

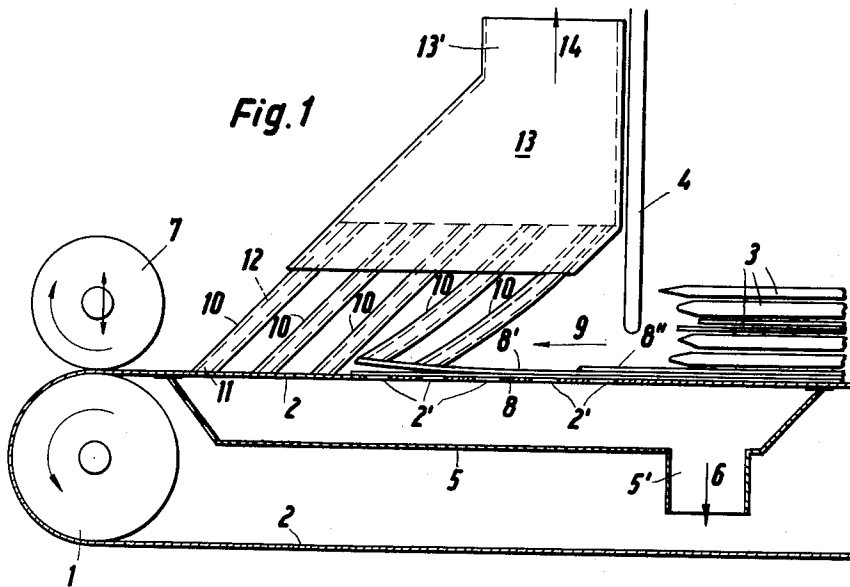
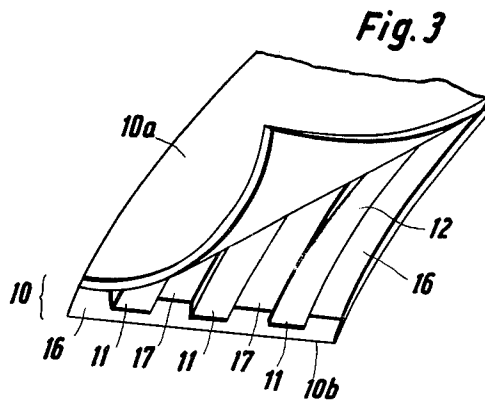
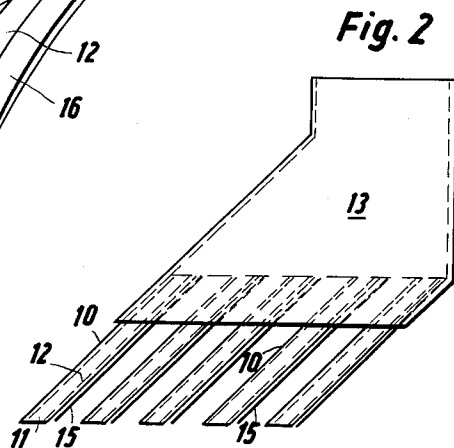
June 28, 1966

K. REHM
STRIPPER

3,258,262

Filed Aug. 28, 1964

3 Sheets-Sheet 1



INVENTOR
Karl Rehm

BY *Spencer & Kaye*
ATTORNEYS

June 28, 1966

K. REHM
STRIPPER

3,258,262

Filed Aug. 28, 1964

5 Sheets-Sheet 2

Fig. 5

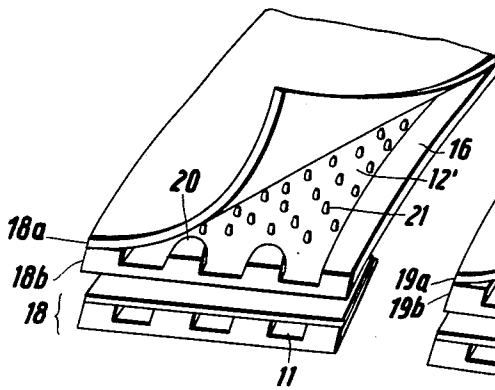


Fig. 4

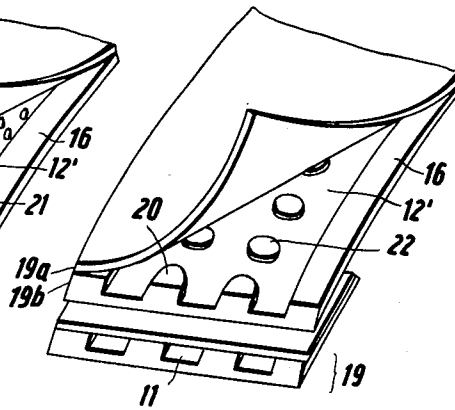
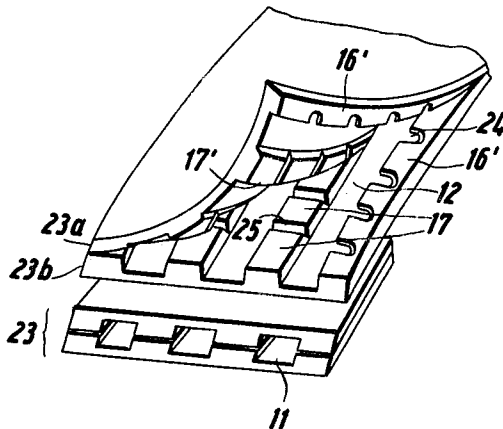


