June 26, 1962 K. REHM 3,040,866

CONVEYING DEVICE

Filed July 6, 1961 2 Sheets-Sheet 1

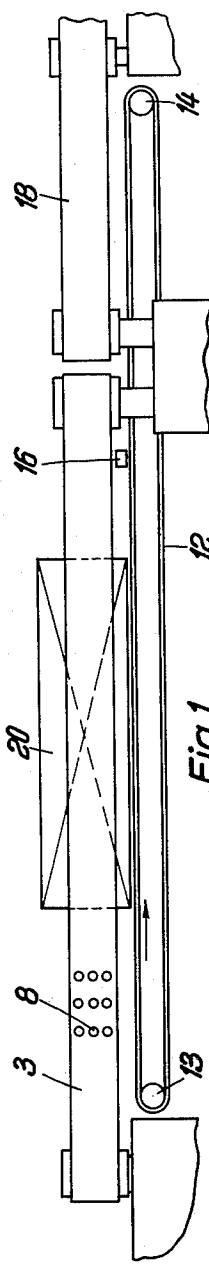


Fig.1

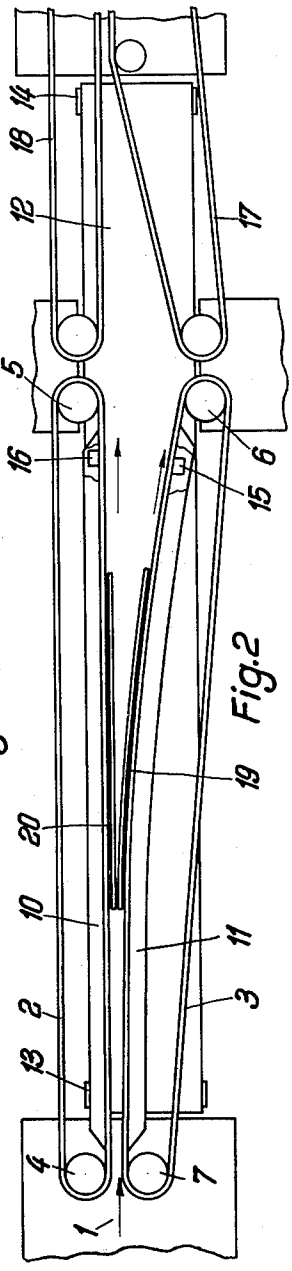


Fig.2

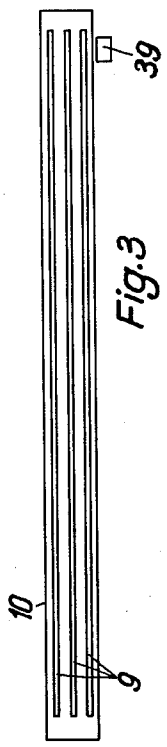


Fig.3

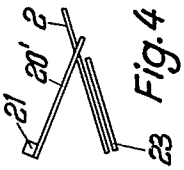


Fig.4

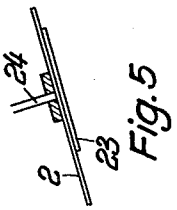


Fig.5

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CONVEYING DEVICE

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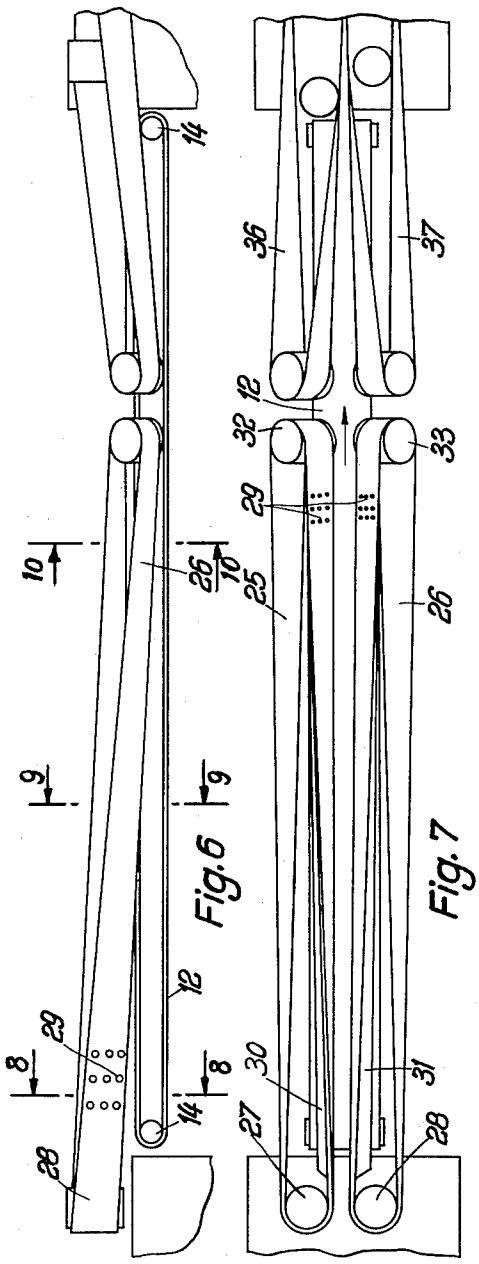


