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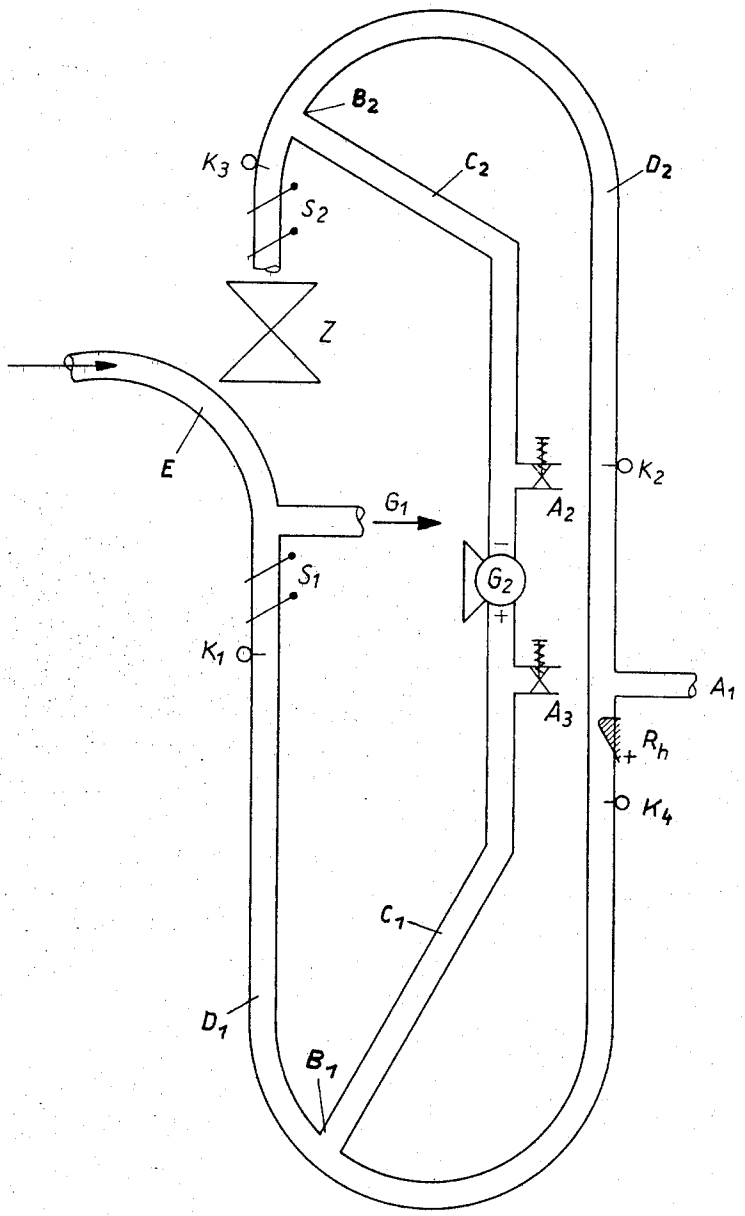

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CARRIER STORAGE ARRANGEMENT IN A PNEUMATIC TUBE SYSTEM

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This invention relates to pneumatic tube systems and more particularly to a carrier storage arrangement for a pneumatic tube system.

It is essential to have carriers available for all the sending stations of a pneumatic tube system if an efficient and fast system is required. This requirement is not met when traffic is one-sided, that is, when the type of traffic requires that more carriers be sent from a station than are received by it. This is always the case in large pneumatic tube systems with a number of sending and receiving stations. If a carrier is not readily available, one must be obtained from a different station or from storage.

Storage arrangements for idle carriers which can be ordered as required by the sending stations are set up at one or more locations to alleviate this problem. Such a storage system usually consists of a loop in the forwarding tube which can accommodate a large number of carriers. The loop has a plurality of individually adjustable valves through which the systems compressed air can be applied to eject the forward portion of the carrier supply stored in the loop and direct it to the station requiring carriers. The number of valves required increases with the capacity of the storage loop. Tube contacts may be provided for indicating the number of carriers available. Obviously, the use of a large number of valves together with a like number of tube contacts and a complicated control arrangement is very expensive.

An object of our invention is, therefore, to provide an arrangement whereby one or more carriers stored in a loop of the system can be delivered on call to a receiving station, such an arrangement, however, being so simple in design that it eliminates the drawbacks mentioned above.

A feature of our invention is the provision in a tube loop of a one-way backing device or stop through which the carriers called for are passed and directed to the calling stations by means of controlled compressed air.

The above-mentioned and other features and objects of this invention will become more apparent by reference to the following description taken in conjunction with the accompanying drawing in which a storage loop in accordance with our invention is schematically illustrated.

