 in a direction depending upon the associated reversing relay that has been energized to feed parts off the cross conveyor 25 into the ovens 17 to 24.

In addition to the switches controlled by the oven doors and the switches controlled by the rollers in the ovens, each of the ovens 17 to 24, inclusive, has associated with them call buttons 137 to 144, respectively. These call buttons are operable to connect ground through their associated switches 97, 105, 106, 107, 108, 109, 110 and 111, respectively, and through the normally closed contacts of relays 147, 148, 149, 150, 151, 152, 153 and 154, respectively, to the windings of electromagnets 157, 158, 159, 160, 161, 162, 163 and 164, respectively. The electromagnets 157 to 164 form a part of a co-ordinate switching mechanism, as illustrated in Fig. 9, wherein pairs of electromagnets control the positioning of interposer members 167. There are ten interposer members 167 mounted upon each of a series of shafts 168, 169, 170 and 171 and the shafts 168, 169, 170 and 171 are attached to armatures 172, 173, 174 and 175. The armature 172 is positioned for actuation by either the electromagnet 157 or 161, the armature 173 is positioned for actuation by either the electromagnet 158 or electromagnet 162, the armature 174 is positioned for actuation by either the electromagnet 159 or the electromagnet 163 and the armature 175 is positioned for actuation by either the electromagnet 160 or the electromagnet 164. The armatures 172 to 175, inclusive, are each of the same construction and each carries on its shaft, as pointed out hereinbefore, ten of the interposer members 167, which are in the form of light springs that will be moved with the armature when it is attracted by either one of its associated electromagnets to rock the shafts and the interposer members 167 either clockwise or counter-clockwise, depending upon which of the electromagnets associated therewith is operated. The interposer members 167 are made in the form of springs so that after one of the electromagnets 157 to 164 has been energized for controlling the position of its associated interposer members across the horizontal of the co-ordinate system shown in Fig. 9 and one of ten electromagnets 176 to 185, inclusive, associated with the vertical operating portions of the co-ordinate switching system has been energized, the interposer member 167 will be held in the position to which it was moved by its associated electromagnet after that one of the electromagnets 157 to 164, which originally moved the interposer member to its operated position, has been released. Each of the electromagnets 176 to 185, inclusive, has assigned to it a separate vertical portion of the co-ordinate system and in each of these portions there are provided three common contacting bars into engagement with which contacts at each horizontal level may be moved by an interposer member 167 which has been displaced from normal position, as shown in Fig. 9, to one of its operated positions when an electromagnet 176 to 185 is operated. It should be noted here that switching mechanisms of this type are quite common in the telephone industry and are known as cross bar switch vertical units and these switching units are particu-

larly adaptable to effect the co-ordinate system of switching covered by the present invention. However, any suitable switching mechanism which will accomplish the desired results may be used so long as it is capable of operating in the manner just described. The patent to J. M. Reynolds, No. 1,139,722, issued May 18, 1915, illustrates an early form of such a switching mechanism and Patent No. 2,021,329, also to Reynolds, shows a later form of this type of switching mechanism which may be used in the apparatus embodying the present invention. The mode of operation of this apparatus will become more apparent as the description progresses, particularly the description of the operation of the entire system in directing trays 16 to the proper location along the cross conveyor 25. It should be noted at this time that the electromagnets 176 to 185 are, in the present embodiment of the invention, operated in a definite sequence under control of the switching mechanisms shown in Fig. 10 and when so operated, the apparatus will cause trays 16 to be delivered to the proper ovens, in accordance with the order in which the call buttons 137 to 144 are operated.

