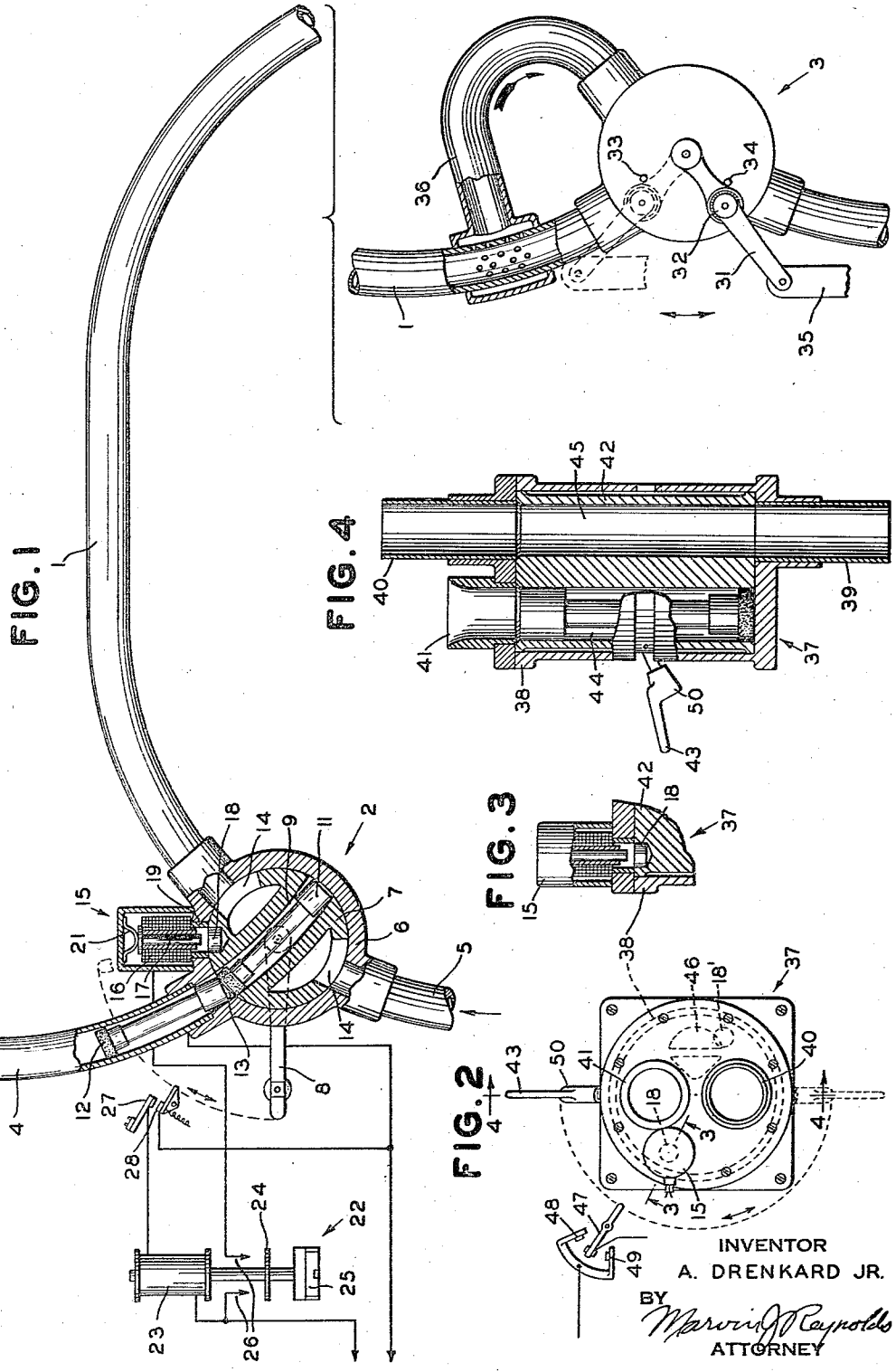
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CARRIER SPACING MEANS

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CARRIER SPACING MEANS

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This invention relates to pneumatic tube carrier dispatch systems in which provision is made for selectively discharging carriers at one or more intermediate branch stations along a main carrier guideway, and has particular reference to a means for spacing the carriers in the guideway.

