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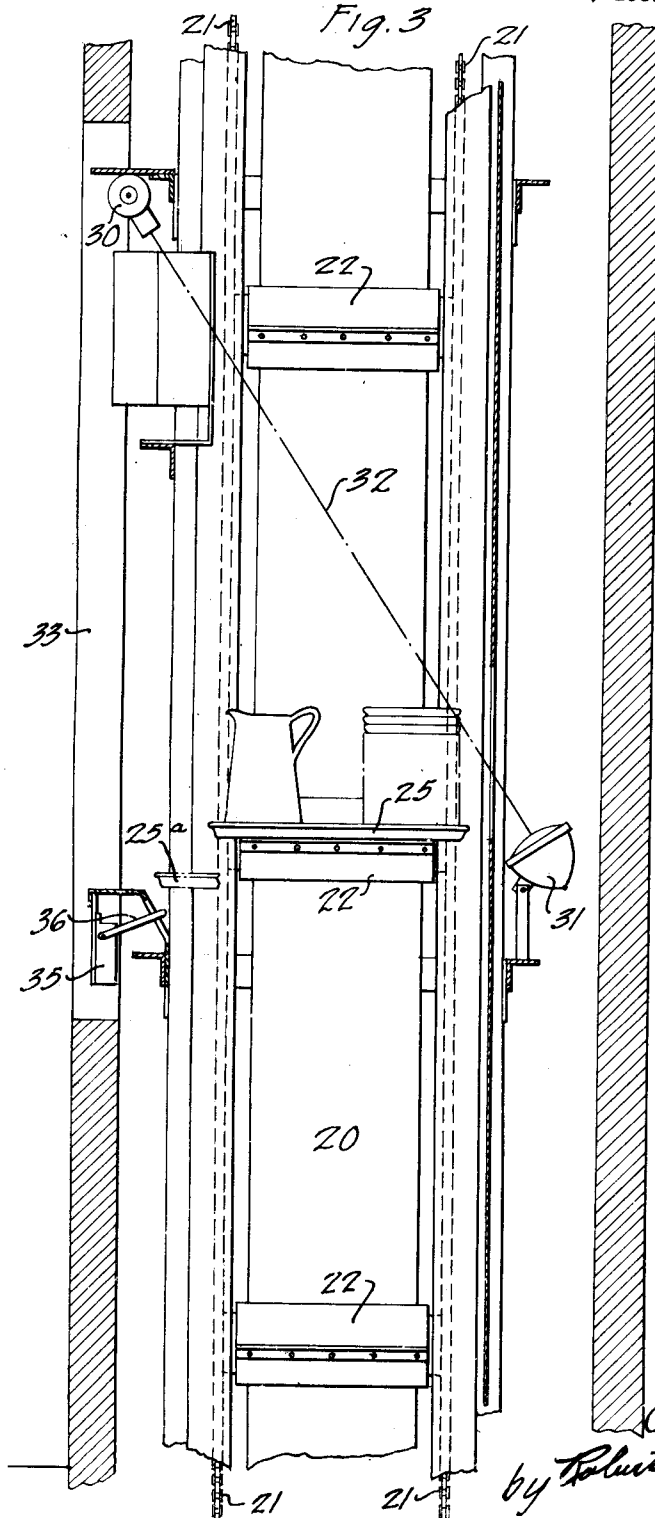
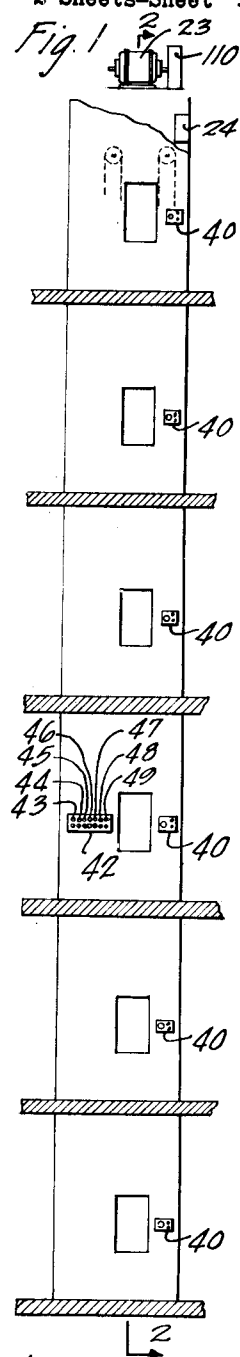
C. S. JENNINGS

