

June 9, 1936.

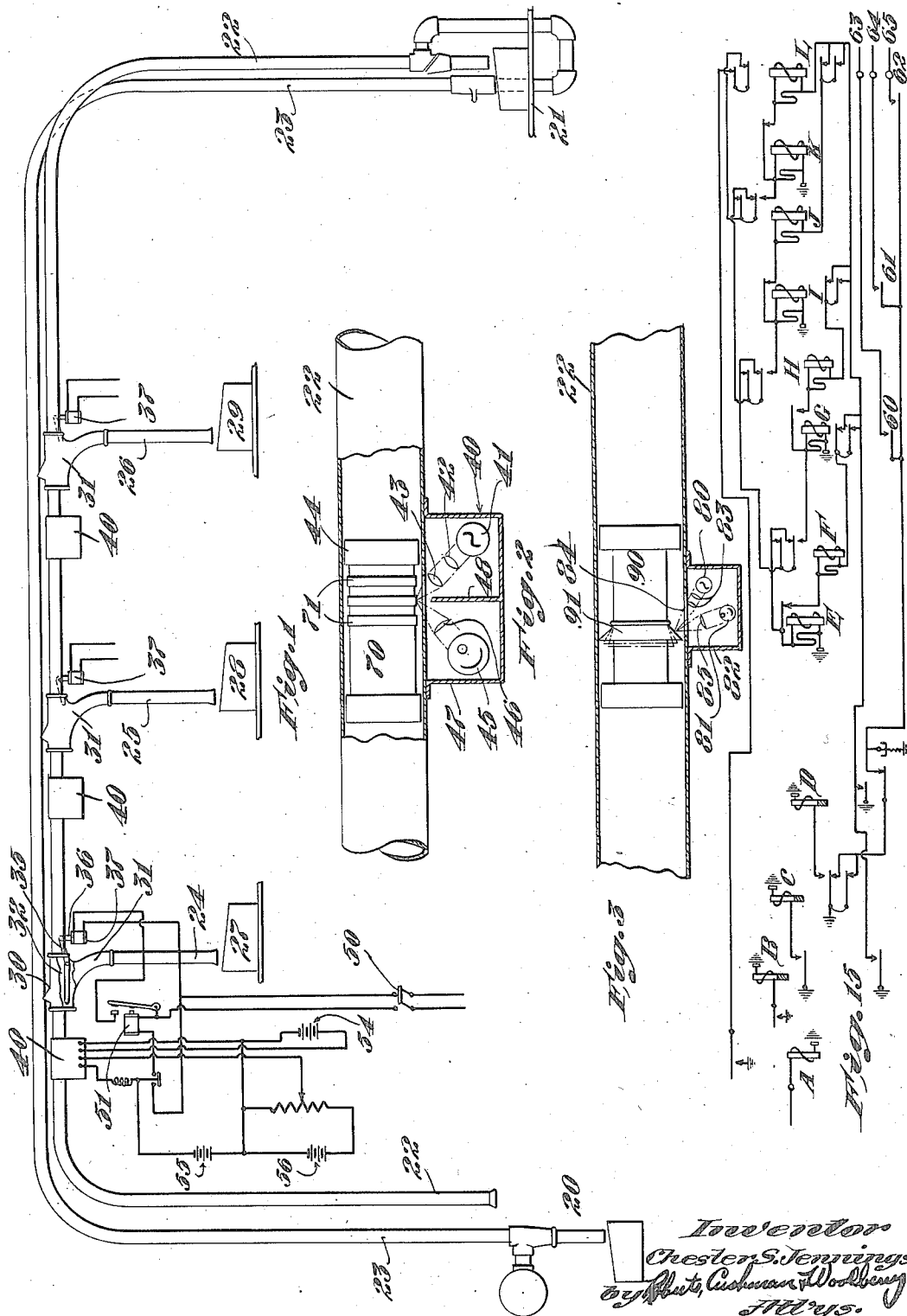
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2,043,293