The switching mechanisms as shown in Fig. 10 comprise stepper switches 200 and 201, each having two banks of contacts. The switch 200 and the switch 201 are of the same construction and only the details of the switch 200 will be described completely. In this switch, there are provided two banks of contacts 202 and 203, each having ten contacts therein which may be selectively interconnected with bars 204 and 205 by brushes 206 and 207, respectively. The brushes 206 and 207 are mounted upon a lever 208 normally urged to rock about a pivot pin 209 in a clockwise direction by a coil spring 210. Attached to the lever 208 is a ratchet 211, which has a pair of pawls 212 and 213 associated with it. The pawl 212 is adapted to be actuated by an electromagnet 214, to the armature 215 of which the pawl 212 is attached, whereas the pawl 213 serves as a locking pawl to hold the ratchet in any of its operated positions where the brushes 206 and 207 will interconnect the contacts on the banks 202 and 203 with their associated bars 204 and 205. Both of the pawls 212 and 213 are adapted to be released from engagement with the ratchet 211 by an electromagnet 216. The structural features of the switch 201 are exactly the same as the switch 200 and the operation of these switches to effect the operation of release relays 220, 221, 222, 223, 224, 225, 226, 227, 228 and 229 and the electromagnets 176 to 185 will become apparent as the description of the operation of the circuit progresses.

In the bank of contacts 202, there are ten active contacts 230, 231, 232, 233, 234, 235, 236, 237, 238 and 239 having leads extending therefrom to one side of the windings of the electromagnets 176 to 185, respectively, for normally connecting ground at 240 successively to the windings of the various vertical controlling electromagnets 176 to 185 through the break contact of a normally de-energized relay 241. The switch 201 is provided with a pair of brushes 245 and 246, which serve to interconnect contact strips 247 and 248 with a contact 249 and one of a series of contacts 250 to 259, respectively. The contact 249 of switch 201, and the single active contact in the bank 203 of switch 200, serve as a restoring contact for restoring the respective switches to normal position by energizing their release electromagnets 216 and the contacts 250 to 259 of the switch 201 are

connected individually to one side of the windings of the release relays 220 to 229, the other side of the windings of these relays being connected to grounded battery at 260.

In the foregoing description of the apparatus provided in the present embodiment of this invention, substantially all of the mechanisms provided have been described and those which have not been described hereinbefore lend themselves better to description in describing the mode of operation of the apparatus which follows.

In the operation of the apparatus, an operator at any one of the ovens 17 to 24, inclusive, may order a tray delivered to him and the first operator ordering a tray will have his order delivered to him first. For example, if the operators at ovens 19, 17, 22 and 18 desire trays 16 delivered to them and the operators operate their call buttons 139, 137, 142 and 138 in succession, the trays will be delivered to the ovens in the same order that the call buttons are operated. When the operator at the oven 19 operates his call button 139, ground will be connected through the closed roller operated switch 106, which is closed when there is no tray in the oven, through the call button 139, normally closed contact of relay 149, to energize electromagnet 159, the other side of which is connected to grounded battery at 261. When electromagnet 159 is energized, its associated armature 174 will be rocked counter-clockwise to position the ten interposer members 167 mounted on the shaft 170 in a position such that the energization of any of the electromagnets 176 to 185, inclusive, will cause the three contacts in the fourth level from the bottom (Fig. 9) that are vertically aligned with the energized electromagnets 176 to 185, to be closed and held closed after the circuit to the electromagnet 159 is released. With the circuit in the condition illustrated in Figs. 7 to 10, electromagnet 176 will be the first electromagnet controlling the verticals of the co-ordinate switching system to be energized. As the electromagnet 159 is energized, its armature 174 will serve as a contact to complete connection between grounded battery 262 (Fig. 10), the winding of electromagnet 214, through armature 174 and its associated contact to ground at 240, relay 241 being at this time de-energized. As soon as electromagnet 214 is energized, it will attract its armature 215, thereby to cause the brushes 206 and 207 to move into engagement with the first contacts in the banks of contacts associated with them. Thus, a circuit will be closed from ground at 240 through bar 204, brush 206, contact 230, winding of electromagnet 176, break contact of relay 220 to grounded battery at 260. Thus, the electromagnet 176 will be energized and will lock energized through its lefthand locking contact, which is grounded, and the electromagnet 176 will remain locked energized until release relay 220 is energized later in the cycle of the operation of the apparatus.

