Oct. 1, 1968 JONG-DOK KIM 3,403,904

PNEUMATIC TRANSPORT DEVICE

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Fig. 1

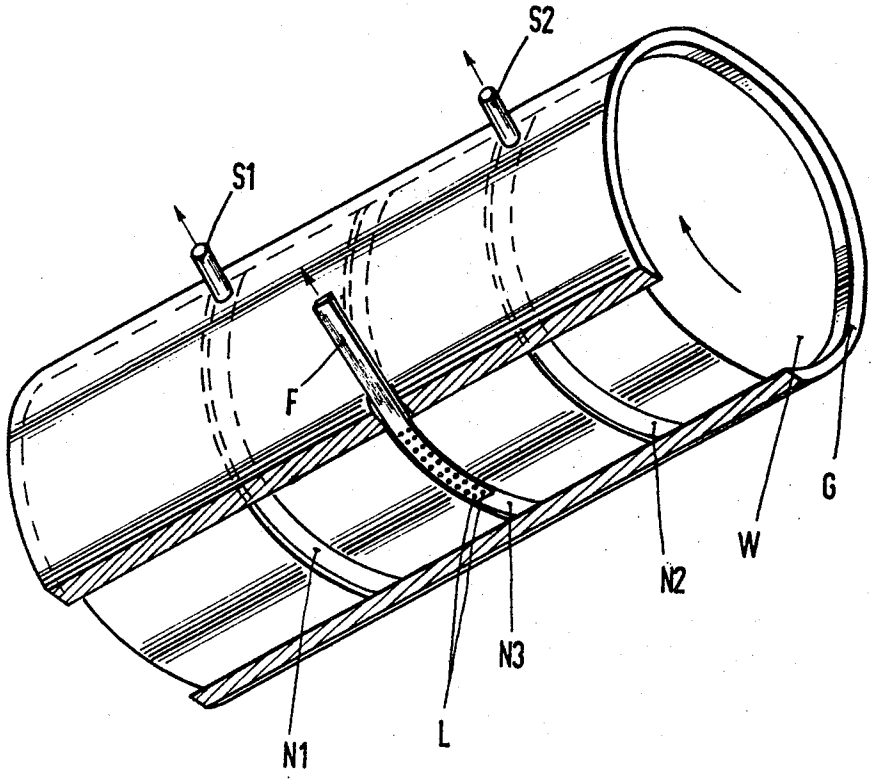

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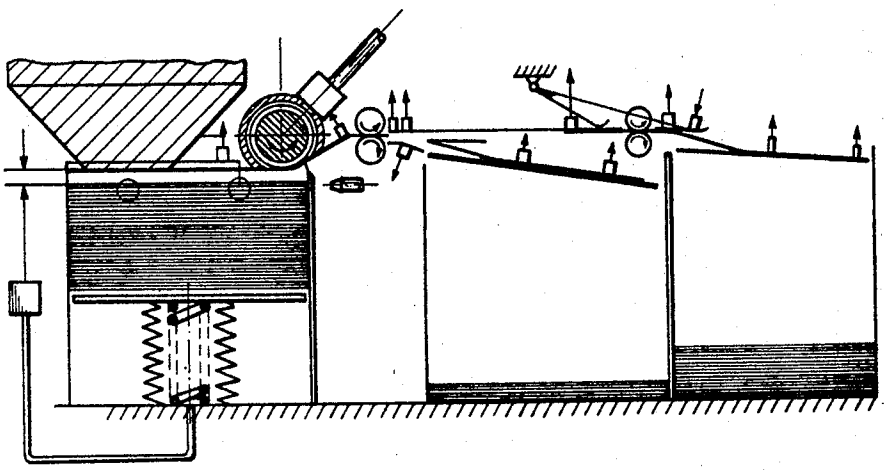
Fig. 2



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PNEUMATIC TRANSPORT DEVICE

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ABSTRACT OF THE DISCLOSURE

A pneumatic transport device for sheet-like record carriers provided with a roller substantially closely surrounded by a casing and rotatably disposed therein, said roller having at least one annular groove which can be selectively connected with a suction device and at least one suction finger immersed in an additional annular grooved which is in close engagement with the record carrier against the roller prior to activating the said suction device.

The present invention relates to a pneumatic transport device for sheet-like record carriers and the like. In sorting machines, feeding devices, etc., the problem exists of withdrawing or segregating individual record carriers which are fed into a magazine in the form of stacks or piles, and to subsequently feed them to a transport device. A known arrangement solves this problem by a rotating suction drum which, on its circumference, has a number of openings. Vacuum is applied to the drum whereby the record carriers are retained against the drum by the external air pressure carried along in the direction of rotation by the resulting frictional force. If the segregation or withdrawal, i.e., the transportation process is to be interrupted, only a disconnection of the suction is required. A stopping of the suction drum, however, is not necessary so that the segregation or withdrawal, i.e., the transportation process can be terminated or started with a minimum expenditure of time. An essential disadvantage of this known arrangement resides in the complicated construction of the suction drum.

It is the purpose of the invention to eliminate this disadvantage. This is achieved by use of a roller to which the respective record carriers to be transported are drawn by suction, by the feature that the roller is provided on its circumference with at least one annular groove, which can be selectively connected with a suction device, with the roller being so disposed in a stationary casing or housing, closely surrounding the roller, that the latter is rotatable. The casing is provided with an opening on its side facing the record carrier, of such size and proportions that the roller is presented, for direct contact with the record carrier, over the exposed area.

