

## Description

### Distributing device for loose articles

The invention relates to a distribution device for loose items within a conveying plant of a material flow system, comprising at least two linear conveyors running parallel to each other at a defined distance apart and a device for laterally deflecting the items out of their direction of conveyance, as well as a device, provided between two linear conveyors, for transferring the items to an adjacent linear conveyor.

The invention is concerned with horizontal distribution and transfer devices, the function of which is to transport items delivered on a linear conveyor to other chosen destinations situated next to the path of conveyance of the forwarding section. The known distribution or transfer devices allow the items to leave the forwarding section and be incorporated into a discharge section in a very varied manner with a wide variety of components and designs.

A known solution envisages providing a chute between two parallel belt conveyors in the region of the deflector, onto which chute the items are deflected and are forwarded to a following crossover conveyor, which feeds them via a further ascending crossover conveyor to the adjacent belt conveyor. This known solution requires a great deal of space between the parallel conveyors and, because of the necessary crossover conveyors and the chute, is additionally very complex. Since the chute requires an appropriate gradient in order to expel the items, the following crossover conveyors must necessarily have a corresponding incline to enable transport to the higher situated adjacent belt conveyor. Since

the size of the incline cannot be freely chosen, a considerable distance between the conveyors is necessary, which distance frequently leads to spatial problems in the plant.

It is also frequently required to load parallel conveyors alternately, i.e. to forward the items both to one and to the other conveyor. Two of the described devices must then be provided, since a change of direction is not possible because of the chute. In this case, still more additional space is required; in the case of the known solution, the devices for lateral diversion, for example diverting arms for the items, must also be doubled, since each diverter interacts with one of the distribution devices.

A distribution conveyor of the generic type has been disclosed by US Patent 5,655,643, wherein the distribution conveyor consists of a forwarding section and three discharge sections. One of the discharge sections corresponds to the extension of the forwarding section. Alongside the conveying section, diverting arms are mounted in the region of the plane of conveyance of the forwarding section such that they can be swiveled inward in a controlled manner, which diverting arms can be pivoted by motorized means out of their rest setting next to the forwarding section into their work setting transversely to the conveyor, in which they direct the items transported on the conveyor to one of the lateral discharge sections. For this, the arms are provided at both ends with a respective vertically revolving guide pulley, at least one of which is driven and around which an endless deflecting belt, orientated substantially in a vertical plane, is guided. The direction of revolution of the deflecting belt corresponds to the direction in which the items are to be deflected, so that the items, with the aid of this diverting belt, are directed - transversely to the original direction of conveyance of the forwarding section - forward to the conveyor of the discharge

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section for as long as the diverting arm remains in a swung-in work setting.

A similar solution is known from US Patent 3,093,236, with the difference that in this document two diverting belts, likewise revolving endlessly around vertically orientated guide pulleys, are moved out of a rest setting on both sides of the forwarding section, transversely thereto, into a work setting where the deflecting belts form a barrier for the items so as to divert these laterally onto the discharge section.

Both known solutions have the drawback of a very complex mechanism, which yields a relatively high cost.

The object of the present invention consists in providing a distribution device for loose items within a horizontal conveying plant, in which, using the known principle of the diverter which laterally expels the items, a very simple and very effective solution for the transfer of the items is created, which solution requires very little space between the adjacent conveyors, but nevertheless enables a secure and rapid transfer.

In order to achieve the object, it is provided according to the invention that the device for transferring the deflected items is configured as an endless conveyor which revolves horizontally transversely to the linear conveyors and projects with its conveying surface, that undergrips the items, upward over the plane of conveyance of the linear conveyors. With this solution, a cost-effective, fast, effective and reliable distribution device is created. The conveying surface of the endless conveyor undergrips the items on their bottom side, which items are displaced by the lateral deflection device transversely to the original direction of transport, and moves them in the direction of diversion onto the adjacent linear conveyor. It is particularly advantageous if the endless conveyor is driven in the direction of diversion of the items.

According to the invention, it is sufficient if, according to the invention, the items are moved by means of the lateral deflection device with a part of their bottom side onto the conveying surface of the endless conveyor revolving transversely to the linear conveyors. As soon as, in fact, a part of the items is gripped by the endless conveyor, these are forwarded under frictional engagement, to be precise until such time as the items have reached the second parallel linear conveyor and the bottom side of the items, which rests on the surface of the endless conveyor, has left the endless conveyor.

According to a particularly favorable feature of the invention, it is provided that the endless conveyor is configured as a drum rotary driven about its longitudinal axis, which drum is mounted rotatably about a horizontally running axis orientated between the linear conveyors in the longitudinal direction thereof and bridges the gap between two adjacent linear conveyors.