If it be assumed that the four call buttons 139, 137, 142 and 138 are operated in that order and in rapid succession so that there will be an insufficient interval between the operation of the various call buttons to permit a tray to be delivered to an oven in that interval, the contacts associated with the electromagnet 176 and the interposer member 167 shifted counter-clockwise by electromagnet 159 will remain locked up, as described in detail hereinafter. However, the time required for the operation of the relays 157 to 164 will be of sufficient duration to permit the vertical controlling electromagnets 176 to 185 to

lock up the contacts in alignment therewith before the electromagnet 159 is released.

The operation of call button 137 will complete a circuit from ground through the closed contact 97, call button contacts, normally closed contact of relay 147 to energize electromagnet 157, which will again close the circuit to operate the stepper switch 200 and move the brushes 206 and 207 into engagement with their second contacts. Brush 206 will, at this time, complete a circuit from ground at 240 through contact 231, winding of electromagnet 177, normally closed contact of relay 221 to grounded battery 260, thus locking up the contacts associated with the electromagnet 177 in the first horizontal level from the top of the co-ordinate system shown in Fig. 9.

In a similar manner, the operation of call button 142 will cause the energization of electromagnet 162 and electromagnet 178 and thus effect the closure and locking up of the three contacts in vertical alignment with the electromagnet 178 and at the fourth horizontal level from the top of the co-ordinate switching system shown in Fig. 9. It should be noted that at the time of the locking up of the third level from the top in the fourth vertical group from the left, the third level from the top is still locked up in the third vertical group from the left since the interposer members 167 will be held by the electromagnet associated with their particular vertical group in spite of the fact that their associated electromagnets which move them to position have been released. Also, the operation of call button 138 will cause the three contacts at the third level from the top and in the fourth vertical group in alignment with electromagnet 179 to be closed.

The operations controlled by the groups of contacts which are selected for operation by the electromagnets 157 to 164 and are subsequently actuated by the electromagnets 176 to 185 consist of indicating to the operator that his request for a tray has been registered or stored and, thereafter, controlling the blocking means and motors adjacent the various ovens to complete the delivery of trays to the operators that have requested them in the order in which the requests were made. In each case, the corresponding contacts in a vertical area and horizontal area of the co-ordinate system perform the same functions and it is believed necessary to describe in detail the operation of only one of these sets of contacts. As soon as the first group of contacts is closed, that is, the contacts under control of electromagnet 176 and electromagnet 159, three circuits will be prepared, contact 263 will be engaged with a common contacting bar 264, contact 265 will be engaged with a contacting bar 266 and contact 267 will be engaged with a contacting bar 268. Common contacting bar 264 is connected to ground at 269 through a break contact of electromagnet 185 (Fig. 9) and when the bar 264 is engaged by the contact 263, a circuit from ground will be supplied to one side of the winding of a relay 270 (Fig. 8), the other side of the winding of which is connected to grounded battery 271. This will cause relay 270 to be energized and connect one side of a 110 volt current source 272 through rear door switch 101, if the rear door of the oven is closed, to the winding of relay 126 which controls the current supply from the 440 volt source 120 to the motor 52 and which, when operated, will cause the motor to run in a direction such that a tray 16 will be fed to the oven 19. Relay 126 will not be immediately energized, but will be held in

condition to be energized when a tray 16 engages plungers 81 and effects the closure of switches 90 and 91. Immediately upon energization of relay 270, a circuit will be completed from one side of the line running to the 110 volt source 272, through the winding of solenoid 63 to the other side of the 110 volt line. The solenoid 63 thus supplied with current is one of three similar solenoids positioned adjacent each pair of ovens.