Storage loop D_1, D_2 is connected by means of tube segment E to the pneumatic tube system from which empty carriers are received. The vacuum side of blower C_1 is connected to tube segment E. Tube segment E is also connected through lock S_1 to the downward directed portion of loop segment D_1. Backing device or stop R_h is located at approximately the middle of the entire loop section. Segment D_2 leads to the loop exit where there is another lock S_2. Locks S_1 and S_2 pneumatically separate the storage loop from the main pneumatic tube system. Past S_2 the loop empties into a central position Z from which carriers are dispatched to the calling stations. Near the start of lower arc D_1, at point B_1, and in the vicinity of the end of upper arc D_2, at point B_2, tube segments C_1 and C_2 are connected respectively. C_1 and C_2 lead to the pressure and vacuum side of a special blower G_2. Each of segments C_1 and C_2 has a valve A_3 or A_2, respectively, which can apply the pressure or vacuum side respectively of blower G_2 to the outer air. There is also a connection A_1 to the outer air in the vicinity of backing device R_h.

At the input of the storage loop, at the end of the loop, and at a distance of one or more carrier lengths above backing device R_h there are contacts K_1, K_3 and K_2 respectively. These contacts serve to control blower G_2 and valves A_2 and A_3. Another contact K_4, is located below backing device R_h.

The arrangement operates as follows:

Once emptied, carriers are routed by the sending stations over tube segment E to the storage loop. Before entering the loop they are driven by the main pneumatic tube system's compressed air provided by blower G_1. Due to their kinetic energy and weight, the carriers travel one by one through lock S_1 into lower arc D_1 of the storage loop. As soon as the latter is filled up enough for contact K_1 to remain constantly closed an appropriate signal is sent to the sending stations that indicates this and/or that prevents further dispatching. In order to advance the carriers on the other side of the arc up to about stop R_h and thus fill arc D_1 completely, pressurized air is introduced into the tube loop from blower G_2 over line C_1 at point B_1. This air cannot penetrate lock S_1 and passes through line A_1 to the outer air. The lead carriers of the carrier supply are thus brought through backing device R_h to contact K_2. Valve A_2 on the vacuum side of blower G_2 is open during this time while valve A_3 on the pressure side remains closed. When actuated by the lead carrier of the train, contact K_2 causes valve A_3 to open thereby removing the driving pressure from the carriers in tube loop D_1.

The carriers that are now above backing device R_h are retained, while the rest of the carrier train in D_1 falls to the bottom of the loop. When carriers are called for from any station of the pneumatic tube system, valve A_2 is closed. In this way blower G_2 via lines C_2 and A_1 pulls the carriers above backing device R_h into the upper portion of D_1. As soon as the lead carrier of this train touches tube contact K_3, valve A_2 is opened, with the result that the carrier train below the backing device returns to the tube's lower arc, while the carriers above the backing device, due to their momentum advance into central area Z through lock S_2, said area providing for their further dispatching to the calling station.

Valve A_3 is then closed and additional carriers are made ready at backing device R_h in anticipation of another call. Contact K_4, in combination with stacking contact K_1, are used to ensure maximum utilization of storage area D_1. Contact K_1 signals when carriers are present at that point. If contact K_4 is not actuated at the same time, valve A_3 closes and the carrier train located in loop D_1 is advanced to contact K_4 to free contact K_1 so that additional carriers can be brought up.

The storage arc itself has no valves and only four tube contacts are required for as many carriers as can be contained in the loop. This system can be easily maintained and the cost of production as well as operation is substantially lower than in the case of similar systems known.

While we have described above the principles of our invention in connection with specific apparatus, it is to be clearly understood that this description is made only by way of example and not as a limitation to the scope of our invention as set forth in the objects thereof and in the accompanying claims.

We claim:

1. An arrangement for storing and dispatching pneumatic tube carriers for delivery to and reception from the forwarding tube of a pneumatic tube system comprising a storage loop having a receiving and output end,

means for delivering carriers from the forwarding tube to said receiving end, means for positioning one or more carries in said storage loop for delivery to said forwarding tube, and means for conveying only said positioned carriers out of said output end to said forwarding tube.

2. An arrangement according to claim 1 wherein said positioning means comprises a movable stop which permits carriers to pass in one direction only.

3. An arrangement according to claim 2 wherein said positioning means further comprises an air outlet in the vicinity of said stop at which said loop is separated into two pneumatically separate sections.

4. An arrangement according to claim 3 wherein said positioning means further comprises a blower, a tube connecting both the receiving and the output ends of said storage loop to said blower which cooperates with said air outlet to move one or more carriers through said stop and wherein said conveying means cooperates with said blower to move only the carriers which passes said stop to said forwarding tube.

5. An arrangement according to claim 4 further comprising means for pneumatically sealing both ends of said storage loop from said forwarding tube.

6. An arrangement according to claim 5 wherein said storage loop is vertically disposed and said stop passes only upwardly moving carriers.

7. An arrangement according to claim 6 further comprising means for sensing when the portion of said storage loop below said stop is filled with carriers.

8. An arrangement according to claim 7 further comprising means for sensing when a desired number of carriers pass said stop.

9. An arrangement according to claim 8 further comprising means for sensing when said positioned carriers are conveyed to said forwarding tube.

10. An arrangement according to claim 9 wherein said delivering means comprises a portion of said forwarding tube connected to said receiving end of said storage loop.

No references cited.

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