Fig. 6

Fig. 7

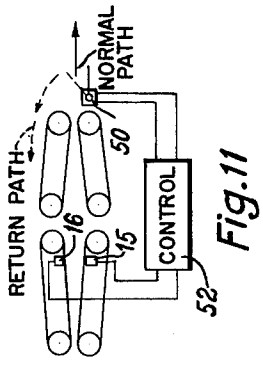


Fig. 11

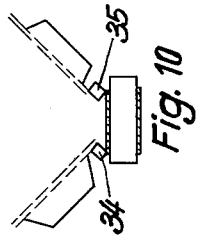


Fig. 10

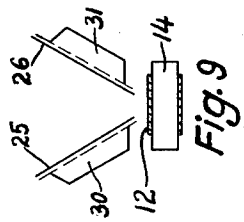


Fig. 9

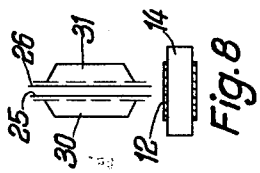


Fig. 8

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3,040,866
CONVEYING DEVICE

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Claims priority, application Germany July 9, 1960
9 Claims. (Cl. 198—30)

This invention relates generally to the sorting art, and more particularly to a device which renders it possible in conveyor systems for flat objects, to sense and then separate out all shipments which are poorly singled out or separated from each other. This device is especially suitable in automatic sorting plants where mail shipments are processed. Of course, it may also be used for controlling other material to be sorted, such as forms and the like.

As is known in automatic sorting plants for mail shipments, a flow of singled out shipments or parcels must be provided from a disordered stack of shipments, which is the co-called rough mail. This is necessary because only individual shipments may be properly processed in other and subsequent parts of the plant. It is particularly when dealing with mail shipments that difficulties are encountered because these shipments are not at all standardized, but have quite different characteristics regarding size, thickness, weight, frictional behavior, rigidity, and the like. Therefore, it is almost impossible to prevent occasional overlapping of two or more shipments. Thus, in order to prevent such shipments from causing disturbances or sorting flaws in the further processing apparatus, a control device is inserted at a suitable location in the plant which device recognizes and separates out or rejects these overlapping shipments.

It is known to control the separating operation by means of a measuring member which checks the lengths of the shipments. If the measured length exceeds a predetermined value, it is concluded therefrom that overlapping shipments are present. Such a control device, however, is usable only if all shipments are substantially equal in length. Also, such a system does not recognize shipments which cover one another completely (double copies). In another known control device, all shipments are detained for a short while between a controlled mechanical clamping member and a controlled suction nozzle. Thereupon, first the clamping member and then the suction nozzle is rendered inoperative, so that when dealing with overlying double shipments first the one abutting against the clamping member and then the one abutting against the suction nozzle is released. This accomplishes separation of double copies. However, this device requires great conveying distances and is not usable with increased conveying speeds.

With these defects of the prior art in mind, it is an object of the present invention to provide a control device which is capable of sensing poorly singled out shipments which overlap to any extent whatever and which, furthermore, permits operation with a continuous high conveying speed.

Another object of this invention is to utilize the information regarding overlapping shipments to reject such shipments from further processing.

A further object is to provide a simple and inexpensive overlapping shipment detector, yet one which is exceedingly effective.

These objects and others ancillary thereto are accomplished according to a preferred embodiment of the invention, wherein the control means includes a pneumatic separating device having two suction type conveyor belts which may be considered as comprising two sections. In the first section, the belts jointly pick up the

shipments from both sides, and in the second section, the belts are separated from each other and a checking device is coordinated with each suction type conveyor belt at corresponding points. Each checking device gives off a signal when a shipment passes, and the signals of these two checking devices are fed to a control device which, should shipments pass the checking devices simultaneously (which will always occur with overlapping shipments), actuates a switch arranged in a further section to remove the overlapping shipments from the normal conveying path.

The pneumatic separating device with the two suction type conveyor belts is known per se for use in connection with another problem, namely, that of separating blueprint and original in blueprinting devices. The problem of controlling separating does not occur there.

Additional objects and advantages of the present invention will become apparent upon consideration of the following description when taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a side elevational view of one type of conveyor system which may be used as a part of the present invention.

FIGURE 2 is a plan view of the system illustrated in FIGURE 1.