The present application is a continuation in part of application Ser. No. 23,764, filed May 27, 1935, entitled "System of selector control for carrier conveyors", now Patent 2,128,671 granted August 30, 1938.

One of the principal objects of this invention is to provide spacing means at the inlet end of the tube system and at other desirable points for suitably spacing the carriers so that they will arrive at the branch stations in a spaced relation sufficient to prevent them from interfering with each other in the operation of the selecting or discharge mechanism.

Another object is to provide a spacing mechanism which may be operated manually, having means to lock the mechanism in one of its extreme positions for a predetermined period of time so as to prevent the insertion of another carrier until sufficient time has elapsed after the introduction of the preceding carrier to allow for the desired spacing between successive carriers.

These and other objects are effected by this invention as will be apparent from the following description taken in connection with the accompanying drawing, of which,

Fig. 1 is a view of a conveyor system showing a manually operated spacing mechanism at the initial inlet and an automatic spacer at an intermediate point along the carrier path;

Fig. 2 is a plan view of a modified form of carrier inlet;

Fig. 3 is a partial section taken on the line 3—3 of Fig. 2 showing one of the locking mechanisms; and

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 2 and illustrating the inlet in its relation to the conveyor system.

According to this invention, there is provided a novel arrangement for feeding the carriers into the pneumatic tube system separated from one another by a period of travel time or distance not less than a predetermined minimum and, also, when the tube extends for a considerable distance before selection occurs, means for again spacing the carriers automatically before they reach the selector mechanism associated with the intermediate branch station.

The present system also embodies means for suitably by-passing the spacing units so as to provide a continuance of air flow through the guideway while the spacing function is being performed.

Referring now to Fig. 1, there is shown a conveyor system including a main carrier guideway 1, a manually operated spacing device 2 disposed at the inlet to the guideway, and an automatically operated spacer 3 disposed at some suitable intermediate point therealong.

The spacing device 2 is connected to the main guideway 1 at the home station or initial sending point, and is provided with a feed-in tube 4, into which carriers may be inserted manually, and an air-supply tube 5 leading to a source of air pressure for driving the carriers.

In general, the spacing devices 2 and 3 are similar in construction to that shown and described in Patent No. 1,923,052, granted to John M. Chulstrom on August 19, 1933. However, various improvements and modifications have been incorporated herein, as will presently be described. Of course, it is to be understood that the forms of apparatus shown are merely typical, and that any other types performing an equivalent function may be employed in their stead.

The illustrated form comprises a drum casing 6 in which an inner drum or cylinder 7 is arranged to be oscillated, either periodically by a handle 8 or continuously by any suitable automatic driving means, as shown at 3. An arcuate-shaped tubular pocket 9 is substantially diametrically disposed in the cylinder 7 and arranged in a manner to permit its being rotated in a clockwise direction to a position in alignment with the air-pressure supply tube 5 and the main carrier guideway 1, both of which are disposed to conform with the arcuate shape of the cylinder pocket 9.

The cylinder 7 is of such diameter that a single carrier 11 resting in the pocket completely fills the latter. Where more than one carrier is dropped into the feed-in tube 4 before the cylinder handle 8 is operated, the second carrier 12 will rest upon the upper end of the first carrier 11 in the pocket 9 and, because of the arcuate shapes of the pocket and the feed-in tube, the carriers will not be in alignment but will be angularly disposed to each other. In other words, there will be an angular space 13 between the abutting ends of the carrier in the pocket and the following carrier which will permit the forward end of the latter to slide over the outer surface of the cylinder 7 as it is rotated

into the discharge position without having the forward edge of the second carrier 12 catch on the edge of the cylinder pocket 9. When the cylinder has reached its discharge position, the pocket in the cylinder is in alignment with the air-supply tube 5 and the main carrier guideway 1 so that the air pressure may immediately drive the carrier from the cylinder pocket into the tube. Suitable means, such as openings 14, are provided for permitting the air to flow substantially continuously through the cylinder and around the outer portion of the pocket 9 into the guideway 1.