CONVEYER SYSTEM

Filed Nov. 3, 1930

4 Sheets-Sheet 1



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2,043,293

CONVEYER SYSTEM

Filed Nov. 3, 1930

4 Sheets-Sheet 2

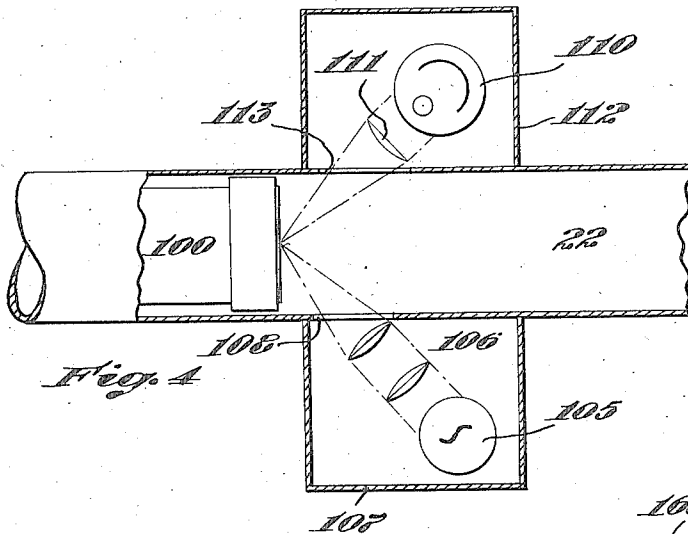


Fig. 4



Fig. 5

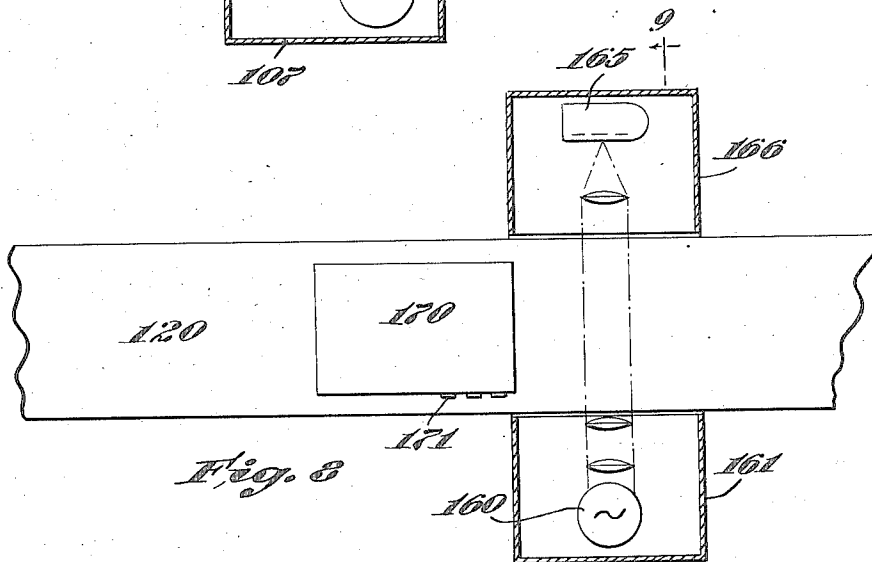