Fig. 6



INVENTOR
Karl Rehm

BY *Spencer & Kaye*
ATTORNEYS

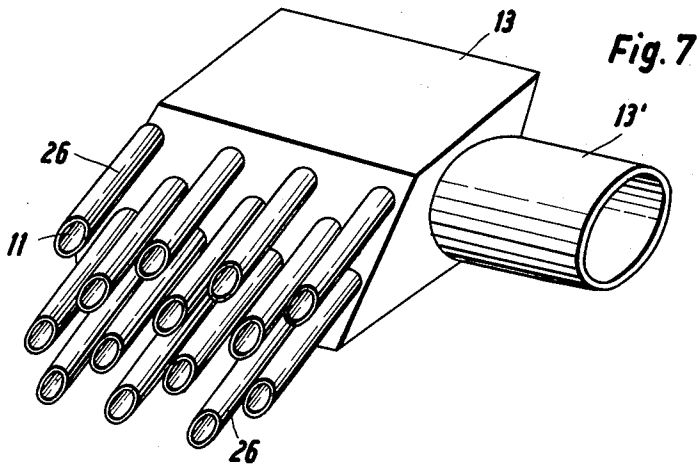
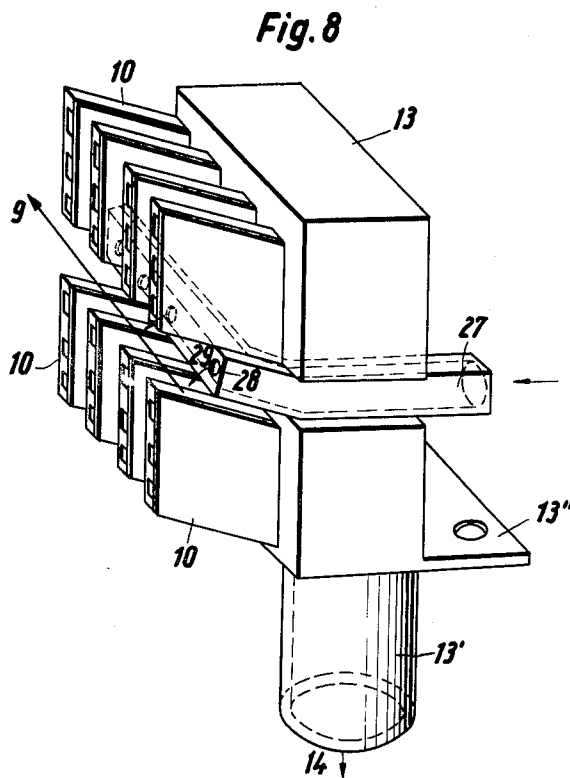
June 28, 1966

K. REHM
STRIPPER

3,258,262

Filed Aug. 28, 1964

3 Sheets-Sheet 3



INVENTOR
Karl Rehm

BY *Spencer & Kaye*
ATTORNEYS

1

3,258,262
STRIPPER

Karl Rehm, Konstanz, Germany, assignor to Telefunken
Patentverwertungs-G.m.b.H., Ulm (Danube), Germany
Filed Aug. 28, 1964, Ser. No. 392,882
Claims priority, application Germany, Aug. 29, 1963,
T 24,592
14 Claims. (Cl. 271—32)

The present invention relates to a separator which for the purpose of this specification is understood to mean a device which, using an endless conveying means, is adapted to withdraw from a pile conveyed articles which are flat or in the form of sheets, and to deliver them in succession in a single row to a following conveying device. A conveyor belt or conveyor drum may serve as the conveying means which effects the withdrawal, and the entrainment force of the mentioned conveying means may be increased in known manner by suction.

It is known that in such separators, occasional separating faults which lead to double or multiple withdrawals, can be not be entirely avoided. The reason for this lies, in particular, in different characteristics of the articles conveyed, for example, different rigidity, thickness, coefficient of friction, and possibly also porosity. This explains why double or multiple withdrawals occur relatively frequently, particularly in separators for mail, because with these items, the differences are particularly striking. Badly separated items of mail, however, lead to disturbances or misrouting in the following parts of a sorting installation, for example, at switch points or in scanning devices. Efforts are therefore made to ensure or improve the separation of the items of mail by means of separate additional devices.

For this purpose, so-called frictional strippers are known. These may, for example, comprise a pivotally mounted arm which is covered at its free end with a material having a high coefficient of friction, for example, polyvinyl chloride or rubber. The pivotal arm is biased against the conveying device which holds the items of mail, for example by means of suction, and prevents by friction the excess items from advancing. In order to achieve this, the retaining force between the stripper and a letter engaged by it must, on the one hand, be greater than the frictional force acting between two superimposed letters and, on the other hand, be less than the entrainment force which is effective between the conveying device and a letter resting directly thereon. This condition is difficult to fulfill in frictional strippers, however, and it is scarcely possible to maintain it for a long time with varied items of mail. Furthermore, it is known in the case of drum separators to mount a suction member at a fixed distance from the drum. This suction member comprises a relatively large number of suction apertures on its active face adjacent to the items of mail. However, such a device no longer works satisfactorily when the thickness of the items of mail to be handled exceeds a certain value. Then, not only is the consumption of air high, but there is also the risk of thinner items being damaged.