Favorably, the drum projects with a portion of its periphery over the plane formed by at least one, preferably both planes of conveyance of the adjacent linear conveyors. If linear conveyors lie in a common plane, the known chutes and conveyor belts can thus also be dispensed with.

In a further embodiment of the invention, it is proposed that the drum is cylindrical or slightly conical, in which latter case conveyors can also be connected which are not arranged exactly in parallel.

In order to ensure that the items are carried along safely by the endless conveyor, according to a further feature of the invention it is envisaged to provide the conveying surface of the endless conveyor with an antislip lining. This can consist of a rubber or a rubber-like

plastic or can be created by roughing of the surface of the endless conveyor.

It has proved to be favorable if, according to another feature of the invention, the device for laterally deflecting the items consists of at least one diverting arm which can be swiveled into the region of the plane of conveyance of the linear conveyor in a controlled manner about a vertical axis and which can be pivoted by motorized means out of its rest setting beside and parallel to the forwarding section into a work setting transversely to the conveyor.

Preferably, each diverting arm is provided at both ends with a respective vertically revolving guide pulley, around which an endlessly driven deflecting belt, orientated substantially in a vertical plane, is guided. The deflecting belt deflects the items securely out of their original direction of conveyance and transfers the items in the transverse direction to the point where they comes to lie with their bottom side on the endless conveyor.

It is particularly advantageous if two diverting arms are pivotable out of their rest setting on both sides of the linear conveyor, transversely thereto, into a work setting in which the deflecting belts of the diverting arms, which are driven in the same direction, form an aligned barrier for the items which are laterally deflectable onto the discharge section.

In a further embodiment of the invention, it is proposed to mount one of the diverting arms midway between two adjacent linear conveyors. A diverting arm mounted midway between the two adjacent linear conveyors has the particular advantage that it forms, according to choice, with one of the two diverting arms provided on the opposite sides of the adjacent linear conveyors, a respective barrier on one of the two linear conveyors.

It is further proposed to make at least the running direction of the driven deflecting belt of the diverting arm mounted midway between the adjacent linear conveyors reversible. Both linear conveyors can thus be operated with one diverting arm.

In order to prevent a collision between the diverting arm and the endless conveyor, the diverting arm can be swiveled at close range over the endless conveyor.

With the solution according to the invention, the generic distribution device for loose items is substantially improved. The provided endless conveyor, particularly if realized as a drum, requires only very little space between two adjacent linear conveyors and nevertheless enables the items to be quickly and reliably transferred from one of the linear conveyors to the other. The invention can be particularly favorably applied in concert with known pivotable diverting arms whose vertically revolving conveyor belt transports the items at least far enough onto the endless conveyor that they are gripped by the latter and are transferable to the parallel linear conveyor.

An illustrative embodiment of the invention is represented in the drawing and is described below, in which drawing:

- figure 1            shows the distribution device according to the invention in top view,
- figure 2           shows the distribution device according to figure 1 in a cross section through the endless conveyor,
- figure 3           shows the top view of a distribution device according to the prior art, and

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figure 4 shows a cross section through the distribution device according to figure 3.

In figure 3, a generic distribution device according to the prior art is represented; the two linear conveyors 1 and 2 can be seen, the direction of conveyance of which is indicated by the arrows 3a and 3b. Items (not represented in figure 3) are transported, for example, on the conveyor 2 in the direction of the arrow 3c and is deflected by the diverting arms 5a, 5b pivoted over the linear conveyor 2 about vertical pivot axes 4, the swivel arms 5a, 5b forming a mutually aligned diversion surface for the items. Deflection pulleys can be seen, which are disposed on both sides at the ends of each diverting arm 5a, 5b and around which a diverting belt revolving perpendicularly to the linear conveyor 2 is guided, the direction of revolution of which diverting belt, on the side facing the items, corresponds to the direction of diversion transversely to the linear conveyor 2. Alongside the linear conveyor 2, a chute, denoted by 6, is provided, which with a larger angle of opening receives the items coming from the linear conveyor 2 and, by gravitational effect, delivers them downward onto the transverse conveyor 7. The transverse conveyor 7 is already arranged such that it slightly ascends in the direction of the linear conveyor 1 and usually consists of an endlessly revolving conveyor belt. The conveyor 7 is adjoined by a further conveyor 8, which ascends in the direction of the linear conveyor 1 and whose end that faces the linear conveyor 1 ends slightly above the plane of transport of the linear conveyor 1. The items can thus be transferred from the conveyor 8 to the linear conveyor 1 for onward transport in the direction of transport 3a.