Fig. 8

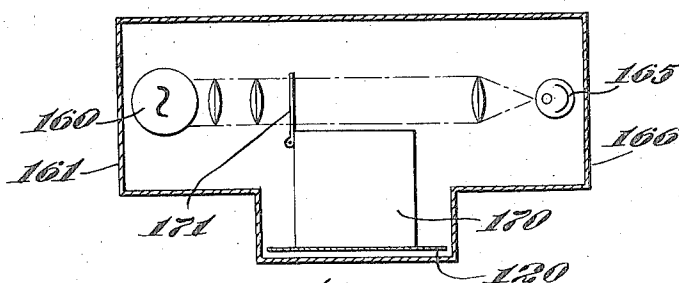


Fig. 9

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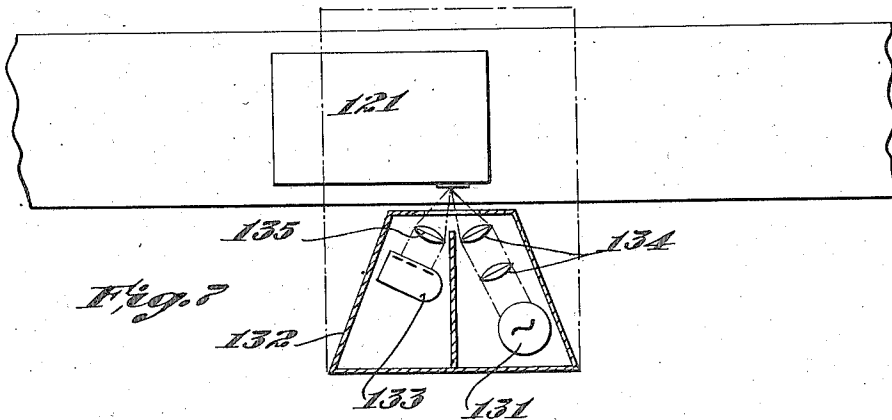
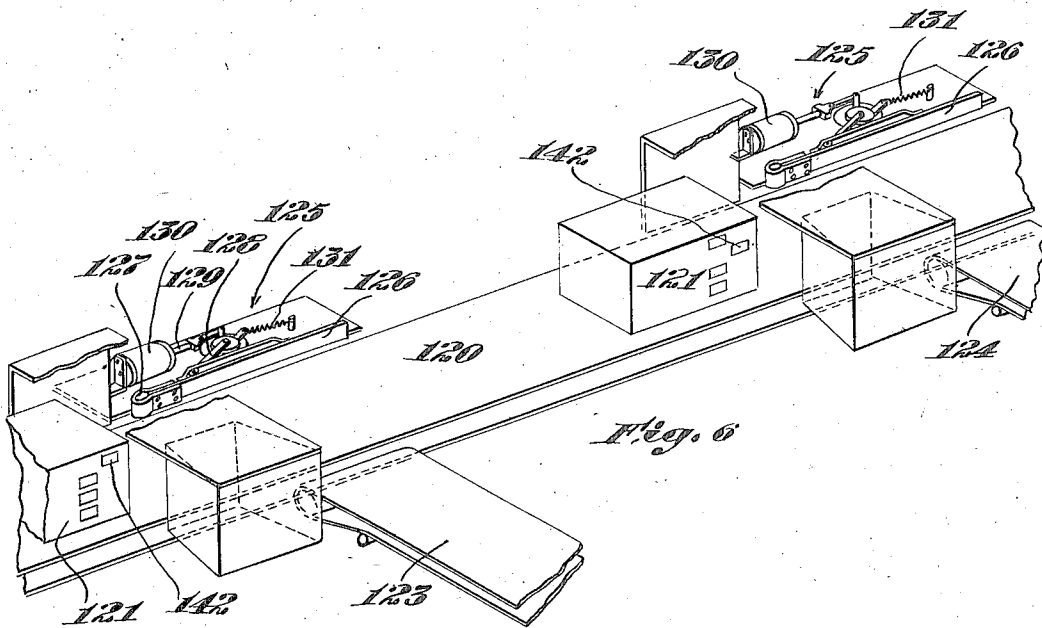
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CONVEYER SYSTEM

