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SYSTEM OF SELECTOR CONTROL FOR CARRIER CONVEYERS

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FIG. 2

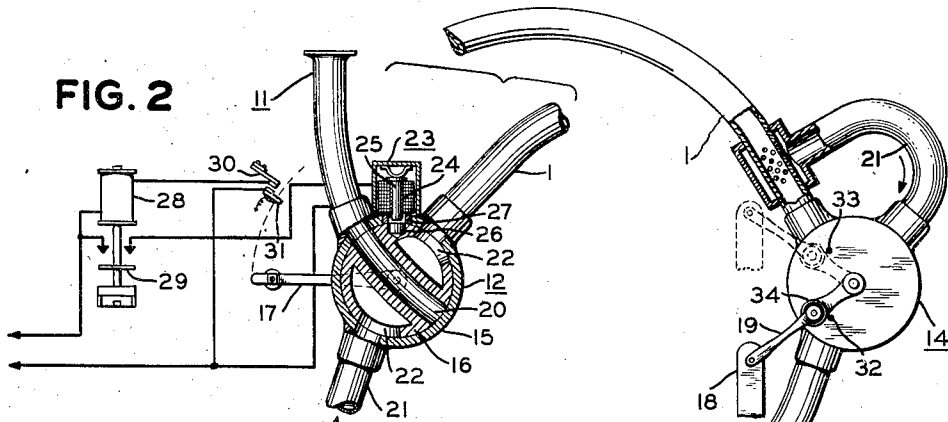


FIG. 3

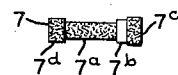


FIG. 4

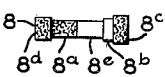


FIG. 5

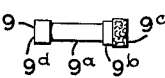
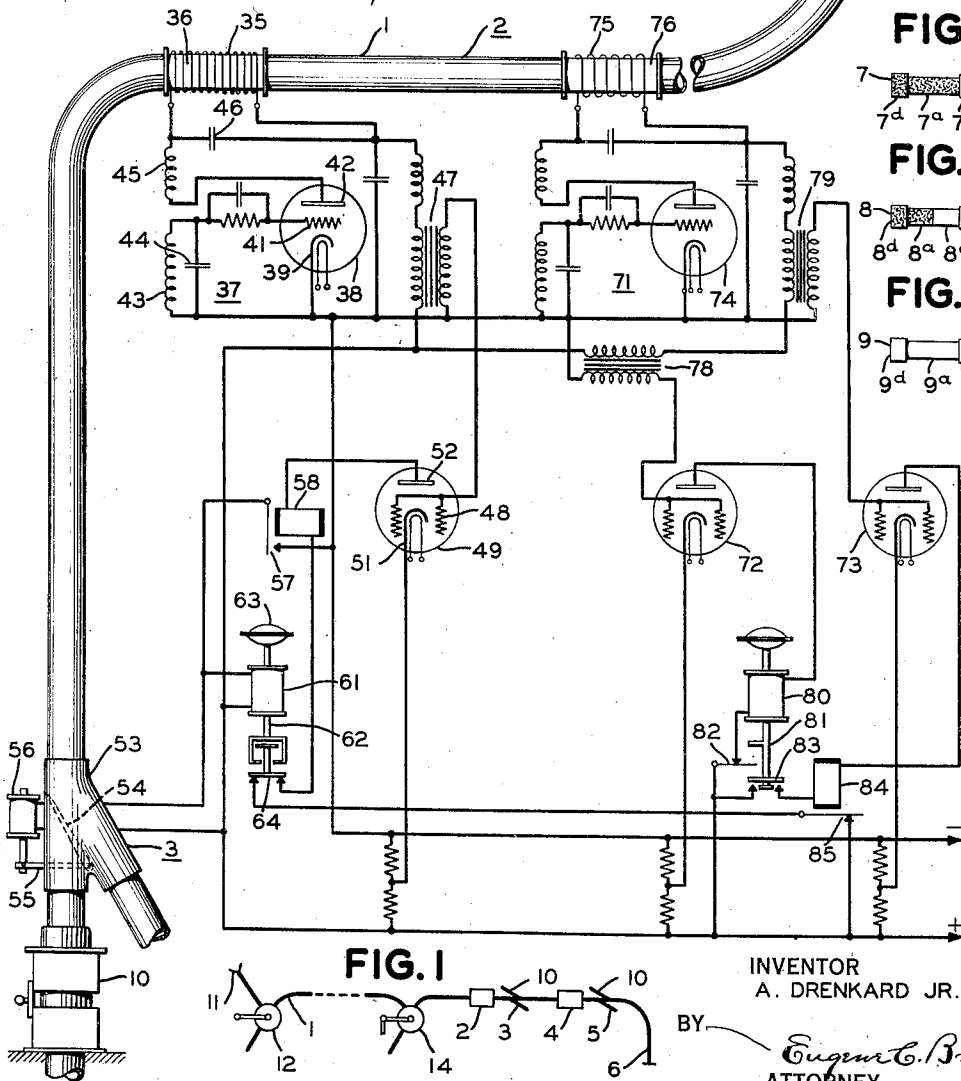


FIG. 1



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SYSTEM OF SELECTOR CONTROL FOR CARRIER CONVEYERS

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12 Claims. (Cl. 243—16)

This invention relates to pneumatic tube systems, more particularly to systems having means to selectively discharge carriers at one or more intermediate points along the tube or guideway, and has for its primary object obviating the difficulties resulting from misselection due to insufficient spacing or insufficient time interval between successive carriers traveling in the tube.

