This invention relates to tubular conveyor systems and more particularly to the exchange stations thereof, i.e., the stations where the carriers, i.e., the conveying containers moved along the tubes, are delivered from one tube into another in order to be brought to the desired receiving point.

In known arrangements, the carriers are constructed so that they are led by their own action from one tube into a predetermined other tube. For example, they may have rings for closing electric circuits, and in such circuits means are operated to bring the carriers from one tube into the other.

This may be effected by a rotatable drum or other distributing arrangement.

According to the invention in an exchange station for pneumatic tube conveyor systems, a group of incoming tubes and a group of outgoing tubes are interconnected by a single tube from which means for selectively directing the carriers into the outgoing tubes are controlled by the carriers, whilst controlling means are provided for feeding the carriers into this single tube from the incoming tubes in succession so that the carriers shall not collide in leaving the incoming tubes.

An arrangement combining these features is simpler in operation and occupies less space than prior systems.

An embodiment of the invention is explained in the following description, reference being had to the accompanying drawing in which:

Fig. 1 is a diagram of the exchange station.

Figs. 2 and 3, drawn to a larger scale than Fig. 1, are detail views, partly in section, of a locking device more fully referred to hereafter. This device is shown in two different states of operation. Fig. 4 is a detail view, partly in section, showing a circuit arrangement described further on. Fig. 5 is a plan view of a gearing that forms part of the arrangement represented in Fig. 1.

Fig. 1 shows four incoming tubes 1 each provided with an outlet flap 2 and a suction conduit 3. The flaps 2 are each disposed above an inlet funnel 4 of a tube 5. The tubes 5 run into a tube 6 which feeds into a tubular member 7. Disposed below the tubular member 7 are three switch tongues 8, 9, 10 adapted to lead each into one of three outgoing tubes 11. The fourth of the tubes 11 has a funnel-shaped end 12 with which it extends into the space between the switch tongues 8, 9, 10.

The switch tongues 8, 9, 10 are each under the control of an electromagnetic relay indicated by its winding. These windings are denoted by 8a, 9a, 10a. The circuit of the winding 8a contains two sliding contacts 8b. In the circuit of the winding 9a two contacts 9b are provided, and in the circuit of the winding 10a there are two sliding contacts 10b. A circuit arrangement that may be employed in this connection is shown in Fig. 4. The circuit of Fig. 4 includes a relay 8c whose winding is connected to a battery 36 and 19 to one of the pair of contacts 8d. The relay 8c is energized by closure of contacts 8d during the passage of the appropriate carrier through the tube. Upon being energized the relay 8c is locked by means of its locking or holding contact 8e, which is engaged by the pulling-up of the relay armature in a manner well known. The holding contact 8f is under the control of a spring latch 31 of the tube 11, this latch projecting into the path of the carriers, so that the carrier forces the spring latch 31 into engagement with the movable contact member of the holding contact 8f thereby mechanically opening the holding circuit of the relay 8c. The relays indicated by the winding 8a, 10a may be connected in the same manner as the relay indicated by the winding 9a. Their circuits are therefore not shown.

The distance between contacts 8b is greater than that between contacts 9b and this latter distance is greater than that between contacts 10b. These three pairs of contacts are disposed in the tube 6 and are intended to coat with contact rings of the carriers in a well-known manner.

As shown in Figs. 2 and 3, each tube 5 has an opening 13 for an arm 14 and an opening 15 for an arm 16. Each arm 14 and an arm 17 form a bell crank lever pivotally mounted on a shaft 18 that can not rotate. The bell crank levers 14, 17 each have a finger 19. The arms 16 and 17 are each rotatable on one of the shafts 18, and they are located between the fingers 19 and a spring 20 fixed to the axle 18. The arm 11 each have a roller 21. The bell crank levers 14, 17 each tend to bear on the circumference of individual cams 22. This is due to a spring 23 which is fixed to the tube 6 and is bearing against the fingers 19. Each cam 22 is disposed in a position different from that of the other cams 22. In the instance shown the position of each cam differs by a right angle from that of the adjacent cams. As shown in Fig. 5, the cams 22 are geared by bevel wheels 32 to a shaft 33 operated by a motor 34.

Each tube 11 is provided with an arrangement...
of levers that has certain parts similar to the parts f4, 6, 9, 20, 23 of the arrangement represented in Figs. 2 and 3. In Fig. 1 the parts which correspond to the arms 14 are denoted by 24 and those corresponding to the arms 16 are denoted by 25. The arms 24, 25 are mounted on a shaft 22 which is common to all of them. The arms 24 are fixed to this shaft and the arms 26 are disposed loose thereon. The shaft 25 has an arm 27 carrying roller 28 which bears on the circumference of a cam 29. In order to avoid the necessity for further illustration the parts 24, 25, 27, 28, 29 are shown as if they were lying in one plane with the shaft 25, although they are arranged in planes normal to this shaft.

The operation is as follows:

The driving air which is in a well-known manner produced in the tubes 1 through the suction conduits 3 causes the carriers to move toward the flaps 2. The carriers by their impact open these flaps against the action of the driving air, which tends to close the flaps, and then full through the funnels 4 to the tubes 5.