FIGURE 3 is an elevational view of the suction means for the conveyor belts.

FIGURE 4 is a diagrammatic view of one form of checking device.

FIGURE 5 is a diagrammatic view of another form of checking device.

FIGURE 6 is a side elevational view of another type of conveyor system.

FIGURE 7 is a plan view of the system illustrated in FIGURE 6.

FIGURE 8 is a vertical sectional view of the conveyor belt taken substantially along the plane defined by line 8—8 in FIGURE 6.

FIGURE 9 is a vertical sectional view of the conveyor belt taken substantially along the plane defined by line 9—9 in FIGURE 6.

FIGURE 10 is a vertical sectional view of the conveyor belt taken substantially along the plane defined by line 10—10 in FIGURE 6.

FIGURE 11 is a diagrammatic view illustrating the relation of the switch to the conveyor.

The shipments to be controlled are fed to the device in the direction indicated by the arrow in FIGURES 1 and 2 from a singling out device, for example. They are picked up by two opposing suction type conveyor belts 2 and 3. These belts are guided around rolls 4, 5 and 6, 7 and have suction openings (perforation fields) 8 which correspond to the conveying distance of the shipments. The suction openings run over suction slots 9 of suction troughs 10 and 11. In these troughs, a vacuum pressure is maintained in known manner. Further, a horizontal conveyor belt 12 is provided, which runs over rolls 13 and 14. The rolls 6 and 7 and, if necessary, the suction trough 11 are flexibly and/or resiliently mounted so that they may yield according to the thickness of the shipments. The necessary means to accomplish this are known per se and are not shown in the figures.

The suction type conveyor belts 2, 3 run parallel at the entrance of the control track. In what may be considered the first section adjacent to the rolls 4 and 7, their mutual distance is so small that the entering shipments are in each case picked up by both belts at the same time. Belt 2 is guided in a straight line. Belt 3 is guided in such a way that the mutual distance between the suction belts increases in a subsequent second section. In this second section, checking devices 15 and 16 are coordinated with each suction type conveyor belt at cor-

responding points. Each checking device gives off a signal if a shipment passes which is adhering to the suction belt associated therewith. In a further section, all shipments are taken over by two conveyor belts 17 and 18 and fed to a switch 50 (see FIGURE 11). The output signals from the two checking devices 15 and 16 are fed to a control device 52 which, when the shipments pass the checking devices simultaneously, actuates the switch in such a way that the shipments involved are separated out and follow the return path back to the separating device, rather than proceeding along the normal path.

Shipments delivered in direction 1 are thus first picked up from both sides by one perforation field of each of the two suction type conveyor belts 2, 3. If the shipment involved is singled out, it is retained against one of the two belts in the second section, in a coincidental manner, against belt 2. When this shipment passes the checking device 15, for example, device 15 gives off a signal, whereas the checking device 16 does not give off a signal. Consequently, switch 50 is not actuated and the shipment involved is fed along the normal path for further processing in the plant.

If, however, as shown in FIGURE 2, two more or less overlapping shipments 19, 20 enter the device, one shipment is retained by the suction type conveyor belt 3 and the other by the suction type conveyor belt 2. In the second section, both checking devices 15 and 16 will respond at the same time, so that the switch 50 is actuated, via the control device 52, in such a way that shipments 19 and 20 are rejected into the return path. If more than two shipments enter at the same time, the shipments lying on the outside will adhere to the two belts in the same way as shipments 19 and 20, while the other shipments are carried along at the same speed by the horizontal conveyor belt 12. Since all these shipments enter the switch simultaneously, they are all rejected from the processing operation. The device is also capable of determining those shipments in which there is only partial overlap. In this case, the control signal for the switch will come about during the overlapping time of the output signals of checking devices 15 and 16.

The checking devices may be designed in different ways, known per se. FIGURE 3 is a view of a suction trough 10 showing, for example, an opening 39 arranged below this suction trough. Opening 39 may contain a magnetic sensing member which responds when opening 39 is covered by a shipment. A nozzle 24, for example, may be arranged, according to FIGURE 5, below the suction trough and suction type conveyor belt. The nozzle is connected with excess pressure or vacuum pressure. In front of the nozzle, an air current is formed which is disturbed when a shipment passes. This causes a change of pressure to occur in nozzle 24, which causes an output signal via an appropriate pressure sonde. According to FIGURE 4, a mechanical sensor 20' may be used, which is maintained in a support 21. This sensor may, for example, project beyond belt 2 and is brought out of its position of rest by a shipment 23 conveyed on the suction belt 2. The sensor may be designed in such a manner that hereby an electric contact is closed or opened. The passing of a shipment could also be determined electrostatically by passing the shipment between two condenser plates. Finally, the checking devices for determining the passing of a shipment may contain known photoelectric scanning means.