In the early stages of the pneumatic tube art the normal practice was to connect each sending point with its corresponding receiving point by a complete and independent tube or guideway. This meant that each tube was limited to serving only two points. For example, if it was desired to connect a central home station with a plurality of distant stations it was necessary to install a complete tube system between the home station and each individual distant station.

However, it is now becoming common practice to connect a home station with several distant stations by means of a common tube or guideway, by employing selective discharge means at the intermediate out or distant stations which will cause carriers designated for a particular station to be discharged thereat while carriers for a more distant station are continued along the guideway.

Although this increases the usefulness of a single tube system and makes it possible to serve several stations by a single tube, there are certain disadvantages in the arrangement as heretofore devised. Suppose, for instance, that at the extreme end of a tube system it was desired to service a private office, such as a broker's office, while at some intervening point or points along the guideway it is desired to service a public telegraph message station; in such a case, of course, there will be messages of a confidential nature going to the public office which should not be allowed to reach private hands. This means it is extremely important that only messages intended for the broker should be permitted to reach his office. Thus if for any reason the selecting apparatus should fail to function at the intervening office or offices, messages containing information not intended for the broker are likely to be transmitted to his office.

It is an object of this invention to provide an arrangement which will permit only those carriers designated for a distant station to reach the same.

Another object is to provide a system whereby if a condition develops with respect to a group of carriers which would cause misselection at a near station, all carriers of the group will be dis-

charged thereat and carriers not designated for that station returned to the guideway by hand.

These and other objects are effected by this invention as will appear from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a schematic diagram of a system according to this invention;

Fig. 2 is a diagrammatic view of portions of the system showing the spacing mechanisms at the inlet of the system and at an intermediate point together with the control mechanism at a first branch station; and

Figs. 3, 4 and 5 are diagrammatic showings of typical forms of carriers which may be employed in this system.

The novel arrangement of the pneumatic tube constructed according to this invention provides for feeding the carriers into the system separated from each other by a space of travel time or distance not less than a predetermined minimum, and also when the tube extends for a considerable distance before selection takes place of providing means for again automatically spacing the carriers before they reach the selection apparatus. The spacing means referred to form the subject matter of a co-pending application of Adam Drenkard, Jr., Serial No. 157,298, filed August 4, 1937.

The system also includes means at one or more branch stations for selectively discharging carriers for that station and for continuing the carriers in the tube designated for stations beyond. Then in addition to the selecting means other means are provided for rendering the selecting means ineffective when any two carriers approach the branch station traveling close enough together to cause a misselection.

In general two schemes or systems of selection are employed in pneumatic tube systems. According to one of these schemes the deflector means which diverts the carriers from the main tube or guideway at the branch station is normally set to deflect all carriers arriving at the branch point. The selector means responds to those carriers intended for stations beyond and causes the deflector means to close the branch guideway and continue those carriers along the main guideway. According to the other scheme the deflector means is normally set in position to close the branch guideway. In this case the selector responds to the carriers designated for the branch station and operates to cause the deflector to close the main guideway and divert the selected carriers into the branch guideway from

which they are discharged at the branch station. The principles of this invention are applicable to either of these systems.

Referring now to Fig. 1 of the drawing, a pneumatic carrier tube guideway 1 has an inlet end 11 and a manual spacing device 12 adjacent thereto. The guideway may extend for a considerable distance such as from a building in one part of the city to another building at a distance therefrom, and at the distant point or station a mechanically operated spacer 14 may be provided. This is positioned just ahead of a selecting mechanism 2 at the first branch station which acts to deflect carriers designated to leave the guideway at the station into a branch or discharge section 3 forming a part of the station. The guideway may then continue to a second discharge or branch station at which a selecting mechanism 4 is arranged to cause carriers designated for the second position to be deflected from the guideway into the branch tube 5. Carriers not to be discharged from the guideway at a branch station proceed to a distant end of the guideway 6 where they are discharged.

Referring to Figs. 3 to 5, carriers such as described in my copending application, Ser. No. 10,734, filed March 12, 1935, for "Resonator selector for carrier conveyer systems", are illustrated. Carrier 7 shown in Fig. 3 comprises a body 7a of fibre or other nonmetallic material upon which a metallic cup 7b is fitted to carry the felt head 7c of the carrier. The opposite end of the body is surrounded by a fibre collar 7d. This carrier will be seen as only a relatively short length of metallic material presenting a small annular conductive surface at its periphery.

Carrier 8 illustrated in Fig. 4 has a larger conductive surface than carrier 7. It comprises a body similar to that of carrier 7. A main body portion 8a has a metallic cup 8b carrying the felt head 8c. Extending backwardly from the cup 8b is a metallic section 8e which may be a metal foil or the like, secured upon the body portion and arranged to extend substantially to the midpoint thereof. The rear of the carrier is nonmetallic and carries a nonmetallic collar 8d.

The carrier 9 illustrated in Fig. 5 embodies the maximum metallic or conductive surface. Its body 9a may be a nonmetallic cylinder covered with foil or it may be entirely of metallic material. A metal cup 9b carries the head 9c. The only nonmetallic surface upon the carrier will be the felt head 9c. The collar 9d at the rear of the carrier in this case is preferably metallic also.

From this description it will be seen that carriers are provided which progressively have larger amounts of metallic surface. As will appear in the following description, and as more fully set forth in the aforesaid application, carriers provided with different amounts of metallic surface will cause a selective response in the deflector control mechanisms designed and arranged to be operated by this type of carrier characteristic.

As will be more fully described herein, when a misselection occurs several carriers may be discharged at branch stations and these carriers may be properly rerouted by the manual reinser-tion of those intended for points beyond into the main guideway through inlets 10 provided at each branch station.