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4 Sheets-Sheet 3



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CONVEYER SYSTEM

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4 Sheets-Sheet 4

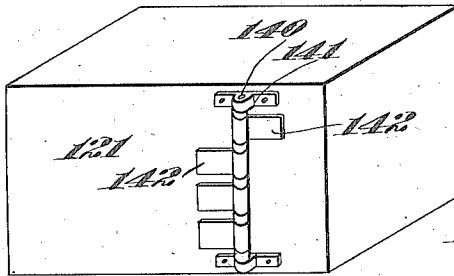


Fig. 10

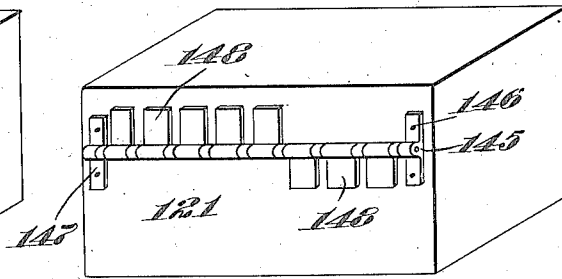


Fig. 11

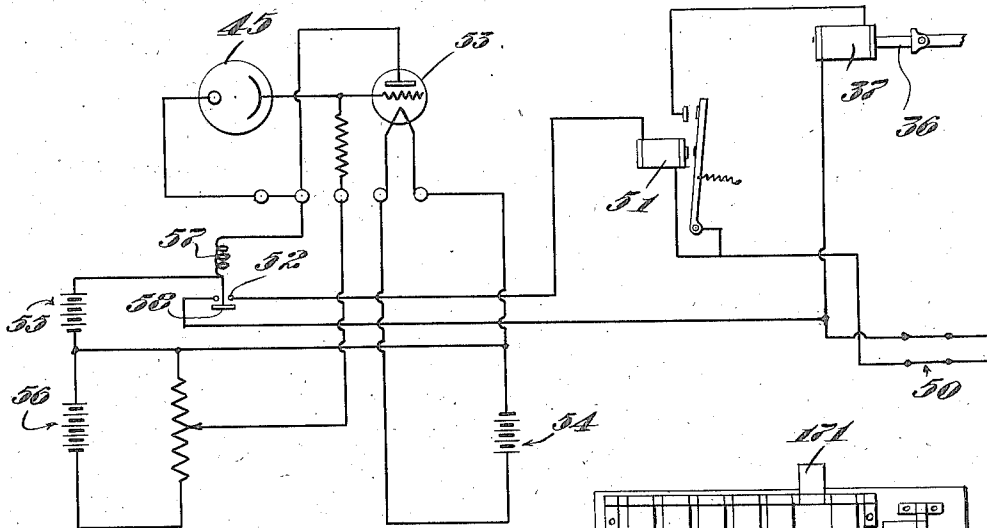


Fig. 14

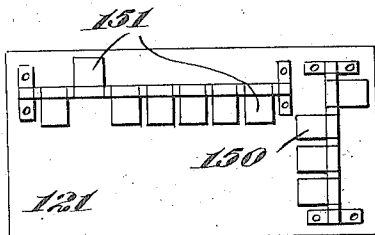


Fig. 12

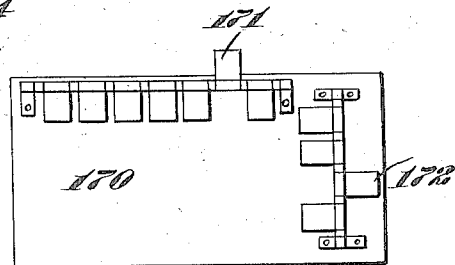


Fig. 13

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UNITED STATES PATENT OFFICE

2,043,293

CONVEYER SYSTEM

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7 Claims. (Cl. 243—16)

This invention relates to an improvement in conveyer systems and more particularly to the employment therein of an automatic electric control device such for example as that commonly referred to as an "Electric eye" wherein advantage is taken of the deflection or interruption of a beam of light to affect a photo-electric cell and thereby cause the desired operation.

Such electric control devices have wide applicability in conveyer systems and may be used to control the operation of many various devices such as for example deflector switches, elevators, signals, counters, motors, movable conveyer sections and the like but for the purpose of illustration I have elected to show its application to the operation of switch deflectors and the control thereby of the course of travel of an article transported by the conveyer system.