Another embodiment of the invention is shown in FIGURES 6 to 10. Again, a horizontal conveyor belt 12 is provided. The device contains two suction belts 25 and 26, which, at the entrance of the control track, are guided parallel over rolls 27, 28. The suction belts likewise contain perforation fields 29 which are moved past suction troughs 30, 31. At least one of the suction belts 25, 26 is then twisted with reference to its original plane in such a manner that in the following second section

the distance between the belts 25, 26 increases toward the top. In the drawing, both belts are shown twisted by means of rolls 32 and 33, and the suction troughs 30 and 31 are, of course, also bent accordingly. In this device, poorly singled out shipments are flipped apart. In the vicinity of section line 10—10 (FIGURE 6), checking devices 34 and 35 are arranged which act in the same way as in the embodiment previously described. After leaving the suction type conveyor belts 25 and 26, the shipments are fed by conveyor belts 36, 37 to the switch 50 which prevents the poorly singled out shipments from continuing in the sorting operation.

The control device according to the invention may be arranged, for example, directly behind a so-called suction belt singling out unit. In a known singling out unit, the shipments are drawn off individually from a stack by means of a perforated suction belt. The device may then be combined with the singling out unit in such a way that one of its two suction type conveyor belts, for example, suction type conveyor belt 2 of FIGURE 1, is formed as an extension of the suction belt of the singling out unit mentioned.

The control device according to the invention may, of course, be used in connection with any singling out device whatever, or at any other point whatever of a sorting plant where a control of the singling out is desired or necessary.

The poorly singled out shipments separated by way of the switch may be returned by way of a special refeeding branch along a return path, so that they again take part in the singling out process. In this case, the outlet of the switch into which the poorly singled out shipments are fed, is joined by a conveying device which feeds the separated out shipments anew to the singling out device of the plant.

FIGURE 11 diagrammatically illustrates the invention as it would be used to control a switch 50. In this figure, the checking devices supply electric signals to the control device 52 which energizes drive means for switch 50 to properly position the latter.

It will be understood that the above description of the present invention is susceptible to various modifications, changes, and adaptations, and the same are intended to be comprehended within the meaning and range of equivalents of the appended claims.

What is claimed is:

1. A device for controlling the singling out of flat material to be conveyed, such as mail shipments, comprising, in combination: a pneumatic separating device with two suction type conveyor belts which in a first section jointly pick up the shipments from both sides and in a second section are separated from one another; a checking device in said second section coordinated with each suction type conveyor belt at corresponding points, each checking device giving off a signal when a shipment passes by; and a control device to which the signals of these two checking devices are fed, and which in case shipments pass the checking device simultaneously, actuates a switch, arranged in a further section of the conveying track, in such a way that the shipments involved are separated out.

2. A device according to claim 1, wherein one suction type conveyor belt extends along a straight line and the other suction type conveyor belt is at first guided parallel thereto and subsequently in such a way that, in said second section, the distance between the belts increases in the conveying direction.

3. A device according to claim 2, wherein the two suction type belts are first guided parallel to each other, and then at least one of the belts is twisted with respect to the original plane so that, in said second section, the distance between the belts increases toward the top.

4. A device according to claim 1, wherein the checking devices contain a pneumatic sensing member which causes

a signal on the basis of a change in pressure occurring when a shipment passes by.

5. A device according to claim 1, wherein the checking devices include a mechanical sensor.

6. A device according to claim 1, wherein the checking devices include photoelectric scanning means.

7. A device according to claim 1, connected after a singling out unit for separating articles, and an outlet of the switch into which the shipments to be separated are fed, is joined by a conveying device which feeds the separated out shipments anew to the singling out unit.

8. A device according to claim 1, characterized by the fact that it directly joins a suction belt singling out unit for separating articles, one of the suction type conveyor belts of said pneumatic separating device being formed by an extension of the suction belt of the singling out device.

9. A device for use following the separation of parcels by a separating machine for assuring that parcels are longitudinally spaced from each other, comprising, in combination: a pair of adjacent conveyor belts each having parcel holding suction means, the leading sections

of said belts being adapted to jointly receive parcel shipments from a parcel separating machine, the trailing sections of said belts being spaced further apart from each other than their leading sections; parcel sensing means coordinated with each holding means in the trailing section of each belt, said parcel sensing means being in transverse alignment; a switch receiving parcels from said belts and selectively directing the parcels to a subsequent processing machine and back to a preceding separating machine; and control means receiving signals from sail parcel sensing means when parcels are sensed to operate said switch to direct articles back to a preceding separating machine when the sensing means indicate that the parcels are in overlapping relation in the transverse direction, and to direct articles to a subsequent processing machine when no overlapping disposition of parcels is sensed.

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