Referring now to Fig. 2 an illustrative type of spacing means is shown at the inlet end of a system employing a selector means of the first type mentioned above, that is, the type normally

discharging all except selected carriers at the branch station. The advantages of this type of system in addition to those already apparent, will be set forth in a discussion of the operation of the system.

The inlet tube or station of origin 11 is connected to a manually operated spacing mechanism 12, which receives the inserted carriers one at a time and feeds them, in a manner presently to be set forth, into the main guideway 1. If the distance between the sending spacer 12 and the selecting mechanism 2 of the first branch station is of such a length that the carriers, even though spaced at the sending end, are likely to overtake each other then it may be desirable to introduce a second spacing means such as that illustrated at 14, immediately ahead of the branch station.

It is to be understood that the forms of the apparatus illustrated are merely typical and that any other type of apparatus performing an equivalent function may be employed instead of that illustrated. The form of spacing mechanisms 12 and 14 employed at the sending end and ahead of the intermediate station are fully illustrated and described in Patent No. 1,923,052, granted to John M. Chulstrom on August 19, 1933. Each comprises a drum casing 15 in which an inner cylinder 16 is arranged to be oscillated periodically by handle 17 or continuously by any suitably driven link 18 connecting with an arm 19 connected to one end of the cylinder. An arcuate shaped pocket 20 is provided in the cylinder and arranged to come into alinement with the inlet portion of tube 1, the latter having an arcuate section of substantially the same radius as that of the pocket. The cylinder is of such diameter that a single carrier resting in the pocket completely fills the latter. Any carrier following the one resting in the pocket will rest upon the upper end of the first carrier, not in alinement therewith but angularly disposed thereto. This means that there is an angular space between the abutting ends of the carriers which will cause the forward end of the following carrier to slide over the edge of the periphery in the cylinder at the entrance to the pocket when the cylinder is oscillated into a position where the pocket is in alinement at its upper end with the inlet portion of the tube 1. At the same time its lower end alines with a tube 21 connecting with a source of air pressure which will immediately drive the carrier from the cylinder pocket into the tube. This takes place very quickly and when the cylinder is mechanically driven the carrier is clear from the pocket before the cylinder begins to move back into its original position for receiving the next carrier. Suitable means such as openings 22 are provided for permitting the air to flow substantially continuously from the source of pressure through the spacing mechanism along the main conveyer tube or guideway.

With the arrangement shown, it is obvious that the carriers must be fed into the feed-in tube rear end foremost, so that, when the cylinder is rotated in the direction indicated, the carriers will be discharged into the main guideway 1 head foremost. It is apparent, of course, that by reversing the curvature of the cylinder pocket and main guideway and the direction of rotation of the cylinder, the carriers may be fed in head foremost.

The spacing mechanisms 12 and 14 differ only in method of operation. They may be used interchangeably, or the mechanically operated type

may be supplied at both positions. Each type provides means for the lapse of at least a predetermined interval of time before admitting successive carriers.

5 In the spacing mechanism 12 the time interval is determined by means for locking the drum 16 and its manual handle 17 in the position illustrated for a period of time determined by a time control circuit closure in the circuit of a special
10 locking solenoid 23.

The locking solenoid or relay 23 comprises a core 24 through which extends a spring pressed plunger 25 with its tip protruding beyond the end of the core. A locking armature in the nature
15 of a plug 26 is disposed to normally rest in a recess in the drum 16 and in alignment with the core 24. The core opening through the shell of the housing of the spacing mechanism is surrounded with an annulus 27 of nonmagnetic material
20 which prevents a magnetic short circuit to the solenoid core, thereby assuring that the plug 26 would be attracted toward the core when the solenoid is energized. Upon energization the plug 26 is pulled upwardly from its recess toward the end
25 of the core 24 and against the force of the spring pressed plunger 25. In this position the plug lies partly in the recess and partly in the housing opening, effectively locking the drum 16 against rotation.

30 The energization of the relay 23 is accomplished by means of the timer 28. When the coil on the timer is energized it lifts the bridge member 29 closing the circuit to the solenoid 23. This bridge member maintains the circuit closed for a time
35 determined by the adjustment of a dashpot mechanism.

Arrangement is provided for energizing the timer, each time the spacing drum 16 is moved from sending to receiving position. This is provided by the circuit closer 30, which includes a
40 pivoted contactor 31 which has an arm projecting outwardly into the path of the tip of the manual handle 17. By referring to the drawing Fig. 2, it will be seen that as the handle 17 is moved
45 upwardly, in a clockwise direction, the arm of the contactor is engaged and turned around its pivot point in a direction separating its contact from the companion contact on the upper element. However, when the handle is brought back to its
50 original position its engagement with the pivoted element will rotate the same so that the companion contact elements come together, momentarily closing a circuit through the winding of the timer. A suitably arranged spring brings the
55 pivoted element back to its normal open position. As soon as the timer is energized the bridge member 29 closes the circuit to the locking relay 23, energizing its winding. In energized condition the relay is ready to pull up the plug 26 as the
60 drum 16 reaches its normal receiving position. It may be readily seen that the drum is then locked until the relay 23 is deenergized and the plunger 25 pushes the plug back toward its recess in the drum. Once the residual magnetic
65 circuit is broken by the action of the plunger, the plug 26 settles down to its normal position by the action of gravity. The spacing mechanism is then ready to be moved again to sending position for sending on any carrier that has been received.

70 The other spacing mechanism 14 is arranged to be operated continuously by means of a suitably reciprocated bar 18 connected to the outer end of arm 19, so that it will oscillate the drum of the mechanism similarly to the manually operated drum just described. The movement of the

drum is limited to the proper extreme positions by means of stop members 32 and 33 set to engage the arm 19. The time interval between successive carriers of course is determined by the rate
5 of the oscillations of the arm. A by-pass around the inlet 21 provides for a continuance of the air flow in either position, as will be understood.