1,938,104

CONVEYER SYSTEM

Filed Jan. 19, 1931

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 4

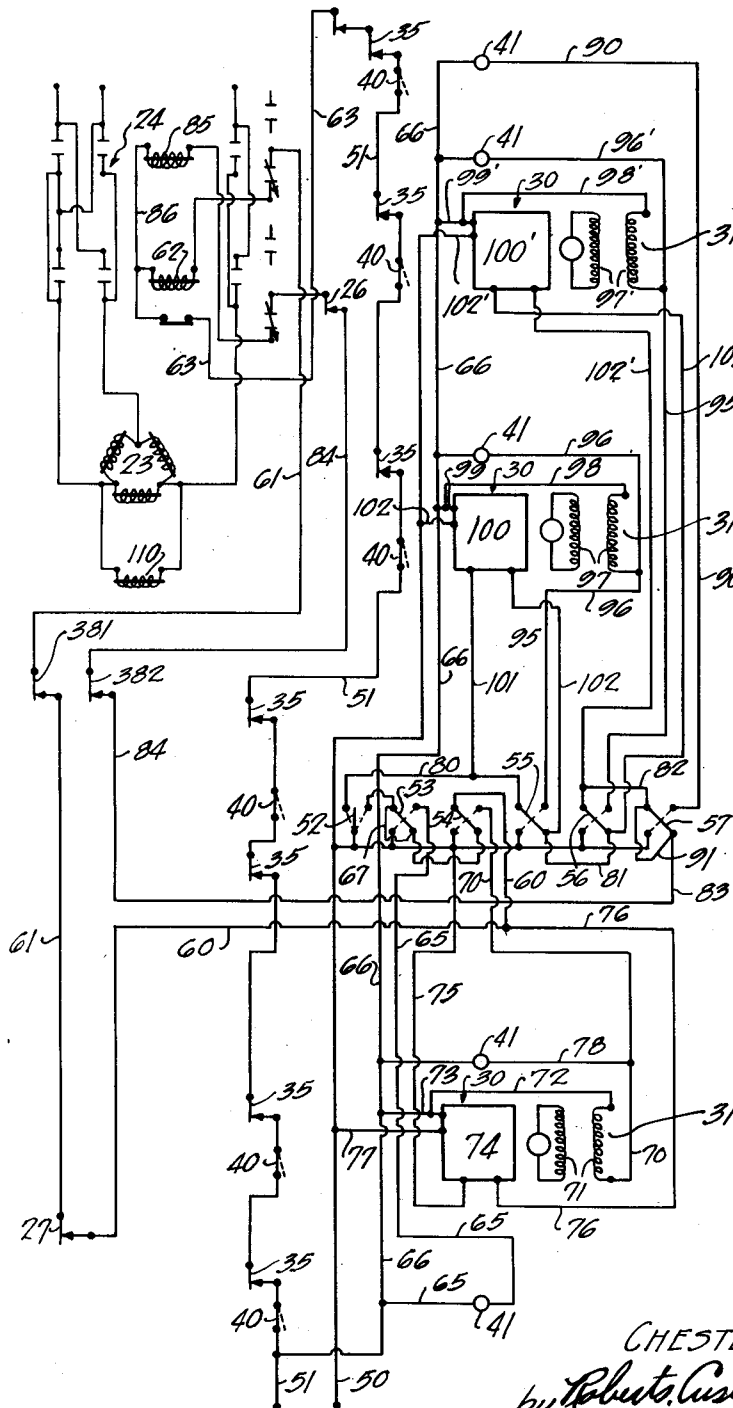
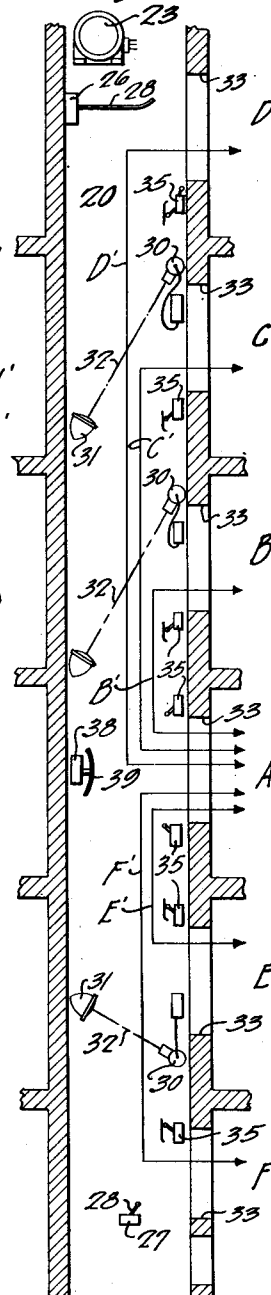