A distribution device of the same design, yet in mirror image arrangement, is represented schematically in the bottom half of figure 3. Through this region is drawn the section represented in figure 4. The linear conveyor 1 can be seen on the left side of the figure, the diverting arms 5a and 5b are represented over the linear conveyor 1 in their item-diverting position, the pivot axes 4 of the diverting arms 5a

and 5b are drawn in dash-dot representation. The direction of diversion of the diverting arms 5a, 5b is identified by the arrow 9. The relatively severe inclination of the chute 6 is clearly discernible, which results in the items making their way below the plane of conveyance of the parallel linear conveyor 2 and having to be raised again via the conveyors 7 and 8. It is also evident in figure 4 that the end of the conveyor 8 ends slightly above the plane of transport of the linear conveyor 2, so that the items can be smoothly transferred without catching on the side of the belt.

From figures 3 and 4 it becomes clear that the distribution device according to the prior art, which is provided between the parallel linear conveyors, requires a great deal of space, which spatial requirement inevitably follows from the used chute and the adjoining belt conveyors.

In figure 1 the solution according to the invention is represented, and in the top view of figure 1 it is already clearly apparent that the distribution device makes do with a minimum spatial requirement compared to the known solution. The linear conveyors, here too denoted by 1 and 2, the direction of conveyance of which, identified by the arrows, is likewise denoted by 3a and 3b, are arranged closely side by side in parallel, the endless conveyor according to the invention, in the form of a drum 10, being arranged between the linear conveyors 1 and 2. As in the prior art, the diverting arms 5a and 5b are driven pivotably about vertical pivot axes 4, in the illustrative embodiment one of the pivot arms 5a, 5b, namely, in the example, the pivot arm 5a, serving both linear conveyors 1 and 2, as will be further described below.

As shown in dashed representation in the bottom half of the drawing, the swivel arms 5a, 5b are pivotable out of a rest setting, parallel to the linear conveyor 1 or 2, into the pivot

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setting represented in the top half of the drawing, in which the arms 5a, 5b are mutually aligned. In this

setting, the items can be deflected, as indicated by the arrow 11, so that they make their way with at least a part of their bottom side onto the endless conveyor, the drum 10. The drum 10 can be driven in the arrow direction 12 and transports the items by frictional engagement of their bottom side onto the linear conveyor 2, where it is transported away in the direction of the arrow 3b. Consequently, items which has been delivered on the linear conveyor 2 in the arrow direction 3c can be transported in the direction of the dashed arrow 13 onto the drum 10, the diverting arms 5a, 5b having been pivoted into the position drawn in dashed representation. If the rotational direction 12 is reversed, the items are transferred to the linear conveyor 1, whereof the swivel arm 5b has been pivoted parallel to the linear conveyor 1 and whereof the swivel arm 5a stands in the dashed setting over the linear conveyor 2.

In figure 2, the situation schematically represented in figure 1 is drawn in cross section, an item 14, in the example a suitcase, being represented at the start of the transfer operation. It can be seen that the diverting arms 5a, 5b are pivoted in mutual alignment, to be precise about the vertical pivot axes 4 represented in dash-dot representation. The linear conveyor 1 has delivered an item, which is transported by the vertically revolving diverting belts of the diverting arms 5a, 5b in the transverse direction (to the right in the drawing) to the point where the bottom side of the item 14 comes to lie clearly on the surface of the drum 10. The drum 10 is rotary driven, its surface is of antislip configuration and hence causes the item 14, supported by the diversion surfaces of the diverting arms 5a, 5b, to make its way over the drum 10 onto the adjacent linear conveyor 2, the diverting arm 5b of which is pivoted into the rest setting in which it lies parallel to and outside of the linear conveyor 2. As soon as the item 14 has left the drum 10, it is further carried along by the

linear conveyor 2 and transported in the direction of conveyance 3b to its new destination.

The working method described with reference to figure 2 is identical with the reverse working method, in which the items are delivered on the linear conveyor 2 and transferred to the linear conveyor 1. In this case, the swivel arm 5b is merely pivoted over the linear conveyor 2 and brought into alignment with the swivel arm 5a, which is likewise swiveled inward over the linear conveyor 2. The endlessly revolving diverting belt of the two diverting arms 5a, 5b is driven in the arrow direction 13 (fig. 1), the rotational direction of the drum 10 is changed oppositely to the arrow direction 12 represented in figure 1, and the arm 5b above the linear conveyor 1 is swiveled back into its rest setting in which the arm 5b lies alongside the linear conveyor 1.