With the arrangement shown, it is apparent that the carriers must be inserted into the feed-in tube 4 rear end foremost, so that when the cylinder 7 is rotated in the direction indicated, the carriers will be driven into the main tube 1 head foremost. It is contemplated that by rotating the cylinder in a counterclockwise direction and by shaping the feed-in tube 4 and the cylinder pocket 9 arcuately in the opposite direction, the carriers may be introduced in their normal traveling manner, that is, head foremost. Where, as a matter of economy and convenience of instalation, the one method is not practicable, the other method may be used.

In both of the spacing devices 2 and 3, means is provided for discharging the carriers separated by a predetermined minimum distance. This is to reduce to a practicable minimum the possibility of the carriers overtaking one another in transit and traveling in grouped relation so as to cause mis-selection at one of the discharge stations.

In the spacing mechanism 2, the time or space interval between successive carriers is regulated and controlled by providing means for locking the cylinder 7 in its normal rest position for a predetermined period of time after the introduction of the preceding carrier into the main tube 1. This is accomplished by the use of a locking solenoid 15, the circuit for which includes a time control device.

The locking solenoid or relay 15 comprises a coil or winding 16 through the central portion of which extends a spring depressed plunger 17 with its tip normally protruding beyond the end of the coil. A locking armature, in the nature of a plug 18, is disposed to normally rest entirely within a recess in the cylinder 7 and in alignment with the center of the coil 16, when the cylinder is in its receiving position. The opening in the shell of the drum casing 6 providing access to the coil 16 from within the drum is fitted with an annulus 19 of non-magnetic material, the purpose of which is to prevent the magnetic short circuiting of the solenoid coil, thereby assuring the attraction of the plug 18 toward the coil 16 when the solenoid 15 is energized. Upon energization of the solenoid the plug 18 is pulled upward against the force of the spring member 21. In this position, the plug 18 lies partly within the recess and partly within the annulus 19, thus effectively locking the cylinder 7 against rotation.

The energization of the solenoid 15 is effected and its duration is controlled by a timer 22 which consists of a winding 23, to the plunger of which is attached a conducting bridge member 24 and a dashpot mechanism 25. When the winding 23 is energized, it lifts the bridge member 24 into engagement with the contacts 26 which are in circuit with the solenoid 15, thus supplying current to the latter. This bridge member 24 maintains the circuit closed for a period of time determined by the adjustment of the dashpot mechanism 25.

An arrangement is provided for energizing the timer 22 each time the cylinder 7 completes a cycle of its rotative operation. This energization is effected during the return portion of the cycle, that is, when the cylinder is being rotated from its sending position back to its normal receiving position, the latter position being illustrated in the drawing. A pair of contacts, consisting of a fixed contact element 27 and a centrally pivoted contact element 28, is placed in series circuit with the timer solenoid 23. The contact elements 27 and 28 are normally open and the pivoted element 28 is disposed so that one arm projects outwardly into the path of the cylinder handle 8. As this manually operated handle 8 is moved upwardly in a clockwise direction, the projecting arm of the contact 28 is engaged by the end of the crank handle and is turned or tripped about its pivot point in a direction to further separate the contact points. However, after the carrier has been discharged and the handle is brought back toward its starting position, the contact element 28 is reengaged by the crank handle 8 and is pivoted in the opposite direction so that the contacts are closed, thus momentarily energizing the timer winding 23. Contact 28 is provided with a suitable spring arrangement so that when it is free from its engagement with the crank handle 8 it will automatically return to its normal or open position.

As soon as the timer is energized, the bridge member 24 closes the circuit to the locking solenoid 15, energizing its winding 16. In its energized condition the solenoid 15 is prepared to pull up the plug 18 as soon as the cylinder 7 has reached its original position. When this position is attained, it may be readily seen that the plug will be raised to a point where it is partly within the annulus 19 in the drum casing 6 and partly within the cylinder recess. The cylinder is thus locked until the contacts 26 are disengaged from the bridge member 24, at which time the electromagnetic effect of the solenoid 15 is destroyed leaving the plug 18 free to return to its recess in the cylinder wall. The spring member 21, acting downwardly upon the plunger 17, serves to free the plug from any residual magnetic effect allowing it to settle down to its normal position in the recess under the action of gravity. The spacing mechanism is then free to repeat its cycle of operation to send on the next carrier.

This type of spacer obviates the possibility of having two or more carriers inserted into the main guideway 1 in such close relationship that they will travel as a group. By suitably adjusting the dashpot 25, any desired timing interval may be secured.