When carriers are arriving, through the tube 1, at the spacer 14 it would be difficult to time their arrival so that every one would enter the drum
10 guideway to a position wholly within the drum before the latter began to move to discharge position. As a consequence there will be occasions when a carrier will be caught at the entrance of the drum passageway in a position partly within
15 the drum and partly within the end of the tube. Unless provision for such eventuality is made the carriers would be either severed, or the mechanism otherwise damaged. This difficulty is overcome by providing a friction joint 34 in the arm
20 19. In case a carrier is caught, the outer end of the arm 19 will rotate about the friction joint to permit the bar 18 to move upwardly to the full extent of its travel. Upon the down movement of the bar 18, the carrier of course is released
25 and settles down to its proper position. The inner part of the arm 19 is then moved until it comes to rest against the stop member 32, after which the outer part of the arm is rotated about the friction joint back to its normal position.
30 The mechanism will then function in its normal manner to discharge the carrier and receive successive carriers which may have arrived in the meantime. The upper stop 33 will function in connection with the friction joint to bring about
35 a similar result should a carrier become caught in leaving the mechanism.

With the provision of spacing means as described, carriers may be transported along a
40 pneumatic tube system of considerable length without the likelihood of the system becoming choked or overloaded by a great number of carriers traveling close together. Not only is this prevented but the spacing may be reestablished before the carriers approach the selecting mechanism at branch stations.

Whenever the situation arises which, either because of inability or impracticability of locating a spacer immediately ahead of the selective
45 switch control mechanism or because of some other consideration, makes it impossible to assure that carriers will arrive at the point where selection will occur sufficiently spaced to permit the selector switch control to complete its operative
50 cycle for each carrier, a special control arranged to influence the selector in such a way as to prevent misselection is provided.

Both the selective means which is influenced by or responsive to carriers to be controlled at
55 this point and the means for preventing misselection are spaced ahead of the switching mechanism a sufficient distance to permit the operating movements of the switch or deflector member in accordance with the well known requirements. The selecting mechanism embodies
60 means which will respond to predetermined carriers to be controlled at the selecting point while the misselection preventing means is influenced by all of the carriers. In other words, the misselection preventer embodies means to detect the
65 passage of every carrier while the selecting means responds only to predetermined carriers. The two mechanisms are coordinated by means of a timing device set in operation by the misselection preventer each time a carrier passes. This
70 75

timer has a cycle substantially the same as required for the selector and the misselection preventer is arranged so that if the detector means is influenced by a second carrier within this time cycle period it kills the action of the selector and returns the switch or deflecting member to its rest position.

The preferred form of the selector device is similar to that shown in my copending application, Serial No. 10,734, filed March 12, 1935, for Resonator selector for carrier conveyor systems. The misselection preventer is similar in many respects to the selector.

As described fully in the above mentioned application, the preferred form of the selector means comprises a coil 35 forming a part of an oscillation generator circuit and placed ahead of the point where carriers are to be deflected from the tube or guideway a sufficient distance to allow the deflector means to be moved into its operated position when the selector has responded to a carrier.

The coil 35 preferably surrounds a non-magnetic portion 36 of the carrier tube 1 so that the inductance of the coil will be modified when a carrier, including a predetermined amount of metal in the structure of its body, passes through the coil. The action of the carrier upon the oscillation generator is fully described in the above application. Any well known type of self-oscillating circuit may be employed to generate the oscillations. In the form illustrated the selector coil 35 is included in the circuit of an oscillation generator 37. This generator comprises a triode electron discharge tube 38 having a cathode 39, a grid 41 and an anode 42. The cathode-grid circuit is of the grid-leak type tuned by an inductance-condenser arrangement 43-44. The cathode-anode circuit includes a feed back coil 45 in series with the response coil 35. A condenser 46 may be disposed in parallel with the response coil 35 to suitably modify the characteristics of the cathode-anode circuit for stabilizing or modifying the resonances of the oscillator. The output of the oscillator is through the voltage supply lead for the anode which includes therein the primary of a transformer 47. The secondary of this transformer is arranged in circuit with the control grid 48 of a vapor discharge tube 49. This tube is preferably of the type having the well known trigger relay characteristics such that when once energized it continues independent of the control of the grid. The tube includes a cathode 51 and an anode 52. This tube provides a control relay responsive to changes in the oscillation of the generator when it responds to the passage of a carrier through the response coil 35.

The switch or deflector mechanism for limiting the path of the carrier comprises a Y connection 53 in the fork of which is pivoted a member 54 arranged to swing from side to side to close in one position the passageway of the main tube and in the other position the passageway to the branch tube or discharge opening as the case may be. The member 54 is swung back and forth by an arm 55 connected by suitable linkage to the plunger of a solenoid 56. In its normal rest position the switch of the arm and linkage acts to hold the deflector member in position to close the passageway of the main tube. When the solenoid is energized and the plunger pulled up the deflector moves into the opposite position.

The energization of a solenoid is initiated through a circuit closed through the contacts 57 of an auxiliary relay 58. The winding of the

relay 58 is in the anode circuit of the vapor discharge tube 49, the tube 49 having been energized and the relay 58 operated, the circuit to the solenoid 56 remains closed until the relay 58 is released by the quenching of the discharge tube. This quenching is accomplished through the medium of a timing device 61, the winding of which is in parallel with the solenoid 56 and is energized simultaneously therewith. The timer 61 includes a plunger device 62 which is moved against the action of a timing bellows 63. As soon as the timer is energized the plunger begins to move upwardly and through suitable lost motion linkage as it approaches the upward limit of its stroke it engages an extension of a contact closing bar 64 and lifts it from its contacts. The circuit through the bar 64 is the anode circuit of the vapor discharge tube 49 and the lifting of the bar opens this circuit and quenches the tube.