Fig. 2



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UNITED STATES PATENT OFFICE

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CONVEYER SYSTEM

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15 Claims. (Cl. 198—37)

This invention relates to an improvement in conveyer systems in which articles are transported through a guideway to various stations, and particularly in the inclusion therein of means whereby the travel of all the articles in the guideway is stopped upon the arrival of an article at a predetermined station and is resumed upon the removal of such article from the guideway at that station.

The primary object of this invention is to provide in a system of this type, means for directing into the guideway a beam of light that will be interrupted by an article being transported by the conveyer, and a light sensitive element which receives and is actuated by the beam, the combination of said means and light element being associated with each of several article-receiving stations, and means by which the articles are transported in the guideway, said transporting means being operative when the light element is actuated and being inoperative when the light element is not actuated, as for instance when the beam is interrupted by an article in transit, said beam directing means being selectively controlled at a central point so that only such means at the selected station are effective and the transporting means are rendered inoperative when an article arrives at that station.

Other objects of the invention reside in the various details of structure and operation set forth hereinbelow based upon an illustrative disclosure of a system of the vertical conveyer type embodying this invention.

In the drawings:

Fig. 1 is a front elevation of a conveyer embodying this invention;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is an enlarged sectional side elevation of one of the outstations of the system, a loaded tray being shown in position for removal; and

Fig. 4 shows diagrammatically one form of wiring that might be employed to operate the system.

The vertical conveyer here illustrated is of the well-known type having a guideway, well or shaftway 20 and pairs of chains 21 equipped with flights 22 on which articles are supported for transportation between a central station A and a plurality of outstations B, C, D, E and F. From the central station A articles are raised in the guideway 20 to the outstations B, C and D or lowered in the guideway to the outstations E and F. Articles will be similarly returned through the guideway to the central station A from the outstations. These paths of travel of the articles are diagrammatically indicated on Fig. 2 by the lines B', C', D', E' and F' respectively.

Suitable driving means are provided for operating the chains 21, such as a reversible electric

motor 23 and a reversible starter 24. The articles transported by the flights are here shown as trays 25 adapted to carry dishes between the stations of the system.

A tray arriving on the conveyer at either the outstation D or the outstation F will contact with a limit switch which stops the motor until the tray has been removed from the flights. These switches, indicated as 26 and 27 respectively, may be of any well-known type and are here shown as circuit breakers each including an arm 28 positioned at all times in the guideway to prevent the travel of a tray beyond these respective end stations.

In order to stop the travel of a tray sent from the central station to one of the intermediate outstations B, C, or E upon its arrival at its destination I make use of a light sensitive element 30, as, for example, a photoelectric cell. At each intermediate outstation is provided such an element 30 in combination with means 31, by which a beam of light 32 is directed upon its associated element. Such means may be, as here shown, a projector by which the light is originated or may be a mirror by which the light from a suitable source is reflected. The light directing means and the cell forming the assembly at each of these stations are suitably mounted upon opposite sides of the guideway and the light beams 32 cross the path of travel of the articles so that they will be interrupted by any article in transit. It will be understood that the sources of the light beams are independently controlled at the central station, and that only that source associated with the station, to which a tray is destined, is rendered effective.