The cams 22 are revolved by the motor 34. On each revolution of a cam the appertaining arms 14, 16 are brought from the position shown in Fig. 2 into the position represented in Fig. 3 and are then returned to the former position. When in this position shown on Fig. 2 the free end of arm 14 projects into the tube 5 so as to stop the carriers x and y and still other carriers that may arrive in tube 5. With the bell crank lever 14, 17 in this position, the arm 16 is retained by the finger 19 so that the arm 16 can not yield under the pressure of the spring 20. The cam 22 moves the lever 14, 17 against the action of the spring 23 and in such manner that the free end of arm 16 leaves the tube 5 whilst the finger 19 is retracted from the arm 16. This will be seen from Fig. 3. The arm 14 thus allows the carrier x to continue its motion. At the same time, however, the spring 20 acts to press the arm 16 against the carrier y, so that this carrier is prevented from following the carrier x immediately. The arm 16 is retracted from the carrier y as soon as the active portion of cam 22 leaves the arm 17. The arm 14 consequently reassumes the position shown in Fig. 2, so as to stop the carrier y just freed of the arm 16. The carrier y remains in this way until the cam 22 has brought the arm 17 and consequently the arms 14, 16 again into the position represented in Fig. 3. By this means the carriers are caused to follow each other at definite spaced intervals.

On the stopping device 14, 16 of one tube 5 being in the condition shown in Fig. 3, the stopping devices 14, 16 of the other tubes 5 are in the condition represented in Fig. 2. This is due to the described mutual position of the cams 22.

Therefore, at any time only one device 14, 16 will allow a carrier to reach the tube 5, so that it is impossible for carriers arriving from different tubes 5 to run into each other.

The carriers may be adapted to close one or other of the circuits in which the contacts 80, 85, 105 are provided. In such case one of the switch tongues 8, 9, 10 is brought into its operative position so as to lead the carrier into the respective tube 11. Carriers not able to coact with one or other of the contacts 80, 85, 105 and thus to set one of the switch tongues will fall through between the switch tongues 8, 9, 10 into that tube 11 which has the funnel 12.

In the tubes 11 the carriers are stopped by the respective devices 24, 26. The devices 24, 26 are moved conjointly by means of the cam 29. This cam by engaging the arm 27 operates in the same manner as the cams 22 act by means of the arm 17, that is, the shaft 25 and arms 24, 26 are rocking in the same manner as the arms 14, 16. In this way carriers arriving in a tube 11 are spaced apart therein in a similar manner to that described with reference to Figs. 2 and 3 so as to avoid the possibility of the carriers being bunched in their passage through the respective outgoing tubes 11.

What is claimed is:

1. A pneumatic tube conveyer system comprising an exchange station, a group of tubes incoming to said station and a group of tubes outgoing from said station, means for successively feeding the carriers from the incoming tubes into said single tube comprising a single tube interconnecting the tubes of one group and the tubes of the other group, means for successively feeding the carriers from the incoming tubes into said single tube, and means operating under control of the carriers during their passage through said single tube for selectively directing said carriers from said single tube into the outgoing tubes as determined by said carriers.

2. A pneumatic tube conveyer system comprising an exchange station, a group of tubes incoming to said station and a group of tubes outgoing from said station, a single stationary tube interconnecting the tubes of one group and the tubes of the other group, means for successively feeding the carriers from the incoming tubes into said single stationary tube, and means operating under control of the carriers during their passage through said single tube for selectively directing said carriers therefrom into the outgoing tubes as determined by said carriers.

3. A pneumatic tube conveyer system comprising an exchange station, a group of tubes incoming to said station and a group of tubes outgoing from said station, means for interconnecting the incoming tubes with the outgoing tubes, means for successively feeding the carriers from the incoming tubes successively into said single tube, means operating under control of the carriers during their passage through said single tube for selectively directing said carriers therefrom into the outgoing tubes as determined by said carriers and means associated with each outgoing tube and controlled by the passage of a carrier therefrom to release said operating means.

4. A pneumatic tube conveyer system comprising an exchange station, a group of tubes incoming to said station and a group of tubes outgoing from said station, a single tube having connected incoming branches positioned to receive carriers from the respective incoming tubes and having its exit positioned to feed the carriers into any one of the outgoing tubes as determined by the carriers, means cooperating with said incoming branches to feed the carriers delivered by the incoming tubes successively into said single tube, and means operating under control of the carriers during their passage through said single tube for selectively directing said carriers therefrom into the outgoing tubes as determined by said carriers.

5. A pneumatic tube conveyer system comprising an exchange station, a group of tubes incoming to said station and a group of tubes outgoing from said station, means for interconnecting the incoming tubes with the outgoing tubes, compris-
ing a single tube having connected incoming branches positioned to receive carriers from the respective incoming tubes and having its exit positioned to feed the carriers into any one of the outgoing tubes as determined by the carriers, means cooperating with said incoming branches to feed the carriers delivered by the incoming tubes successively into said single tube, means operating under control of the carriers during their passage through said single tube for selectively directing said carriers therefrom into the outgoing tubes as determined by said carriers, and means associated with each outgoing tube and controlled by the passage of a carrier therethrough to release said operating means.

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