Before describing the operation of the selector control mechanism the misselection preventer will be described and the operation of both mechanisms considered together. The misselection preventer comprises an oscillation generator 71 having substantially the same parts and arrangements as the generator 37. This generator is arranged to energize two gaseous discharge tubes 72 and 73. The generator includes the triode 74 and the associated circuits arranged as in the generator 37. Included in the anode circuit of the tube is a detector coil 75 arranged to surround a non-magnetic length 76 of the guideway 1. The circuit of the generator is preferably tuned to its maximum sensitivity so that every carrier which passes through the detector coil 75 will sufficiently affect the oscillations of the generator to cause a rapid change in the current passed by the tube. With this arrangement it is presupposed that all of the carriers employed in the system will have at least a pre-determined minimum amount of metal in their body.

The anode or output circuit of the oscillation generator 71 includes the primaries of two transformers 78 and 79 in series. The secondaries of these transformers are coupled to the grids of the gaseous discharge tubes 72 and 73 respectively and operate to raise the potential of the grids in the same manner as a selector oscillation generator described in connection with the gaseous discharge tube 49.

The anode circuit of the discharge tube 72 includes a winding of a timer 81 and contacts 82 opened by the timer when it is energized. The anode circuit of the tube 73 includes contacts which are bridged by bar 83 upon energization of the timer. This circuit also includes a relay 84 having normally closed contacts 85 in the anode circuit of the discharge tube 49.

The correlation of the selector mechanism and the misselection preventer mechanism will now be described. It will be noted that the deflector at the point where carriers are diverted from the main guideway normally rests in a position to close the entrance to the continuation of the main guideway so that without being selectively moved to an operated position, all carriers arriving at the deflection point will be diverted from the guideway. With this arrangement the selector is made responsive to carriers that are to be continued in the main guideway to a distant point and carriers to be diverted from the guideway at the point in consideration will not cause response of the selecting mechanism.

It will be first assumed that several carriers are fed into the inlet of the main guideway 1 ahead

of the initial spacing device 12. It will be assumed that the required spacing to permit the completion of the operative cycle of the selector mechanism is one second apart. The spacer 12 is so arranged by the action of the timer 28 that it cannot be moved into position to send successive carriers more frequently than at intervals of one second. At a point closely ahead of the first discharge or branch station, which it is assumed is the station 2 illustrated in Figs. 1 and 2, a second spacer 14 may be provided when deemed necessary to insure that carriers approaching the discharge station maintain their spacing of at least one second apart. However, except under unusual circumstances the use of the spacer 14 would not be justified. The misselection preventing apparatus will always take care of the occasional case of insufficiently spaced carriers. The approaching carrier will first pass through the detector coil 75 and if carriers of the type herein described are employed, it will be assumed that the first carrier is one embodying only a metal cup which joins the head and body together such as carrier 7, Fig. 3. This carrier will be one which is desired to discharge at the first branch station. The passage of the carrier through the coil 75 at a relatively high speed affects the oscillator 71 and causes a quick change in the amount of current passed by the tube. This change in the primary of transformer 78 is reflected in the secondary so as to elevate the potential of the grid of vapor tube 72 causing the arc discharge through the tube to begin to flow. The response action of the oscillator is at the same time reflected through transformer 79 to the grid of vapor tube 73 but the tube will not function because its plate circuit is at that instant open at the contacts of bar 83. As soon as tube 72 operates, the current passed will energize the timer 80 drawing the plunger 81 quickly downward against the action of a spring. The movement of the plunger downward lets the bar 83 down to close the contacts and the anode circuit of the tube 73. As the plunger approaches the downward limit of its stroke it strikes the tongue of the contacts 82 momentarily opening the same and quenching the discharge tube 72 in a well known manner. The quenching of the tube deenergizes the winding of the timer and the plunger is drawn back upwardly against the timing action of a bellows or similar device. This action controls the movement of the plunger so that the bar 83 is not lifted again until one second of time has expired.

During the time that the bar 83 is on its contacts, the anode circuit of the tube 73 is completed and the tube is in readiness to be energized should the detector respond to another carrier before the expiration of one second time.

However for the sake of illustration, it is assumed that the carriers are spaced, by the spacer 14 or otherwise, so that each succeeding carrier is more than one second behind the preceding one. In this case the timer 80 will resume its normal position after one second with its actuating tube 72 deenergized and the anode circuit of tube 73 open. For each succeeding carrier arriving more than one second after the preceding one the above cycle will be repeated by the detector portion of the branch station apparatus.

As the first carrier of the type already noted, having only a small section of conductive surface such as a band at the head formed by a metal cup, proceeds it passes through selector coil 35, but due to the pre-determined set of the oscillation generator 37 it does not respond to a carrier

having only a metal cup in its body. This being the case, none of the selector mechanism operates and the first carrier will be diverted into the branch tube when it reaches the Y section 53.