By the provision of spacing means as described, carriers may be dispatched along a pneumatic conveyor tube system with a substantially proper spacing therebetween. However, where there is a long uninterrupted run between stations, or where the carriers have varying degrees of wear, so that some provide better seals in the guideway than others, the original spacing is very often not maintained. This condition may be rectified by inserting the second spacer 3 into the line to perform the function of re-spacing the carriers auomatically.

As previously mentioned, the spacing mechanism 3 is similar to spacer 2 in general construction. Its chief distinguishing features are that it is continuously and mechanically operated, and

it has a different method of timing regulation. The cylinder drum is provided with a crank arm 31 having a friction joint or elbow 32 between its extremities. The movement of the cylinder is limited to the proper extreme positions by means of stop members or pins 33 and 34 set to engage the upper section of the arm 31. The outer or free end of the crank handle is connected by means of a connecting rod 35 to any suitable reciprocating means. The reciprocating means performs the function of hand cranking and imparts a continuous oscillating motion to the cylinder. Thus it is apparent that the timing mechanism associated with spacer 2 is unnecessary, inasmuch as the time or space interval between successive carriers may be determined by the rate of the oscillations of the crank arm 31.

In order that the spacing mechanism 3 may perform its function with a minimum of disturbance to the conveyor system, and especially to the air pressure in the tube, an air by-pass 36 is provided to insure a continuance of the air flow when the cylinder is in either position.

With the carriers arriving, through the guideway 1, at the spacer 3 with varying intervals therebetween, it is extremely difficult to time their arrival so that everyone will enter the cylinder pocket to a position wholly therein before the latter begins to move to its discharge position. As a consequence there will be occasions when a carrier will be caught at the entrance of the cylinder passageway in a position partly within the pocket and partly within the end of the main tube 1. Unless provision for such an eventuality is made, the carriers will either be severed or crushed, or the mechanism otherwise damaged. To this end, there is provided the friction joint 32 in the crank arm 31. In case a carrier is caught, the outer end of the arm 31 will rotate about the friction joint 32 to permit the connecting rod 35 to move upwardly to the full extent of its normal travel. Upon the downward movement of the connecting rod 35, the carrier is, of course, released and settles into its proper position in the cylinder pocket. As the crank arm 31 moves downwardly it will be apparent that the inner portion of the arm will engage the lower limiting pin 34, and the cylinder will be returned to its receiving position before the connecting rod 35 reaches its lower limiting position. While the cylinder is maintained in this position, the outer portion of the arm will rotate about the friction joint 32 until the arm resumes its normal shape. The cylinder then rotates to its discharge position to dispatch the carrier and normal operation is resumed. The upper stop pin 33 will cooperate with the crank arm 31 to accomplish a similar result should a carrier become caught in leaving the spacing mechanism.

The embodiment of the locking device with another form of carrier inlet is shown in Figs. 2, 3 and 4. In this modification of the inlet 37, the cylinder is arranged to rotate within the housing drum in a horizontal plane as contrasted to the movement in a vertical plane of the inlets 2 and 3 of Fig. 1.

The housing drum 38 is provided with an outlet 39 into the main carrier guideway on its under side and with an air inlet 40 directly opposite on its upper side. Also on the upper side is a carrier feed-in tube 41 which is diametrically opposed to the inlet 40. A movable cylinder 42 is disposed within the drum housing and is equipped with a handle 43 by which it may be oscillated between two extreme positions spaced apart by one hundred and eighty degrees. A pair of diametrically opposed chambers or pockets 44 and 45 are provided in the cylinder 42. These chambers are situated so that with the cylinder in either of its extreme positions, one chamber, such as 44, is in alignment with the feed-in tube and the other 45 is aligned with the air inlet 40 and the outlet 39. This arrangement provides for the free passage of air through the inlet and for the insertion of a carrier into the chamber 44.