An example of a construction embodying the invention is explained in connection with the drawings, wherein like reference characters indicate like or corresponding parts, in which:

FIG. 1 is a perspective view of a roller drum embodying the invention; and

FIG. 2 is a side elevational view, with portions in section, of a transport device embodying the drum structure illustrated in FIG. 1.

The transport device illustrated comprises a roller W which is enclosed in a casing or housing G. The inner diameter of the casing G is sufficiently greater than the outer diameter of the roller W that the roller may freely rotate within the housing. The roller body is provided with two grooves N1 and N2 which are operatively connected with a suction device by means of tubular connections S1 and S2, respectively. On the lower side the case

is provided with an opening which is so proportioned that the surface of a record carrier to be transported may be brought into engagement with the outer plane of the roller W. The transport device, preferably, is so arranged with respect to a stack of record carriers that when vacuum is applied, the front end, in transport direction, of the record carrier is drawn close to the roller. The roller is driven by suitable means, which for reasons of simplicity and clearness, is not illustrated in FIG. 1, and transports the record carrier forward by approximately one sheet-length, whereupon it is picked up by a transport device of customary construction, for example, by a pair of cooperable feed rollers. According to an advantageous development of the invention, the roller is provided, in the central portion, with another groove N3 in which is disposed a flat suction finger F extending tangentially. The forward end of the suction finger is curved with the radius and center of curvature of its outer surface facing the record carrier coinciding with that of the suction roller. That part of the suction finger F disposed within the groove has, in its lower face, a number of openings L through which air is drawn prior to the beginning of the transport process. It is thereby attained that the front end of the record carrier is immediately drawn close by means of the suction prior to the actual transporting action, and achieves a curved formation so that the record carrier is disposed close to the exposed part of the roller at the opening in the casing, whereby the transport operation can begin without any loss of time. In addition thereto, by use of the suction finger, there is attained the advantage that the record carrier located under the uppermost record carrier in the pile is separated from the uppermost record carrier, due to its inherent stiffness. By this feature, it is assured that only a single record carrier is picked up by the suction roller. Modifications of the invention are possible, for example, by providing further grooves with or without additional suction fingers, in dependence upon the weight or stiffness of the record carriers.

It is also possible to so construct the casing or housing that it is closed at the respective ends of the roller, or to vary the section facing the record carrier without respect to the width of the record carrier. Likewise, instead of utilizing tubular suction connections S1 and S2, one or several channels, arranged on the inner face of the casing G and accessible from the exterior, may be employed.

FIG. 2 illustrates the application of the invention to a machine, for example, a sorting machine wherein the record carrier may be deposited in either of several filling trays. In the example illustrated, the record carriers are initially disposed in a stack within a container suitably constructed to maintain the top sheet of the stack at a predetermined elevation, from which it is withdrawn by roller means. Numerous nozzles or orifices for the withdrawal or discharge of air are utilized, the direction of air flow being indicated by arrows associated therewith. Thus the leading edge portion of the top sheet of the stack is drawn upwardly by an air-withdrawal nozzle positioned thereabove into engagement with the roller drum, which is constructed in accordance with the disclosure of FIG. 1, a similar nozzle being disposed at the opposite side of the roller to raise the edge of the record carrier for engagement between two feed rollers. Three air-withdrawal nozzles are disposed at the discharge side of the rollers, two being disposed above the transport path and one therebelow. The latter nozzle is operative to draw the leading edge portion of the record carrier downwardly, whereby the carrier may be deposited in the first tray, while the other two nozzles are operative to maintain the leading edge portion of the carrier in elevated position

for transport to the next tray. Both trays may be provided with a suitable brake plate and air-withdrawal orifice. Associated with the second tray is a similar angle-shaped lever, additional feed rollers, and respective air nozzles or orifices for controlling the movement of the record carrier in accordance with the desired operation. By suitable control of the various air nozzles a record carrier can be deposited in either tray, the carrier being effectively braked in a suitable manner.

I claim:

1. A pneumatically controllable transport device for sheet-like record carriers by means of a roller to which such record carriers to be transported are to be respectively drawn, said roller having at least one annular groove disposed on the periphery thereof which can be selectively connected with a suction device, and a stationary casing closely surrounding said roller, within which said roller is rotatably disposed, said casing having an opening on the side thereof facing the record carrier of such size that the roller extends beyond the sectional plane for direct contact with the record carrier, characterized in that within the breadth of the record carrier there is provided at least one additional groove in the roller periphery into which a flat suction finger extends tangentially on the side facing the record carrier, the surface of the suction finger facing the record carrier having substantially the same radius of curvature and center of curvature as the outer surface of the roller as well as a plurality of suction openings which are arranged over the arcuate face thereof.

2. In a pneumatically operated transport device for moving sheet-like record carriers having a roller, a housing substantially enclosing the roller, a cordal section of said roller projecting from said housing, and pneumatic means associated with the roller to retain the record carriers on a portion of the roller when the roller is rotating, the improvement of: a circumferential groove around said roller and means extending into a portion of the said groove in the said cordal section effective to attract the said record carriers to the said roller and conform portions of the said record carriers to the surface of the said roller.

3. A transport roller for moving sheets of material comprising: a cylindrical roller, a housing substantially enclosing said roller, a cordal section of said roller projecting from said housing, pneumatic means associated with said roller for retaining said sheets on a portion of said cordal section, a circumferential groove in said roller intermediate the ends thereof, a stationary finger extending into said groove adjacent said cordal section, and said stationary finger pneumatically actuatable to attract said sheets thereto.

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