It will be assumed that the second carrier is one containing metal in excess of the amount embodied in the first carrier and that the selector mechanism will respond thereto. Before the second carrier has arrived at the detector coil 75, the timer 80 will have returned to its normal position and the response of the detector mechanism and the intervening parts controlling the timer 80 will be operated to cause the timer to pass through the cycle just described. The second carrier proceeding will pass through the selector coil 35 and will effect generator 37 causing a sudden change in the current passed by the tube 38 which current change occurring also in the primary of the transformer 47 will impose through its secondary a triggering potential upon the discharge tube 49. It will be noted that the anode circuit of this tube is from plus potential through the contacts and bar 85 in the misselection prevention part of the mechanism and from there through the contact bar 64 and the included relay 58 to the anode 52 of the tube. The tube upon becoming energized operates the relay 58 to close its contacts 57 which simultaneously completes the circuit through timer 61 and solenoid 56. The energization of the solenoid swings the deflector member 54 over to the opposite side closing the branch guideway and opening the continuation of the main guideway. The gaseous discharge device 49 in the meantime continues energized holding the contacts 57 closed. Upon its energization the timer 61 begins to draw its plunger 62 upwardly against the action of the timing bellows 63. This is so timed that substantially at the end of one second of time the plunger will lift the bar 64 from its contacts. This latter action opens the anode circuit of the tube 49 quenching the same. Thereupon the relay 58 is deenergized permitting its contacts to open, which opens the circuit both to the timer 61 and the solenoid 56. This permits these to return to their normal position with the deflector 54 resting across the entrance of the main guideway and the plunger of the timer in its downward position with the bar 54 completing the anode circuit of discharge device 49. Meantime, it should be noted that the contacts 85 of the anode circuit have not been disturbed by the passage of either of the first two carriers.

The apparatus is now in position to respond to the next carrier having more than the minimum conductive surface or other attribute employed to influence the selective means of the oscillation generator 37. Of the carriers illustrated in Figs. 3 to 5, this would mean that it would respond to a carrier either of the type 8 or the type 9. In other words, every carrier having more than the minimum attribute will operate the selective means and thereby be directed past the first branch point and retained in the main guideway. At the several successive branch stations the sensitivity or response limit is set so that it will not respond to or be affected by the type of carrier having the minimum effective attribute for operating the response mechanism at the preceding station. In other words, at station 2 in the diagram of Fig. 1, carriers of the type 8, shown in Fig. 4, would not operate the selective mechanism at station 2. Only carriers having more metallic surface than type 8 would operate the selecting mechanism at this station.

So far, the operation of the mechanism in re-

spending to carriers which are traveling spaced not less than the minimum required distance has been considered. The misselection prevention portion of the apparatus is designed to take care of the situation where the carriers arrive at the point of selection traveling close together. Two situations are possible in this connection. The first is one in which, of the two closely spaced carriers, the first carrier will normally be selected. The second situation is the one in which the first carrier will normally not be selected.

The functioning of the apparatus in connection with the first type of situation will now be described. Let it be assumed that a carrier of the type 8 shown in Fig. 4 arrives at the selecting point followed by a second carrier at a space less than one second's travel time. The first carrier passes through coil 75, which responds to all carriers passing that point, and triggers or energizes vapor tube 72, operating the timer 80 in the manner already described, closing the contacts at bar 83, and completing the anode circuit of the vapor tube 73. As already described the timer 80 acts to maintain the anode circuit of the tube 73 completed for a time period of one second or such other length of period for which it may be regulated.

The leading carrier proceeds and passes through the selector coil 35, causing the oscillator 37 to respond and trigger the vapor tube 49. The action of this tube energizes the solenoid 56 and the timer 61. The solenoid 56 begins to move the deflector 54 to operating position. If the deflector 54 remained in operated position, for the period of one second after the carrier passed the coil 35, the carrier would clear the deflector 54 and continue along the main guideway. But in this case a second carrier is following closely behind the first carrier.

Should the second carrier be of the type which should normally not cause a selective response, it also might clear the deflector 54 and cause misselection or improper routing of that carrier. The action of the detector oscillator mechanism and its associated apparatus, however, prevents such an eventuality. As indicated above, the detector oscillator 71 in responding to the first carrier of the type 7 operated the timer 80 which acted to keep the anode circuit of the vapor tube 73 alive for a period of one second. The second or closely following carrier in passing through the coil 75 within this second period would, through the action of transformer 79, trigger the vapor tube 73. This action energizes relay 84 and opens the contact 85. The circuit through contact 85 is the anode circuit of the vapor tube 49. Consequently, the response of the detector oscillator to the second carrier serves to quench the tube 49 which in turn deenergizes the solenoid 56 and the timer 61. This latter action causes the deflector 54, even though it has begun to respond to the selective action of the first carrier, to be returned to its normal position. As a result of this the first carrier, instead of proceeding along the main guideway, will be deflected into the branch. Should the deflector member 54 not have reached its normal position, the carrier would merely be stopped momentarily by striking the end of the deflector member. As it rebounded from this the deflector would then settle to its normal position and the carrier proceed into the branch guideway.

Meanwhile, the action of the second carrier upon the detector oscillator triggered tube 72 at the same time as 73. This reset the timer

80 to its full one second period. As a consequence, the second carrier would also of necessity be deflected into the branch tube because for a full one second period after it passed the detector, the action of the selector mechanism would be nullified. As a result of this arrangement, if one or more other carriers should follow the second carrier and pass the detector coil 75 within one second's time, they likewise would be deflected at the branch point. In other words, normal selecting action would not be restored until a carrier spaced at a greater distance than a time period of one second from its preceding carrier arrived at the branch station.