The movement of the handle 43 to its other extreme position, shown dotted in the drawing, places the carrier in alignment with the air inlet 40 and the outlet 39, into the latter of which it is discharged. It should be noted that with the handle in this dotted position, the chambers 44 and 45 will be interchanged in positions from those illustrated. A second carrier may then be inserted into the chamber 45 and when the handle is restored to its original position, this second carrier will be moved into the discharge position. Thus, it is not necessary to always return the cylinder 42 to a receiving position in order to dispatch another carrier as it is with the devices 2 and 3 of Fig. 1, since both positions of the carrier inlet 37 of Figs. 2 and 3 are at the same time receiving and discharging positions.

The cylinder 42 is also provided with an auxiliary passage 46 through which the air may circulate while the cylinder is being oscillated between its extreme positions.

The locking solenoid 15, as in Fig. 1, is mounted on the upper surface of the housing drum 38. In the horizontal type of inlet 37, the cylinder 42 requires two locking devices, one in both of its extreme positions. This is accomplished by providing two plugs 18 and 18' normally disposed in recesses on the upper surface of the cylinder 42. In this manner, the cylinder 42 may be locked in either of its extreme positions for a period of time sufficient to provide the desired spacing between successive carriers.

In order to effect this two position locking, a movable contact element 47 is pivoted between two fixed contact elements 48 and 49. The free end of the movable contact 47 is disposed in the path of the projecting arm 50 of the handle 43, so that as the latter is oscillated between its two extreme positions, the element 47 is moved into alternate engagement with the stationary contacts 48 and 49, each engagement effecting operation of the timing and locking mechanism.

Although the cylinder 42 is shown having two carrier chambers, the locking device is not limited in its use to such a cylinder. Any practicable number of chambers may be employed evenly spaced in the cylinder with relation to one another. Also, the cylinder may be operated automatically by having a friction clutch suitably interposed between the driving means and the cylinder.

It is evident from the above description of the invention that carriers may be propelled along a 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 there provided a means for insuring a proper spacing for carriers inserted into the system, but also a novel and efficient means for re-establishing a proper space relationship between successive carriers before they arrive at the selecting mechanism of the various branch stations.

While the invention is shown in but two forms,

it will be obvious to those skilled in the art that it is not so limited but is susceptible to various changes and modifications without departing from the spirit thereof. It is desired, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What is claimed is:

1. A spacing device to be coupled in a carrier conveyor system as a gate in a pathway for the carriers provided by suitable guideways, said device comprising a housing drum having a carrier inlet and a carrier outlet and connecting respectively with in and out guideways, a cylinder in said housing drum having a carrier receiving chamber, said cylinder being arranged to follow a certain cycle of movement in said housing drum for connecting said chamber with the inlet and outlet for receiving and dispatching carriers, time controlled locking means disposed to lock said cylinder to said housing drum in a certain position in its cycle of dispatch operation and holding the same therein until a predetermined time has elapsed so that a carrier will not be dispatched within that time period, and means for automatically causing said locking means to operate each time said position is reached in the cycle to space apart the dispatched carriers by not less than said time period.

2. A spacing device to be coupled in a carrier conveyor system as a gate in a pathway for the carriers provided by suitable guideways, said device comprising a housing drum having a carrier inlet and a carrier outlet and connecting respectively with in and out guideways, a cylinder in said housing drum having a carrier receiving chamber, said cylinder being arranged to follow a certain cycle of movement in said housing drum for connecting said chamber with the inlet and outlet for receiving and dispatching carriers, time controlled locking means disposed to lock said cylinder to said housing drum in the receiving position in its cycle of dispatch operation and holding the same therein until a predetermined time has elapsed so that a carrier will not be dispatched within that time period, and means for automatically causing said locking means to operate each time said position is reached in the cycle to successively space apart the dispatched carriers by not less than said time period.

3. A device for dispatching carriers in spaced relation into a carrier conveyor system, comprising a housing drum having a carrier inlet and a carrier outlet, a cylinder rotatable within said drum about a vertical axis, said cylinder having a plurality of positions and a plurality of vertical carrier chambers, one of said chambers being in alignment with said carrier inlet to receive a carrier and one of said chambers being in alignment with said carrier outlet to discharge a carrier in each of said cylinder positions, and automatically operated means for locking said cylinder to said drum in each of said positions for a predetermined period of time to prevent the dispatch of a carrier during said period of time.