Adjacent the doorway 33 of each station is a circuit control device 35 which acts as circuit breaker and includes an arm 36 adapted to be tripped by any tray not properly and completely placed upon the flights, as for example the tray 25^a indicated in dotted lines in Fig. 3. The tripping of the arm 36 at any station renders, as will be described hereinbelow, the motor 23 inoperative and thus brings the conveyer to rest until the tray, causing the difficulty, has been shifted into the proper position. Opposite the doorway 33 of the central station A is a circuit control device 38 having an arm 39 terminating in an arcuate plate. The arm is adapted to be tripped by trays approaching the central station from any of the outstations through the guideway to stop the travel of the conveyer until such trays are removed.

At each of the stations is provided a two-way switch 40 by which the motor may be stopped or started. A signal 41, preferably a bulb, at each outstation advises the operator that a tray is being sent thereto from the central station. Mounted on a panel board 42 at the central sta-

tion are a plurality of switch buttons arranged in two groups, of which one group determines the direction of travel of the conveyer and starts the motor, and the other group determines the destination of the carrier.

The buttons 43 and 44 form the first group and control the reversible starter 24 and therethrough the motor 23. The depression of the upper buttons 43 or 44 complete the circuit through the starter 24, which sets the motor in operation and starts the downward travel or the upward travel of the conveyer respectively. The buttons 45, 46, 47, 48 and 49 form the second group and the depression of the upper of any of these buttons determines the destination of the tray. The upper button 46 or 49 will be depressed when a tray is being sent to the end stations F or D, and the signal 41 at the proper station is actuated. The upper buttons 45, 47 and 48 respectively, when depressed, define the destination of the tray as to the intermediate stations E, B or C respectively, rendering the projector 31 at the selected station effective to direct a beam of light onto the photo cell 30 and giving the signal at such station. The depression of the lower buttons in each group acts in the well-known manner to restore the mechanism to its normal condition.

In Fig. 4 is illustrated diagrammatically one type of wiring which may be employed to carry out these operations. So far as possible the above-described elements which are indicated on the diagram bear the same reference characters and the various circuits will be described as set up by the operation of the various switches. It will be assumed for purposes of description that the current flows from the source of supply through a main line 50 and returns thereto through a main line 51. The buttons 43 and 44 control a two-way switch 52, while the buttons 45 to 49 inclusive respectively control four-way switches 53 to 57 inclusive. When the system is at rest the switch 52 is open and the bar of each of the switches 53 to 57 in the full line position shown in the diagram.

If a tray is to be sent from the central station down to one of the lower stations E or F and the system is at rest, the upper button 43 is depressed, whereupon the bar of switch 52 is shifted to the right and a circuit completed between the main lines 50 and 51 through switches 52, 53 and 54, leads 60 and 61, solenoid 62 of the starter 24 and lead 63, so that the motor is started and the conveyer travels downwardly. The switch 53 is then shifted by the upper button 45 if the tray is to be sent to station F completing a circuit from line 50 through switch 53, lead 65, bulb 41, and lead 66 to line 51, and advising the operator that a tray is being sent to that station. It will be noted that the switch 53 is provided with a jumper 67 so that the circuit previously described is not broken by the actuation of the switch. The circuit breaker 27 is located in the motor circuit and, when tripped by the tray upon its arrival at that station, opens that circuit, stopping the conveyer and holding it at rest until the tray is removed, whereupon the motor circuit is closed and the conveyer resumes its downward travel.

When the tray is to be sent to station E the upper button 46 is depressed, actuating the switch 54 and completing a circuit from the main line 50 through switch 54, lead 70, transformers 71 of the projector 31, and leads 72, 73 and 66 to the main line 51. The motor circuit previously described as closed by the switch 52 is broken by the throw-

ing of the switch 54, but is restored by the action of the beam 32 directed by the projector 31 upon the photo cell 30 which, as is well known, energizes the relay 74 so that the switch 54 is replaced by lead 75, relay 74 and lead 76. Leads 77 and 73 permanently connect the relay 74 with the main lines. A lead 78 from lead 70 acts to light the bulb 41 and advise the operator that a tray is being sent to station E. When the beam of light 32 is interrupted by the arrival of the tray the relay 74 will no longer pass current between the leads 75 and 76, so that the starter circuit is broken and the motor stops. After the tray is removed the beam is again thrown upon the photo cell completing the starter circuit and causing the motor to resume operations.