It should be noted at this time that the energization of the electromagnet 176 broke the circuit from ground at its contacts to the common bar 264 in the second vertical group from the left and, therefore, although contacts are locked up in the second vertical group by energization of the electromagnet 177 associated therewith, these circuits will be ineffective until electromagnet 176 is released. When the solenoid 63 adjacent the oven 19 is energized, it will pull its associated blocking plate 59 up in the path of a tray, which will be fed down the cross conveyer 25 and as soon as the tray engages both of the plungers 81, contact will be made through the contacts 90 and 91 in series from one side of the line from the 110 volt source 272, through relay 126 to the other side to current source 272, thereby to energize the relay 126 and cause the motor 52 to drive the tray into the oven 19.

When contact 265 in the fifth level and first vertical group is closed, it will connect ground at 275 (Fig. 9) through the winding of relay 149 (Fig. 8), the other side of the winding of which is connected to grounded battery at 276, thereby to energize the relay 149 and break the circuit to electromagnet 159. In this manner, as soon as the electromagnet 159 has caused one of the electromagnets in the group of electromagnets 176 to 185 to be energized and thereby to lock up a contact in one of the vertical groups, the electromagnet 159 will be released and the operation of the armature 174 will be effected by the electromagnet 163.

When the contact 267 engages the common bar 268, a circuit will be completed from battery 277 (Fig. 8) through bar 268 (Fig. 9), contact 267 to a lamp 279, the other side of which is connected to the battery 277, thus indicating by a visual signal that the operator's order has been registered and that a tray will be delivered to him.

When the electromagnet 176 is energized, ground will be supplied through one of its make contacts over a lead 280 (Fig. 9), through the winding of a relay 281, the other side of the winding of which is connected to grounded battery at 282. The relay 281 controls the relay 121 and if there is a tray 16 in the position shown in dot and dash lines (Fig. 7), a plunger 283 will have closed its associated switch 284 and the energization of relay 281 will connect one side of the line from 110 volt current source 272, through the winding of relay 121, through contacts 285 normally in the position shown, through closed switch 284, to the other side of the 110 volt line at source 272. The switch 285 has a movable contact 286, which may be locked in either open or closed position by a spring 287 and the movable contact 286 may be moved to the position shown in Fig. 7 by energization of a solenoid 288, the plunger 289 of which is fixed to the movable contact 286. The movable contact 286 may be moved from the position shown in Fig. 7 by a tray 16 engaging a cam member 290, as the tray is pushed off the conveyer onto the cross conveyer 25, the cam 290 being inter-

connected with the movable contact 286 by a rod 291. In this manner, any tray 16 which engages the cam member 290 will effect the opening of switch 285 and switch 285 will be restored to its normal position, as shown, upon the energization of solenoid 288. After a tray 16 has engaged the plunger 283 and initially completed the circuit for supplying current to the relay 121, the control of the current supply to the motor 35 will be shifted to normally open switch 47, which is held open by the feed dog 45 and which will be closed as soon as the dog 45 moves out of engagement with the switch.