Heretofore various arrangements have been proposed whereby the diversion of articles in the course of their travel is controlled either by contact of a portion of the article with a properly set trip or finger by which mechanism is either electrically or mechanically or by electrical or mechanical means operated independently of the article.

The primary object of this invention is to control the operation of article treating mechanism at various stations in the system by the passage of the articles across a beam of light and by the consequent reflection or interruption of the beam and thereby to affect a photo-electric cell or similar device.

A further object of this invention is to provide upon the articles for such system targets of one form or another by which the beam of light is affected, such targets being, if desired, adjustable or movable so that in one position they absorb the light and in another position they reflect it, being thus inoperative in the first position and operative in the second.

Another object of the invention is to provide upon the articles targets which break up the light beam into a series of successive impulses and thereby determine the response of the particular station mechanism.

Other objects will appear from a consideration of the following specification wherein is set forth several embodiments illustrative of the application of this invention and of the drawings which form a part thereof and in which

Fig. 1 is a view illustrating one embodiment of this invention as applied to a conveyer of the pneumatic type;

Figs. 2, 3 and 4 are views partially in section il-

lustrating various forms of operating means and carriers that might be employed in the Fig. 1 embodiment;

Fig. 5 is an end elevation of the carrier illustrated in Fig. 4;

Fig. 6 is a perspective view illustrating another embodiment of this invention as applied to a conveyer of another type;

Fig. 7 is a sectional plan view of a portion of the mechanism illustrated in Fig. 6;

Fig. 8 is a view similar to Fig. 7 illustrating another embodiment of this invention;

Fig. 9 is a sectional view taken along the lines 9—9 of Fig. 8;

Figs. 10, 11, 12 and 13 are perspective views illustrating various articles or carriers adapted to be employed in connection with the mechanism illustrated in Figs. 6 and 8;

Fig. 14 is a wiring diagram illustrating one type of electric circuit which might be employed in connection with this invention, and

Fig. 15 is a similar diagram illustrating another type of such electric circuit.

In Fig. 1 is illustrated a pneumatic despatch system of the double tube type leading from a central station desk 20 to an out-station 21. Carriers are transmitted from the central station to the out-station through the transit tube 22 and are returned therefrom through the transit tube 23. Leading from transit tube 22 are a plurality of branch tubes 24, 25 and 26 to which carriers sent from station 20 are diverted by the use of switch mechanism 30 located in a coupling 31, which connects the main tube with the branch tubes. While in the drawings the branch tubes are shown terminating at stations 27, 28 and 29 they obviously may include switch mechanism by which carriers are deflected to other tubes as desired. The switch mechanism 30, as shown at the left side of Fig. 1, includes a deflector 32 operated by an arm 35 pivotally secured at its outer end to a solenoid core 36 of a solenoid 37. The operation of the solenoid 37 is controlled by automatic means, indicated generally on Fig. 1 by the reference numeral 40. These means may be of any desired type and, in Figs. 2, 3 and 4 are illustrated three various embodiments thereof.

In Fig. 2 the automatic means 40 is illustrated as comprising a source of light 41, which may be an electric bulb, from which a beam of light passes into the path of travel of the carriers through lenses 42 and 43 and a slot 44 formed in the wall of the transit tube 23 and a photo-electric cell 45 mounted adjacent the source of light 41 and activated when a beam of light from the source falls

upon it through a lens 46. The operation of this photo-electric cell is well-known, and since its construction forms no part of the present invention, it will not be described in detail. The source of light 41 and cell 45 are enclosed within a housing 47 carried by the transit tube and divided by a partition 42 into two separate compartments, both of which are connected through the slot 44 with the interior of the transit tube 22. It will be understood that the joinder between the housing 47 and the tube 22 is such that no light can enter.