When a tray is to be sent from the central station A to one of the upper stations B, C, or D, and the system is at rest, the upper button 44 is first depressed throwing the switch 52 to the left and completing a circuit from line 50, through switch 52, lead 80, switch 55, lead 81, switch 56, lead 82, switch 57, leads 83, 84, starter solenoid 85 and leads 86, 63 to main line 51. The motor 23 is thereupon started to raise the chains 21. If station D be the destination of the tray the button 49 is depressed, shifting the switch 57 and providing a circuit from the main line 50, through switch 57, lead 90, bulb 41 at station D and lead 66 to line 51. The circuit breaker 26 at station D is in the lead 84, and obviously when tripped by a tray will stop the motor. The switch 57, like the switch 53, has a jumper 91 so that the starter circuit previously described will not be affected by the shifting thereof.

Should it be desired to despatch the tray to station B the upper button 47 is depressed shifting the switch 55 and providing a circuit from the main line 50 through switch 55, leads 95, 96, transformer 97 of the projector 31 at station B, and leads 98, 99 and 66 to the main line 51. The lead 96 also connects the lead 95 with the lead 66 through the bulb 41 which is thereupon lighted to advise the operator that a tray is being sent to station B. The relay 100 of the photo cell 30 at station B is affected by the beam of light directed thereon by the projector 31 so that current may pass therethrough between leads 101 and 102 and the starting circuit previously described, which is broken by the shifting of switch 55, is restored. The relay 100 is also connected across the main lines by leads 102, 99 and 66. If a tray is to be sent to station C the switch 56 is shifted by depressing the upper button 48 and completing circuits which are similar to those described in connection with station B. Such circuits need not be described in detail but are indicated on Fig. 4 by the use of primed reference characters corresponding to those used above.

Thus when articles are to be sent from the central station to either of the end outstations F or D and the conveyer is set into operation by depressing the proper button 43 or 44, the depression of the second button 45 or 49 merely lights a bulb 41 and does not affect the motor starter circuit. On the other hand, when articles are to be sent from the central station to any of the intermediate outstations E, B or C and the proper button 43 or 44 has been depressed and the conveyer set into operation, the depression of the second button 46, 47 or 48 not only lights the bulb 41 at the selected station, but by throwing a switch in the motor circuit breaks such circuit and then, through the article controlled beam assembly which is set into operation by the throwing of the

switch, completes a by-pass around the thrown switch, and restores the motor starter circuit.

From the above description it will be apparent that the tray, upon its arrival at the station to which it is destined, will open the motor circuit so that the conveyer will be at rest until the tray is removed and that the circuit will be closed and the travel of the conveyer resumed when the removal of the tray has taken place. It will also be apparent that if for any reason a beam of light is not thrown by the projector 31 at the selected station the motor will be stopped and no trays can be sent to an intermediate station until the projector is repaired. The circuit control devices 35 and the switches 40 at the various stations are located in the main line 51 and obviously either motor circuit will be broken and the travel of the conveyer stopped if any of the devices be tripped or any of the switches opened. The circuit control device 38 at the central station includes a circuit breaker 381 in the lead 61 and a circuit breaker 382 in the lead 84, so that whether the arm 39 is tripped by a tray approaching the central station from above or from below each motor circuit is broken and the conveyer is brought to rest until the tray has been removed. Associated with the motor 24 is a solenoid brake 110, by which the conveyer is held at rest except when the motor is in operation.

While one embodiment of the invention has been shown and described, it will be understood that I am not limited thereto and that other embodiments may be made without departing from the spirit and scope of the invention as set forth in the following claims.

I claim:

1. In a conveyer system in which articles travel along a guideway, means for directing a beam of light into the path of travel of the articles, a photoelectric cell energized by said beam, means for causing the articles to travel in the guideway, and electrical connections between said cell and said last-named means, said cell controlling the operation of said means which operate only when the cell is energized, whereby the interruption of said beam, by an article travelling in the guideway, causes the deenergization of the cell and stops the operation of the last-named means until the article is removed from the position in which the beam is interrupted.