From the foregoing, it is believed to be apparent that each time the motor 35 is energized to feed a tray 16 off the main conveyer 15 and onto the cross conveyer 25, the motor 35 will drive its chain 42 through a complete cycle, the circuit to the motor being initially completed by the plunger 283 if a tray has been ordered by an operator and the circuit being maintained through normally open switch 47 until the dog 45 or 46 returns to open switch 47. The circuit to switch 284 will be held open by switch 285 until solenoid 288 is operated. The solenoid 288 will be energized to restore the switch 285 to the condition shown through a series of normally closed switches 295, 296, 297 and 298 associated with the drive chains 56, 130, 131 and 132. These drive chains 56, 130, 131 and 132, when in normal position, will carry their switch actuating dogs in position to hold the switches 295 (a part of the switch 47), 296, 297 and 298 closed to connect one side of the 110 volt source 272 through the switches to hold a slow-to-operate relay 310 energized. Relay 310 is provided with a break contact which, when relay 310 is de-energized, will connect one side of the 110 volt source 272 through the switches 298, 297, 296 and 295 to one side of the winding of a relay 299, the other side of the winding of which is connected to the opposite side of 110 volt source 272. The break contact of relay 310 is also connected to the winding of solenoid 288. Thus, when one of the switches 295, 296, 297 or 298, which had been opened by the operation of its associated chain dog, returns to normal, the switch 295, 296, 297 or the switch 298 will complete a circuit momentarily to relay 299 and solenoid 288. The circuit to the break contact of relay 310 will be maintained only for the "slow to operate" period of relay 310 and as soon as relay 310 breaks its contacts, the circuit to relay 299 and solenoid 288 will not be made again until one of the switches 295, 296, 297 or 298 opens and closes. Upon energization of relay 299, it will connect ground at 300 through electromagnet 214 of switch 201 to grounded battery at 301 to step the switch 261 to its first position, where brush 246 will complete a circuit from ground at 302 to contact 250 to energize release relay 220.

From the foregoing, it is believed to be apparent that relay 176 will not be restored to inoperative position until after a tray has been delivered to the oven 19, the first oven, the operator of which ordered a tray in the sequence chosen for illustration, since the relay 176 locked up initially because of the operation of the call button 139 and, upon being energized, the relay 176 prevented the operation of the motor controlling relays associated with the other ovens due to the fact that it broke the ground connection to the common bar 264 at the second vertical group in the co-ordinate switching system shown in Fig. 9.

The circuit connections completed by the selection of groups of three contacts in the co-ordinate

system under control of the electromagnets 157 to 164 will thus be opened in sequence and the switches 200 and 201 will be stepped to their various positions until they reach their tenth position. As soon as the switch 200 reaches its tenth position, the brush 207 will become effective to connect ground at the common bar 205 through the tenth contact in the bank 203 and relay 241 will operate to break the ground connection from ground at 240 to the bar 204 and to energize restoring electromagnet 216, thus permitting the lever 208 to drop back to its normal position, as shown. The relay 241 is made slow-to-operate so that the tenth contact 239 at the bank 202 will perform its function before ground at 240 is supplied to the restoring electromagnet 216. Similarly, the switch 201 will be restored to its normal position, as shown after the tenth contact 259 associated with brush 246 has energized the release relay 229. If, for any reason, it is desired to reset the switches 200 or 201 to normal position after one or more of the call buttons have been operated and the switches 200 or 201 have stepped their brushes into engagement with any one of the first nine contacts in the associated banks, restoring switch 320 or 321 may be operated manually to connect ground to the slow-to-release restoring relays 241. If, as stated in the selected example, only four call buttons are operated, the brushes of switches 200 and 201 will be stepped only four places and regardless of the interval elapsing before the next call button is operated, the switches 200 and 201 will remain in position to connect bar 204 with contact 203 and bar 248 with contact 253 unless switches 320 and 321 are operated. Thus, the fifth call button to be operated will, through switches 200 and 201, control the fifth vertical group of contacts in the co-ordinate system. Similarly, the eleventh call button operated will control the first vertical group unless switches 320 and 321 are operated at some time between the operation of the first and eleventh call buttons in sequence.

Although a specific embodiment of the invention has been described hereinbefore, it will be understood that additional stations might be serviced by the cross conveyor 25 by adding mechanism similar to those described hereinbefore as necessary and that regardless of the number of stations along the cross conveyor 25, these stations may have parts delivered to them in the order in which their operators close their respective call buttons.