The cell 45 is electrically connected with the solenoid 37 in any desired manner, and the wiring illustrated in Figs. 1 and 14 will be described. Current controlled by a main switch 59 will under conditions to be described energize the solenoid 37 and also the relay magnet of a switch 51. As illustrated in Fig. 14, the main line circuit is normally open at 52 and consequently no current flows. The photo-electric cell 45 is associated with an amplifier 53 here shown as a thermionic tube, the elements of which are connected in the usual manner with batteries 54, 55 and 56. When the photo-electric cell is activated by the falling of a beam of light thereon a relay 57 in the line of the battery 55 is energized sufficiently to raise the normally open switch plate 58 so that the circuit from the main line through the magnet 51 is closed and current flows therethrough energizing the switch. The circuit from the main line through the solenoid 37 is thereby closed energizing the solenoid and causing the core 36 to move to the left in Fig. 14, and consequently swinging the deflector 32 into operative position.

In place of the connections just described there may be employed an electrical connection by which the deflector 32 is swung into operative position only after the automatic means 49 has received two or more impulses. One form of such connection is illustrated diagrammatically in Fig. 14 wherein are provided a plurality of relays A to L respectively by which switches 60, 61 or 62 are controlled. The switch 60 controls the operation of the deflector trip 63, the switch 61 controls the trip 64 and the switch 62 controls the trip 65. The various wiring connections will not here be described in detail since they form no part of the present invention. However if the relay A receives two impulses, relays B to H will be energized and the switch 60 will close the circuit to trip 63, if the relay A receives three impulses the relays B to J inclusive will be energized and the switch 51 will close the circuit to trip 64 and if the relay A receives four impulses the relays B to L inclusive will be energized and the switch 62 will close the circuit to trip 65. Obviously by increasing the number of relays the number of impulses to which the relay A might respond is similarly increased. Moreover by selecting the number of relays associated with any desired deflector the operation of that deflector only by a predetermined number of impulses can be assured.

The tube is adapted to transport carriers of the well-known type, one of which is illustrated in Fig. 2 and designated by the numeral 70. The body portion of the carrier is provided with a series of targets, here shown as annular bands 71. The outer surface of the bands is light-reflecting and the source of light 41 and cell 45 are so positioned that when the carrier 70 passes along the line the bands 71 will pass through the beam of light from the source 41 and reflect it through the lens 46 onto the cell 45.

Fig. 3 illustrates another form of the automatic means 49 wherein the source of light 80 and the photo-electric cell 81 are enclosed in a single housing 82. The direction and intensity of the beam of light from the source 80 is controlled by the lenses 83, so that it normally passes out into the interior of the tube 23 through a slot 84 and the beam of light affecting the cell 81 passes through a lens 85. The carrier 90 here employed is provided with a target in the form of an annular band 91, one surface of which is inclined toward the body of the carrier. The inclination of the band may be varied as desired, or separate carriers provided with bands of different inclinations may be provided. Such inclinations are illustrated for example by dotted lines in Fig. 3.

When the carrier travelling through the tube 22 passes through the beam of light from the source 80 its target reflects that light back onto the photo-electric cell 81 through the lens 85 so arranged that only when the carrier bearing a target having the proper inclination crosses the beam of light, is that beam reflected through the lens 85 on to the cell. It will thus be clear, that by selecting a carrier provided with a band of the proper inclination the carrier may be sent to any desired station.

In place of providing the carrier with the target in the form of annular body-surrounding bands, the target may be in the form of a series of bands on one end of the carrier, such for example as is shown in Figs. 4 and 5, wherein the carrier 100 is provided at its head with a series of concentric bands 101. The exposed surface of such bands is of light-reflecting quality, so that the carrier will set in operation the automatic switch-controlling means 49. While the carrier 100 has three bands 101 it will be understood that other carriers have a greater or smaller number of bands.