The second situation which may arise will now be considered, namely the one in which the first carrier would normally not be selected. It will be assumed that a carrier of type 7 shown in Fig. 3 will be the leading carrier followed by a carrier which will cause selective response. The leading carrier in passing through the detector coil 75 of oscillator 71 sets up the action of the timer 80 as before. This carrier proceeds without affecting the selector oscillator 37 and travels towards the deflection point for the branch section 3. If no means of preventing misselection were provided, a selecting carrier of the type 8 or 9 closely following the first carrier would produce an erroneous routing of the latter through a selective response of the oscillator 37 which would move the deflector 54 into position to continue the first carrier along the main guideway before it reached the branch point. If this action was not completed, it would be completed when the carrier struck the deflector 54 and rebounded, giving additional time for the completion of its movement. However, misselection prevention apparatus comes into play by the action of the detector oscillator being repeated in the same manner as in the previous situation. In other words, passage of the second carrier through the detector coil 75, while the timer 80 is in action, acts to kill, in the same manner as before the action of the selector oscillator. This means that the second or succeeding carrier, even though selective, causes no response and as a result the deflector 54 remains in its normal deflecting position and both the first and second carriers are deflected to the branch guideway. In like manner the apparatus will not assume its normal selecting function until a carrier spaced a distance more than one second's travel time behind the carrier preceding it reaches the branch station.

As already set forth, according to this system means will preferably be provided for normally maintaining all of the carriers properly spaced. However, in the event that they are not at any time so spaced, the improperly spaced carriers will all be discharged at the first branch station at which they arrived subsequent to their becoming spaced at a distance apart shorter than the minimum spacing. The proper delivery of the carriers will be carried out by the attendant at this station selecting carriers manually which are to be delivered at stations beyond and reinserting the same in the manual inlet 10 provided at the branch stations.

It is to be understood that while the form of the invention herein illustrated shows the same applied to a system in which the deflector in its normal rest position diverts the carriers from the guideway at the branch or intermediate stations, it may be as readily applied to other types of systems. When applied to a system in which

the deflectors are normally set to retain the carriers in the guideway at the branch points, a different basis of characterization or differentiation of the carriers may be employed.

5 With the former system selective characteristics of the carriers can best be obtained on the basis of an arithmetical differentiation such as herein described. However, with the latter system wherein the selector response is restricted to the particular carriers to be discharged at each
10 intermediate point or branch station, the selective characteristics of the carrier may best be obtained on the basis of algebraic differentiation.

15 Since both types of differentiation are now in common use in the art, it is not deemed necessary to illustrate the invention as applied to the latter type of system.

It is also to be understood that other means than that illustrated may be employed to produce a physical differentiation of the carriers.

In other words, the principles of this invention may be applied to any system of selective carrier routing or handling and any well known
25 method of obtaining carrier selection may be employed without departing from the spirit of this invention.

It is further to be understood that the misselection prevention features may be provided by any of the known methods of detecting the passage of a carrier past a certain point such as by the use of a trigger device which makes mechanical contact with the carrier as it passes the point where the trigger is located. The essential features of
35 the invention are the intercontrol between the detector or misselection preventer devices and the selection devices at each of the branch stations, and the particular means for carrying them out are not to be restricted to those illustrated herein.

40 It is further to be understood that the misselection preventor apparatus at the branch stations for causing all of the carriers of a group which are traveling spaced apart insufficiently to permit of normal selective operation at the
45 branch stations may be readily and effectively employed alone in a carrier system entirely without the use of spacing devices in any part of the system.

While this invention has been illustrated in but one form, as indicated, it may assume other forms without departing from the spirit thereof and it is desired, therefore, that only such limitations shall be placed thereon as are imposed by the prior art or as specifically set forth in the appended claims.

55 What I claim is:

1. In carrier conveyer system, a single carrier path communicating with a pair of carrier paths along either of which carriers may be directed, a movable deflector disposed at the juncture of said paths to normally direct the carriers from said single path into one of said pair of paths, selective means for moving said deflector into position to direct predetermined carriers into the other of said paths, said selecting means including control means responsive to said latter carriers and disposed ahead of said deflector a distance at least equivalent to that traversed by a carrier during the time required for the selective means to move the deflector into its selected position and means coordinated therewith for restoring the deflector to normal a predetermined time after said required time has elapsed, and detecting means responsive to all carriers, said
75 detecting means being disposed also ahead of the

deflector a distance not substantially less than the selective means and having means for rendering the selective means ineffective when the next succeeding carrier after the detecting means has responded arrives within said required time.

2. In a carrier system in which several carriers may travel along a single guideway joined to a pair of guideways along either of which the carriers may be directed, movable deflector means disposed at the juncture of said guideways with
10 biasing means for normally holding the same in position to direct the carriers into one of said guideways, a selector disposed at a control point ahead of the juncture, said selector being responsive to certain ones of said carriers as they pass
15 the control point, and acting when said carriers pass the control point to move the deflector into position to direct said carriers along the other guideway, said selector being disposed at a predetermined distance ahead of the juncture sufficient for the deflector to have arrived at its new position before the carrier reaches the juncture, and a carrier detector disposed adjacent to said control point and responsive to each carrier, said
20 detector having means for interrupting the action of the selector if a second carrier is detected while a formerly detected carrier is traversing the space between the control point and the guideway juncture.

3. In a carrier system in which several carriers may travel along a single guideway joined to a pair of guideways along either of which the carriers may be directed, movable deflector means for normally holding the same in position to direct the carriers into one of said guideways, a selector disposed at a control point ahead of the juncture, said selector being responsive to certain ones of said carriers as they pass the control point, and acting when said carriers pass the control point to move the deflector into position
40 to direct said carriers along the other guideway, said selector being disposed at a predetermined distance ahead of the juncture sufficient for the deflector to have arrived at its new position before the carrier reaches the juncture, means for sustaining the action of the selective means while the carrier passes said juncture, and a carrier detector disposed adjacent to said control point and responsive to each carrier, said detector embodying a first means for setting up a condition co-extensive with said sustaining action, and a second means for interrupting said sustaining action if a succeeding carrier is detected while said condition is being sustained.