What is claimed is:

1. A conveyer system comprising a main conveyer and a cross conveyer, a series of processing stations positioned in pairs on opposite sides of said cross conveyer, means for feeding articles from the main conveyer to the cross conveyer, means adjacent each pair of processing stations for blocking movement of articles beyond said processing stations, means operable in either of two directions for feeding articles off the cross conveyer to the processing stations on opposite sides of the cross conveyer, a plurality of call buttons, one adjacent each processing station, an electrical switching mechanism operable under control of said call buttons to register the sequence of operation of the call buttons, and means controlled by said switching mechanism for controlling the feeding of articles from the main conveyer to the cross conveyer and for controlling the direction of operation of the means for feeding the articles off the cross conveyer to the processing stations.

2. The combination with a plurality of processing machines of a conveyer apparatus for selectively feeding articles to said processing machines comprising means adjacent each processing machine for feeding parts into the processing machine, means for stopping articles adjacent the processing machines, signalling mechanism adjacent each processing machine and operable in any desired sequence, and means controlled by said signalling means for controlling the stopping means and the means for feeding articles to the processing machines in the same sequence that the signalling means are operated.

3. The combination with a plurality of processing machines of a conveyer apparatus for selectively feeding articles to said processing machines comprising means adjacent each processing machine for feeding parts into the processing machine, means for stopping articles adjacent the processing machines, signalling mechanism adjacent each processing machine and operable in any desired sequence, means controlled by said signalling means for controlling the stopping means and the means for feeding articles to the processing machines in the same sequence that the signalling means are operated, and means on said stopping means for preventing operation of the means for feeding articles to the processing machines until the articles are in proper registry for said feeding.

4. The combination with a plurality of processing machines of a conveyer apparatus for selectively feeding articles to said processing machines comprising means adjacent each processing machine for feeding parts into the processing machine, means for stopping articles adjacent the processing machines, signalling mechanism adjacent each processing machine and operable in any desired sequence, means controlled by said signalling means for controlling the stopping means and the means for feeding articles to the processing machines in the same sequence that the signalling means are operated, and means operable by an article on the main conveyer reaching a predetermined position for initiating the operation of feeding an article from a main conveyer to the cross conveyer.

5. The combination with a plurality of processing machines of a conveyer apparatus for selectively feeding articles to said processing machines comprising means adjacent each processing machine for feeding parts into the processing machine, means for stopping articles adjacent the processing machines, signalling mechanism adjacent each processing machine and manually operable in any desired sequence, means controlled by said signalling means for controlling the stopping means and the means for feeding articles to the processing machines in the same sequence that the signalling means are operated, and means controlled by an article entering the conveyer for preventing the feeding of another article thereto until the first fed article is fed into the processing machine.

6. A conveyer controlling circuit including a plurality of contacting mechanisms arranged in vertical groups and horizontal rows, manually operable means associated with said rows, one of said manually operable means being individual to one of said rows, and means operable in a predetermined cyclic order for associating all of the manually controlled means with each vertical group of contacting mechanisms for registering the order in which the manually operable means are operated.

7. A conveyer controlling circuit including a plurality of contacting mechanisms arranged in vertical groups and horizontal rows, manually operable means associated with said rows, one of said manually operable means being individual to one of said rows, means operable in a predetermined cyclic order for associating all of the manually controlled means with each vertical group of contacting mechanisms for registering the order in which the manually operable means are operated, and means controlled by the contacting mechanisms for selectively operating a conveyer.

8. A conveyer controlling circuit including a plurality of contacting mechanisms arranged in vertical groups and horizontal rows, manually operable means associated with said rows, one of said manually operable means being individual to one of said rows, means operable in a predetermined cyclic order for associating all of the manually controlled means with each vertical group of contacting mechanisms for registering the order in which the manually operable means are operated, and means controlled by the contacting mechanisms for blocking movement of articles along the conveyer.