In this embodiment the source of light 105 40 and the lenses 106 are enclosed within a housing 107 at one side of the transit tube 22, while the photo-electric cell 110 and its lens 111 are enclosed within a housing 112 at the opposite side of the tube. The interior of the tube 22 is connected to the interior of the housing 107 by a slot 108, and to the interior of the housing 112 by a slot 113. The beam of light from the source 105 normally enters the tube 22 and may be adjusted so that it will focus at any desired point. In the present instance it was desired that the focus of the beam from the source 105 be at the center line of the tube, and consequently upon the arrival at this mechanism of the carrier 100 the central portion 101 reflects the light through the lens 111 on to the cell 110. The focus of the beam may of course be changed so that it will be reflected on to the cell 110 when it comes into contact with the intermediate or the outer band 101. As in the previous case, by selecting the carrier having the proper number of bands, the destination can be automatically determined.

In Fig. 6 is illustrated the application of this invention to a conveyer mechanism of the belt type, but it will be understood that it will be applicable to other types of conveyer mechanism, such as gravity, chute or live roll for example. Transported by the main belt 120 of the conveyer mechanism shown in Fig. 6 are illustrated a pair of boxes 121. Leading from the main belt 120 are shown two branch belts 123, 124 to which the boxes or other articles transported by the main belt 120 may be deflected by suitable switch mechanism illustrated generally by the reference numeral 125. As here illustrated, the switch

mechanism comprises a deflector 126 pivotally mounted upon a pin 127 and positively swung on its pivot by an arm 128 oscillated by the reciprocation of a solenoid core 129, controlled by a solenoid coil 130. In the present instance the deflectors 126 are normally in the inoperative position, being held therein by the springs 131. Upon the energizing of the coil 130, however, the arm 128 is caused to oscillate and the deflector 126 is consequently swung over the main belt 120 so that any articles contacting with the deflector while in that position are deflected over the branch conveyer 123 or 124 associated therewith.

One form of the automatic means employed for energizing the solenoid coil 130 and causing the operation of the deflector 126 is illustrated in Fig. 7, wherein is shown a structure substantially like that illustrated in Fig. 2, a source of light 131 being enclosed in one compartment of a housing 132, while a photo-electric cell 133 is enclosed in the other compartment and lenses 134 and 135 are provided for concentrating the beam of light.

Each article 121 is provided with a vertical series of targets, as shown in Fig. 10, wherein the article 121 is shown to support a rod 140 in brackets 141, upon which rod are pivotally mounted a plurality of targets 142. These targets are so constructed that one surface is light-reflecting, while the other surface is light-absorbing. In Fig. 10 the upper target 142 is shown with its light-reflecting surface exposed, while the other targets are arranged with the light-absorbing surfaces exposed. The vertical position of the beam of light from the source 131 can, of course, be adjusted, and with the article 121 set, as shown in Fig. 10, it is obvious that it will function only when it passes through a beam of light which falls upon the reflecting surface of the upper target 142. The leading box 121 in Fig. 6 has the next to the top target operative while the other box has its upper target operative as in Fig. 10.

In Fig. 11 is illustrated another embodiment of this invention, wherein a horizontally extending rod 145 is supported in brackets 146, 147 on the wall of the box of the article and upon it are secured a plurality of targets 148. These targets, like the targets 142, have one surface light-reflecting and the other surface light-absorbing. The article shown in Fig. 11 of the drawings has three targets 148 with their light-reflecting surfaces exposed and the remaining targets with their light-absorbing surfaces exposed. Obviously the passage of this article will function only when it passes an automatic means, the beam of which will be reflected by the targets of the first group.

In Fig. 12 is illustrated an article having both a vertical series of targets 150 and a horizontal series of targets 151. It is obvious that by this construction a number of different combinations can be provided since the article can be set to operate successively various automatic means, and as a result can be directed in its travel to any desired destination.