2. In a conveyer system in which articles travel along a guideway, means for directing a beam of light into the path of travel of the articles, a photoelectric cell energized by said beam, means for causing the articles to travel in the guideway, and connections between said cell and said last-named means, including an electric circuit which is closed so that the articles travel when the cell is energized by the beam and is opened to stop the travel of the articles when the beam is interrupted by an article travelling in the guideway and kept open until the article interrupting the beam is removed, whereupon the articles are again caused to travel.

3. In a conveyer system in which articles travel through a guideway, a conveyer by which the articles are transported, means for directing a beam of light across the guideway in the line of travel of the articles, a light sensitive element upon which the beam falls, means for driving the conveyer and electrical connections between the driving means and the light sensitive element, said element controlling the operation of the driving means which operate only when the beam of light falls on the element whereby when the

beam falls on the element the conveyer is driven, and when the beam is interrupted by a transported article so that it does not fall thereon the conveyer is not driven.

4. In a conveyer system in which articles travel through a guideway, a conveyer by which the articles are transported, means for directing a beam of light across the guideway, a light sensitive element upon which the beam falls, said beam being interrupted by the arrival of an article at a predetermined position, means for driving the conveyer and electrical connections between the last-named means and the light sensitive element, said element controlling the operation of said means whereby, when the beam falls on the element, the conveyer is driven and, when the beam is prevented from falling on the element by the arrival of an article, the conveyer is not driven until the article is removed from such position.

5. In a conveyer system in which articles travel through a guideway from a central station to any one of several outstations, a conveyer by which the articles are transported, means for driving said conveyer, and means at each of said outstations for stopping the travel of the conveyer upon the arrival of an article at the outstation to which it was sent, which means comprise a light sensitive element and mechanism for directing a beam of light in the guideway upon said element, which beam will be interrupted by an article upon its arrival at such station.

6. In a conveyer system in which articles travel through a guideway from a central station to any one of several outstations, a conveyer by which the articles are transported, means for driving said conveyer, means at each of said outstations for stopping the travel of the conveyer upon the arrival of an article at the outstation to which it was sent, which means comprise a light sensitive element and mechanism for directing a beam of light in the guideway upon said element, which beam will be interrupted by an article upon its arrival at such station, and selective means at the central station for causing the mechanism at the predetermined outstation only to function.

7. In a conveyer system in which articles travel through a guideway from a central station to any one of several outstations, a conveyer by which the articles are transported in the guideway, an electric motor for driving said conveyer, a starter for the motor, means at the central station for completing a circuit to the starter for the motor, said circuit including a switch, article controlled mechanism at one of said outstations, and means at the central station for throwing the switch to break the motor starter circuit and restore said circuit through the mechanism at the outstation.

8. In a conveyer system in which articles travel through a guideway from a central station to any one of several outstations, a conveyer by which the articles are transported in the guideway, an electric motor for driving said conveyer, a starter for the motor, means at the central station for completing a circuit to the starter for the motor, said circuit including a switch, article controlled mechanism at one of said outstations, said mechanism comprising a light sensitive element and means for directing a beam of light upon said element, and means at the central station for throwing the switch to break the circuit and set said beam directing means into operation, whereby said element completes a by-pass around the thrown switch and restores the motor starter circuit.

9. In a conveyer system in which articles travel through a guideway from a central station to any one of several outstations, a conveyer by which the articles are transported in the guideway, an electric motor for driving said conveyer, a starter for the motor, means at the central station for completing a circuit to the starter for the motor, said circuit including a switch, article controlled mechanism at one of said outstations, said mechanism comprising a light sensitive element and means for directing a beam of light upon said element, which beam of light is in the path of travel of an article upon the conveyer, and means at the central station for throwing the switch to break the circuit and set said beam directing means into operation, whereby said element completes a by-pass around the thrown switch and restores the motor starter circuit until the beam is interrupted by the arrival of an article at such station and the circuit is opened, stopping the conveyer.