4. A device for dispatching carriers in spaced relation into a carrier conveyor system, comprising a housing drum provided with an internal recess, a cylinder rotatable within said drum and having a definite cycle of operation between a carrier receiving position and a carrier discharging position, said cylinder having an external recess in alignment with said drum recess at one stage of said cycle of operation, and automatically operated means for interlocking said recesses in said aligning position for a predetermined period of time during each cycle of operation to prevent the dispatch of a carrier during said period of time.

5. A device for dispatching carriers in spaced relation into a carrier conveyor system, comprising a housing drum provided with an internal recess, a cylinder rotatable within said drum and having a definite cycle of operation between two extreme positions, said cylinder having an external recess in alignment with said drum recess at one of said positions, means for receiving carriers into said cylinder in one of said positions, means for discharging carriers from said cylinder in one of said positions, and automatically operated means for interlocking said recesses in said aligning position for a predetermined period of time during each cycle of operation to prevent the dispatch of a carrier during said period of time.

6. A device for dispatching carriers in spaced relation into a carrier conveyor system, comprising a housing drum provided with an internal recess, a cylinder rotatable within said drum about a horizontal axis and having a definite cycle of operation between a carrier receiving position and a carrier discharging position, said cylinder being provided with a substantially diametral carrier chamber and with an external recess in alignment with said drum recess at one stage of said cycle of operation, and automatically operated means for interlocking said recesses in said aligning position for a predetermined period of time during each cycle of operation to prevent the dispatch of a carrier during said period of time.

7. A device for dispatching carriers in spaced relation into a carrier conveyor system, comprising a housing drum provided with an internal recess, a cylinder rotatable within said drum about a vertical axis and having a definite cycle of operation between two extreme positions, said cylinder having two external recesses, one of said recesses being in alignment with said drum recess in each of said positions, two vertical diametrically opposed carrier chambers in said cylinder to simultaneously receive and to discharge carriers in each of said cylinder positions, and automatically operated means for interlocking said drum recess and one of said cylinder recesses in each of said aligning positions for a predetermined period of time to prevent the dispatch of a carrier during said period of time.

8. A device for dispatching carriers in spaced relation into a carrier conveyor system, comprising a housing drum provided with an internal recess, a cylinder rotatable within said drum and having a definite cycle of operation between a carrier receiving position and a carrier discharging position, said cylinder having an external recess in alignment with said drum recess in said receiving position, and automatically operated means for interlocking said recesses in said receiving position for a predetermined period of time during each cycle of operation to prevent the operation of said cylinder during said period of time.

9. A device for dispatching carriers in spaced relation into a carrier conveyor system, comprising a housing drum provided with an internal recess, a cylinder rotatable within said drum and having a definite cycle of operation between a carrier receiving position and a carrier discharging position, said cylinder having an external recess in alignment with said drum recess at one

stage of said cycle of operation, and automatically operated means for interlocking said recesses in said aligning position for a predetermined period of time during each cycle of operation to prevent rotation of the cylinder during said period of time, said means including a plug normally carried within one of said recesses and lodged partially within both recesses in said aligning position.

10. A device for dispatching carriers in spaced relation into a carrier conveyor system, comprising a housing drum provided with an internal recess, a cylinder rotatable within said drum and having a definite cycle of operation between a carrier receiving position and a carrier discharging position, said cylinder having an external recess in alignment with said drum recess at one stage of said cycle of operation, a plug normally carried within said cylinder recess, and automatically operated means including a solenoid concentrically disposed to said drum recess for lodging said plug partially within both recesses in said aligning position and locking said cylinder to said drum to prevent rotation of the cylinder for a predetermined period of time after the dispatch of a carrier.

11. A device for dispatching carriers in spaced relation into a carrier conveyor system, comprising a housing drum provided with an internal recess, a cylinder rotatable within said drum and having a definite cycle of operation between a carrier receiving position and a carrier discharging position, said cylinder having an external recess in alignment with said drum recess at one stage of said cycle of operation, a locking relay having a coil concentrically disposed to said drum recess and a plug type armature normally carried within said cylinder recess, energizing means including a timing solenoid having fast closing and slow opening contacts for operating said relay for a predetermined period of time, said plug armature being lodged partially within both recesses in said aligning position and locking said cylinder to said drum to prevent rotation of the cylinder during said period of time, and means for automatically operating said timing solenoid once in every cycle of operation.

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