9. A conveyer for carrying trays of articles to a plurality of processing machines comprising a main feed conveyer, a cross conveyer extending between two rows of processing machines positioned in pairs on opposite sides of the cross conveyer, means for feeding a tray from the main conveyer to the cross conveyer, a blocking means on the cross conveyer adjacent each pair of processing machines, means for moving the blocking means into the path of trays moving on the cross conveyer, reversible mechanism adjacent each pair of processing machines for selectively driving trays to either one of the adjacent processing machines, a coordinate switching system for controlling the operation of the means for moving the blocking means and the reversible mechanisms, and manually operable means adjacent the processing machines for controlling the sequence of operation of the co-ordinate switching mechanism.

10. In a conveyer for feeding trays to processing machines, a cross conveyer for feeding trays to position between pairs of processing machines reversible mechanisms, one for each pair of machines, for moving trays off the cross conveyer into a selected machine, a plurality of contacting mechanisms arranged in vertical groups and horizontal rows, manually operable means associated with each machine and with said rows, one of said manually operable means being individual to one of said rows, means operable in a predetermined cyclic order for associating all of the manually controlled means with each vertical group of contacting mechanisms for registering the order in which the manually operable means are operated, and means interconnecting the reversible mechanisms with the contacting mechanisms for operating the reversible mechanisms in accordance with the sequence of operation of the manually operable means.

11. In a conveyer for feeding trays to processing machines positioned at opposite sides of the conveyer, selectively operable blocking means positioned between pairs of machines on opposite sides of the conveyer, means for controlling the operation of said blocking means including a plurality of contacting mechanisms arranged in vertical groups and horizontal rows, manually operable means associated with each machine and

with said rows, one of said manually operable means being individual to one of said rows, and means operable in a predetermined cyclic order for associating all of the manually controlled means with each vertical group of contacting mechanisms for registering the order in which the manually operable means are operated.

12. In a conveyer for feeding trays to processing machines, a cross conveyer for feeding trays to position between pairs of processing machines, reversible mechanisms, one for each pair of machines, for moving trays off the cross conveyer into a selected machine, a plurality of contacting mechanisms arranged in vertical groups and horizontal rows, manually operable means associated with each machine and with said rows, one of said manually operable means being individual to one of said rows, means operable in a predetermined cyclic order for associating all of the manually controlled means with each vertical group of contacting mechanisms for registering the order in which the manually operable means are operated, means interconnecting the reversible mechanisms with the contacting mechanisms for operating the reversible mechanisms in accordance with the sequence of operation of the manually operable means, and means operable by a tray for initiating operation of the reversible mechanisms.

13. In a conveyer for feeding trays to processing machines, a cross conveyer for feeding trays to position between pairs of processing machines, reversible mechanisms, one for each pair of machines, for moving trays off the cross conveyer into a selected machine, a plurality of contacting mechanisms arranged in vertical groups and horizontal rows, manually operable means associated with each machine and with said rows, one of said manually operable means being individual to one of said rows, means operable in a predetermined cyclic order for associating all of the manually controlled means with each vertical group of contacting mechanisms for registering the order in which the manually operable means are operated, means interconnecting the reversible mechanisms with the contacting mechanisms for operating the reversible mechanisms in accordance with the sequence of operation of the manually operable means, and a pair of contact switches operable by a tray for initiating operation of each reversible mechanism.

14. In a conveyer for feeding trays to processing machines, a cross conveyer for feeding trays to position between pairs of processing machines reversible mechanisms, one for each pair of machines, for moving trays off the cross conveyer into a selected machine, a plurality of contacting mechanisms arranged in vertical groups and horizontal rows, manually operable means associated with each machine and with said rows, one of said manually operable means being individual to one of said rows, means operable in a predetermined cyclic order for associating all of the manually controlled means with each vertical group of contacting mechanisms for registering the order in which the manually operable means are operated, means interconnecting the reversible mechanisms with the contacting mechanisms for operating the reversible mechanisms in accordance with the sequence of operation of the manually operable means, and a pair of switches closed by a tray on the conveyer in proper position to be fed to machine for completing an operating circuit to reversible mechanism.

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