10. In a conveyer system in which articles travel through a guideway from a central station to any one of several outstations, a conveyer by which the articles are transported in the guideway, an electric motor for driving said conveyer, a starter for the motor, means at the central station for completing a circuit to the starter for the motor, said circuit including a switch, article controlled mechanism at one of said outstations, said mechanism comprising a light sensitive element and means for directing a beam of light upon said element, which beam of light is in the path of travel of an article upon the conveyer, and means at the central station for throwing the switch to break the circuit and set said beam directing means into operation, whereby said element completes a by-pass around the thrown switch and restores the motor starter circuit until the beam is interrupted by the arrival of an article at such station and the circuit is opened, stopping the conveyer, the beam being permitted to fall upon the element and close the circuit upon the removal of the interrupting article, so that the conveyer resumes its travel.

11. In a conveyer system in which articles travel through a guideway from a central station to any one of several outstations, a conveyer by which the articles are transported in the guideway, an electric motor for driving said conveyer, a starter for the motor, means at the central station for completing a circuit to the starter for the motor, said circuit including a plurality of switches one for each outstation, so that the conveyer is set in motion, article controlled mechanism at each outstation, and means at the central station for throwing the switch for a selected outstation to break the motor starter circuit and restore the circuit through the article controlled mechanism at such station.

12. In a conveyer system in which articles travel through a guideway from a central station to any one of several outstations, a conveyer by which the articles are transported in the guideway, an electric motor for driving said conveyer, a starter for the motor, means at the central station for completing a circuit to the starter for the motor, said circuit including a plurality of switches one for each outstation, so that the conveyer is set in motion, article controlled mechanism at each outstation, said mechanism comprising a light sensitive element and means for directing a beam of light upon said element, and means at the central station for throwing the switch for a selected outstation to break the circuit

and set said beam directing means at such outstation into operation, whereby said element completes a by-pass around the thrown switch and restores the motor starter circuit.

13. In a conveyer system in which articles travel through a guideway from a central station to any one of several outstations, a conveyer by which the articles are transported in the guideway, an electric motor for driving said conveyer, a starter for the motor, means at the central station for completing a circuit to the starter for the motor, said circuit including a plurality of switches one for each outstation, so that the conveyer is set in motion, article controlled mechanism at each outstation, said mechanism comprising a light sensitive element, and means for directing a beam of light upon said element, which beam of light is in the path of travel of an article upon the conveyer, and means at the central station for throwing the switch for a selected outstation to break the circuit and set said beam directing means at such outstation into operation, whereby said element completes a by-pass around the thrown switch and restores the motor starter circuit until the beam is interrupted by the arrival of an article at such station and the circuit is opened stopping the conveyer.

14. In a conveyer system in which articles travel through a guideway from a central station to any one of several outstations, a conveyer by which the articles are transported in the guideway, an electric motor for driving said conveyer, a starter for the motor, means at the central station for completing a circuit to the starter for the motor, said circuit including a plurality of switches one for each outstation, so that the conveyer is set in motion, article controlled mechanism at each outstation, said mechanism comprising a light sensitive element, and means for directing a beam of light upon said element, which beam of light is in the path of travel of an article upon the conveyer and means at the central station for throwing the switch for a selected outstation to break the circuit and set said beam directing means at such outstation into operation, whereby said element completes a by-pass around the thrown switch and restores the motor starter circuit until the beam is interrupted by the arrival of an article at such station and the circuit is opened stopping the conveyer, the beam being permitted to fall upon the element and close the circuit upon the removal of the interrupting article so that the conveyer resumes its travel.

15. In a conveyer system in which trays travel along a vertical guideway, means at one side of the guideway for directing a beam of light across the guideway, a photoelectric cell at the other side of the guideway on which the beam of light falls to energize the cell, conveying means in the guideway, and mechanism for operating said conveying means, such means passing the beam of light without interrupting the same and supporting trays which do interrupt the beam, electrical connections between said cell and said operating mechanism, said cell controlling the operation of the mechanism which acts only when the cell is energized, whereby the interruption of the beam by a tray, causing the de-energization of the cell, stops the operation of the mechanism until the interruption of the beam is terminated by the substantial removal of the tray from the guideway.

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