If the linear conveyors 1 and 2 are placed further apart, the drum 10 can be configured as a short conveyor belt without departing from the concept of the invention. The most favorable spatial relationships are obtained, however, if the endless conveyor, as represented in the example, is configured as a drum, which drum projects with an upper portion out of the plane formed by the supports of the linear conveyors 1 and 2.

Patent claims

1. A distribution device for loose items within a conveying plant of a material flow system, in particular of a baggage handling system, comprising at least two linear conveyors, which in at least one defined portion run side by side, preferably parallel to each other, and a device, assigned to at least one of the linear conveyors, for laterally deflecting the items transversely to their direction of conveyance, as well as a device, provided between two adjacent linear conveyors, for transferring the deflected items to the respectively adjacent linear conveyor,

characterized in that

the device for transferring the deflected items (14) is configured as an endless conveyor (10) which revolves horizontally transversely to the linear conveyors (1, 2) and projects with its conveyor surface, that undergrips the items (14), upward over the plane of conveyance of the linear conveyors (1, 2).

2. The distribution device for loose items as claimed in claim 1, characterized in that the items (14), by means of the device (5a, 5b) for laterally deflecting the items, can be transported at least partially onto the endless conveyor (10) revolving transversely to the linear conveyors (1, 2).

3. The distribution device for loose items as claimed in claims 1 and 2, characterized in that the endless conveyor (10) is configured as a rotary driven drum, which is mounted rotatably about a horizontally running axis (15) orientated between the linear conveyors (1, 2) in the longitudinal direction thereof and bridges the gap between two adjacent linear conveyors (1, 2).

4. The distribution device for loose items as claimed in claim 3, characterized in that the drum (10) projects with a portion of its periphery over the plane formed by at least one, preferably both planes of conveyance of the adjacent linear conveyors (1, 2).

5. The distribution device for loose items as claimed in claims 1 to 4, characterized in that the drum (10) is cylindrical.

6. The distribution device for loose items as claimed in claims 1 to 4, characterized in that the drum (10) is slightly conical.

7. The distribution device for loose items as claimed in claims 1 to 6, characterized in that the conveying surface of the endless conveyor (10) is of antislip configuration.

8. The distribution device for loose items as claimed in claims 1 to 7, characterized in that the device (5a, 5b) for laterally deflecting the items consists of at least one diverting arm (5a or 5b) which can be swiveled in the region of the plane of conveyance of the linear conveyor (1 or 2) in a controlled manner about a vertical axis (4) and which can be pivoted by motorized means out of its rest setting beside and parallel to the linear conveyor (1 or 2) that is to be fed into a work setting transversely to the linear conveyor (1 or 2).

9. The distribution device for loose items as claimed in claim 8, characterized in that each diverting arm (5a, 5b) is provided at both ends with a respective vertically revolving guide pulley, around which an endlessly driven deflecting belt, orientated substantially in a vertical plane, is guided.

10. The distribution device for loose items as claimed in claims 8 and 9, characterized in that two diverting arms (5a, 5b) are pivotable out of their rest setting on both sides of the linear conveyor (1 or 2), transversely thereto, into a work setting in which the deflecting belts of the diverting arms (5a, 5b), which are driven in the same direction, form an aligned barrier for the items (14) which are laterally deflectable onto the discharge section.

11. The distribution device for loose items as claimed in claim 10, characterized in that one of the two diverting arms (5a or 5b) is mounted midway between two adjacent linear conveyors (1, 2).

12. The distribution device for loose items as claimed in claims 10 and 11, characterized in that the diverting arm (5a or 5b) mounted midway between the two adjacent linear conveyors (1, 2) forms, according to choice, with one of the two diverting arms (5a or 5b) provided on the opposite sides of the adjacent linear conveyors (1, 2), a respective barrier for one of the two linear conveyors (1 or 2).

13. The distribution device for loose items as claimed in claims 9 to 12, characterized in that at least the running direction of the driven deflecting belt of the diverting arm mounted midway between the adjacent linear conveyors (1, 2), as well as the rotational direction of the endless conveyor (10), are reversible.

14. The distribution device for loose items as claimed in one of claims 1 to 13, characterized in that the diverting arm (5a or 5b) mounted midway between the adjacent linear conveyors (1, 2) can be swiveled by means of the endless conveyor from a setting in which it is positioned over one linear conveyor (1, 2) into a setting in which it is positioned over the other linear conveyor (1 or 2).