In Fig. 8 is illustrated, somewhat diagrammatically, another embodiment of this invention applicable to the conveyer mechanism illustrated in Fig. 6. In this embodiment the source of light 160 is enclosed within a housing 161 at one side of the article conveyer, while a photo-cell 165 is similarly enclosed in a housing 166 at the other side of the conveyer. As illustrated in

Figs. 8 and 9, the beam of light from the source 160 normally falls upon the photo-electric cell 165, and, as intimated above in connection with the first described embodiment, activates that cell so that it causes the operation of certain mechanism. Thus for instance with the parts in the position shown in Fig. 8, the solenoid coil 130 may be normally energized and the deflector 126 normally extended across the path of the main conveyer.

Articles adapted to be used in connection with this embodiment are designated by the reference numeral 170, and, as shown in detail in Fig. 13, are provided with a horizontal row of targets 171 which, when in one position, project beyond the line of the carrier into the beam thrown out by the source 160. The interruption of the beam by the passage of the carrier 170 upsets the electrical condition of the automatic mechanism, and as a result causes the deflector 126 to be retracted into the position shown in Fig. 6, and to permit the article to pass through undisturbed. The article 170 may also be provided with a vertical series of targets 172 so that it may also coact with the reflecting type of automatic means as well. The mechanism by which the solenoid coil 130 is operated may be of any desired type, preferably one in which it is necessary that the beam of light be interrupted several times in succession before the switch bar is retracted. This embodiment, unlike the embodiment previously described in connection with Figs. 4 and 5, depends upon the interruption of a beam of light which normally activates the photo-cell, whereas the other embodiments depend upon the reflection of a beam of light upon the cell.

While the selected embodiments illustrate the application of this invention to deflector switch operating mechanism it will be understood that it is not limited thereto since it can be employed in operating various forms of mechanism associated with the travel of an article as pointed out above and that other embodiments of the invention can be made without departing from the spirit and scope thereof as set forth in the following claims.

I claim:

1. The combination in a pneumatic despatch conveyer by which carriers are transported of a deflector for changing the direction of travel of a carrier and automatic means for operating said deflector, said means comprising a source of light, a photo-electric cell adapted to be activated by a beam of light from said source, and mechanism actuated by said cells for operating the switch, said automatic means being set into operation upon the passage across the beam of light of a carrier having at least one annular target by which the beam of light is reflected upon the photo-electric cell to actuate the switch operating mechanism.

2. A carrier for a pneumatic despatch conveyer of the type set forth in claim 1, said carrier having a plurality of annular bands by which a beam of light is reflected seriatim.

3. A carrier for a pneumatic despatch conveyer of the type set forth in claim 1, said carrier having a plurality of annular bands surrounding the body thereof by which a beam of light is reflected seriatim.

4. A carrier for a pneumatic despatch conveyer of the type set forth in claim 1, said carrier having a plurality of annular bands at an

end surface thereof by one of which a beam of light is reflected.

5 5. A carrier for a pneumatic despatch conveyor of the type set forth in claim 1, said carrier having at least one annular band, one surface of which diverges at an angle from the body of the carrier, by which surface a beam of light is reflected.

10 6. An article for transportation by a conveyor having a plurality of guideways, switch mechanism for controlling the course of travel of articles thereover and automatic means associated with each said switch mechanism for operating the same, each of said means including a source of light, a photo-electric cell and
15 switch mechanism operating means actuated by said cell when the beam from the source of light is reflected upon the cell, said article having a series of targets vertically arranged on one wall thereof, one face of each of said targets being
20 light reflecting and the other face being light absorbing, and said targets being so arranged

that as the article is transported it is automatically deflected along the desired course of travel.

7. An article for transportation by a conveyor having a plurality of guideways, switch mechanism for controlling the course of travel 5 of articles thereover and automatic means associated with each said switch mechanism for operating the same, each of said means including a source of light, a photo-electric cell and switch mechanism operating means actuated by 10 said cell when the beam from the source of light is reflected upon the cell, said article having a series of targets horizontally arranged on one wall thereof, one face of each of said targets being light reflecting and the other face being 15 light absorbing, and said targets being so arranged that as the article is transported a predetermined number of beams of light are reflected upon certain photo-electric cells.

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