4. In a carrier system in which several carriers may travel along a single guideway joined to a pair of guideways along either of which the carriers may be directed, movable deflector means disposed at the juncture of said guideways with biasing means for normally holding the same in position to direct the carriers into one of said guideways, a selector disposed at a control point ahead of the juncture, said selector being responsive to certain ones of said carriers as they pass the control point, and acting when said carriers
65 pass the control point to move the deflector into position to direct said carriers along the other guideway, said selector being disposed at a predetermined distance ahead of the juncture sufficient for the deflector to have arrived at its new position before the carrier reaches the juncture, interconnecting circuits between the selector and the deflector for operatively coupling the deflector to the selector, said circuits including relay means which upon being operated nullifies the action
75

of the selector upon the deflector so that the biasing means of the latter may immediately return it to normal position, and a carrier detector disposed adjacent to said control point and responsive to each carrier, said detector including a first means for preparing an operating circuit to said relay and a timing device initiated by said first means for maintaining said circuit prepared for a predetermined time period, said detector also including a second means for completing said operating circuit to the relay when said detector responds to a succeeding carrier within said time period, whereby if two carriers are travelling in the system spaced so that they will pass said control point within said predetermined time period the selector action will be nullified and both carriers directed into the guideway which would have received them had no selective action taken place.

5. In a selectively controlled carrier conveyer system, a conveyer along which several carriers may travel in succession and embodying points intermediate thereof where carriers may be diverted from the conveyer, said carriers having selector actuating means varied according to their destination, a deflector member at each of said intermediate points for diverting a carrier from the conveyer, said deflector member having two positions of rest in one of which it diverts carriers from the conveyer and in the other of which it retains carriers in the conveyer, and means for normally returning it to one of said positions when released, actuating means for moving the deflector from its normal position of rest to its other position of rest, and releasing means operable upon the consummation of a subsequent event for releasing the deflector to permit it to return to normal position, means associated with the selector at each of said points and positioned ahead of the deflector member for responding to the actuating means of certain carriers for operating the actuating means, said responsive means being disposed ahead of the deflector a distance greater than that traversed by the carrier while the deflector is passing through its cycle of operation, and means for interrupting the operation of said responsive means when a second carrier enters the portion of said conveyer lying between the selector and the deflector.

6. In a carrier system, a guideway in which several carriers may travel in succession, said guideway being joined to a pair of continuing guideways along either of which carriers may be directed, a deflector disposed at the juncture of said guideways and normally resting in a first one of two positions in which it directs carriers respectively into the one and the other of said continuing guideways and requiring a predetermined time to go through a functional cycle including an initial portion during which it moves from the first to the second position and a completing portion during which it moves back to normal, selectively operated means at a point ahead of said juncture for initiating the movement of said deflector, and means cooperating with said selecting means for rendering the latter inoperative whenever two or more carriers approach the juncture separated by a travel time less than the time required for the deflector to go through the initial portion of its functional cycle.

7. In a carrier conveyer system in which several carriers may travel in succession and embodying intermediate branch stations, selectively

operated means at the branch stations arranged for selectively discharging thereat carriers designated for that station, said means including a diverter disposed to rest normally in diverting position and including means responsive to carriers designated for stations beyond for moving the diverter into position for retaining the carrier and then restoring the same to normal position, and means for immediately restoring the diverter to normal position when a second carrier approaches the diverter before the latter has been restored in consequence of the normal cycle of operation.

8. In a pneumatic carrier system having a guideway along which several carriers may travel in succession and embodying one or more intermediate branch stations, means at each branch station for selectively discharging thereat carriers designated for that station, and means for rendering the selecting mechanism inoperative whenever two or more carriers arrive at a branch station spaced less than a predetermined period of travel time.

9. In a carrier conveyer system, a single carrier path communicating with a pair of carrier paths along either of which carriers may be directed, a movable deflector means normally disposed to direct the carriers from said single path into one of said pair of paths, means selectively responsive to predetermined carriers for moving said deflector into position to direct said carriers into the other of said paths, and means operative in response to successive carriers arriving at less than a predetermined time period apart for interrupting the operation of said selective means.

10. In a carrier conveyer system, a guideway along which several carriers may travel in succession and having one or more intermediate branch stations, selectively operated means at the branch stations arranged for selectively discharging thereat carriers designated for that station, means collectively responsive to two or more carriers approaching a branch station travelling at less than a predetermined interval apart for causing all of said carriers to be discharged at the branch station irrespective of their designation, and means at the branch station for permitting discharged carriers designated for stations beyond, to be reinserted into said guideway.

11. In a carrier conveyer system having a guideway along which several carriers may travel in succession, said guideway being arranged to serve a sending station, a terminal station and one or more intermediate branch stations, means at the sending station for dispatching carriers at spaced intervals, means at each of the intermediate branch stations for selectively discharging thereat carriers designated for that station, and means for rendering the selecting means inoperative whenever two or more carriers have changed their initial spacing in transit so as to arrive at said branch station spaced less than a predetermined interval apart.

12. In a carrier conveyer system having a guideway along which several carriers may travel in succession, said guideway being arranged to serve a sending station, a terminal station and one or more intermediate branch stations, means at the sending station for dispatching carriers spaced at a suitable distance apart, means ahead of one or more said branch stations remote from the sending station to again space said carriers to overcome any change in their spacing occur-

ring in transit, deflector means at each branch station normally positioned for discharging thereat carriers designated for that station, selector means at each branch station responsive to carriers other than those designated for that station to operate said deflector means, and means for rendering the selector means inopera-

tive whenever two or more carriers arrive at said station spaced apart less than a predetermined interval whereby said insufficiently spaced carriers will be discharged thereat irrespective of their intended destination.

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