In U.S. Patent No. 3,126,201, a device is disclosed for holding back double or multiple withdrawals on a separator of the kind heretofore mentioned which device avoids the mentioned disadvantages. This is achieved by the use of one or more stripper members which are resiliently mounted, are continuously pressed by means of a relatively weak biasing force against the conveying side of the separating conveyor device, and have one or more suction apertures on their active surface adjacent to the conveying device. The suction apertures are in communication with a vacuum chamber through a suction

2

pipe. These stripper members are constructed in the form of shoe-like hollow bodies of which each is secured to a pivotally mounted arm.

The resiliently mounted suction strippers render it possible to fulfill reliably the conditions which have to be fulfilled in such a device with regard to the relationship between retaining force, mutual friction between the items of mail, and entrainment force, even when articles are conveyed which have unfavorable and very different characteristics.

With these features of the prior art in mind, it is a main object of the present invention to provide stripper members which are considerably simpler than those of the prior art.

It is another object of the invention to provide stripper members which can be made substantially lighter and which thus have less inertia than prior art devices.

These objects and others ancillary thereto are accomplished according to preferred embodiments of the invention wherein there is provided a device for holding back double or multiple withdrawals in association with a separator of the kind described which device likewise uses movable stripper members with suction apertures which are in communication with a vacuum chamber through a suction pipe. As a further development of the means disclosed in the above-mentioned patent, it relates to a particularly advantageous embodiment of the movable suction stripper members. The feature of this device is that each stripper member forms a flexible tongue which is provided with at least one suction aperture at its working surface facing the moving conveying device and bearing against this in the position of rest, and which itself acts as a suction line in that it has one or more cavities or passages extending in the longitudinal direction.

In a further development, these stripper members are secured, at the end which is remote from the conveying device and is in communication with the vacuum chamber in such a manner that the connecting line between the secured end and the suction apertures forms an angle of about 30 to 80 degrees with the conveying direction. In conjunction with the stripper members according to the invention, this feature provides special effects, explained below, which can not occur in the known frictional strippers.

In devices according to the invention, apart from their greater simplicity, the stripper members can, inter alia, be made considerably lighter and hence with a lower inertia than the above-mentioned vacuum strippers constructed in the form of shoe-like hollow bodies. The consequence of this is that the device remains fully effective even when the separating operation is carried out at high speed. Thus not only its static but also its dynamic behavior is equal to or adaptable to all the conditions which may occur in practice.

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 schematic plan view illustrating a portion of a separator constructed in accordance with the present invention.

FIGURE 2 is a schematic plan view of a modified stripper member.

FIGURE 3 is a perspective view of one embodiment of a stripper member which is rectangular in cross section, with a portion of one wall thereof shown raised to disclose further details.

FIGURE 4 is a perspective view similar to FIGURE 3 showing another embodiment.

3

FIGURE 5 is a perspective view similar to FIGURES 3 and 4 showing a further embodiment.

FIGURE 6 is a perspective view similar to FIGURES 3 to 5 showing still another embodiment.

FIGURE 7 is a perspective view of a stripper assembly in which the stripper members are circular in cross section.

FIGURE 8 is a perspective view of still another embodiment of a stripper assembly.

With more particular reference to the drawings, FIGURE 1 shows a suction conveyor belt 2 which is guided around a driven pulley 1 and a counter pulley, not visible, and which is provided with, for example, two groups of holes 2'. The mutual spacing of the individual groups of holes corresponds to the required conveying distance between the separated items. The stack 3 of items to be separated rests in front of a wall 4 with the items standing on edge. A suction trough 5 is mounted behind the suction conveyor belt 2 in such a manner that, beginning in the region of the front ends of the items in the stack 3, it extends over a certain length in the direction of movement of the suction conveyor belt. It is in communication, through a pipe socket 5', with a suction unit, not illustrated, the suction direction of which is indicated by the arrow 6. Mounted opposite the pulley 1 is a yieldably mounted roller 7, so that all the items of mail which travel towards the left out of the range of action of the suction trough 5, are forcibly gripped between the pulley 1 and roller 7 and delivered to a further conveying device, not illustrated.

As soon as a group of holes 2' in the moving suction conveyor belt 2 coming from the right comes within range of the suction trough 5, the items 8 in the stack 3 which is immediately adjacent to the belt 2 is sucked against the belt by which it is conveyed in the direction of the arrow 9. The drawing illustrates the case where, apart from the item 8, two further items 8' and 8'' are withdrawn from the stack and also conveyed in the direction of the arrow, which is undesirable. This may, for example, be caused by the fact that the items 8 and 8' are to some extent permeable to air (porous) so that the negative pressure at the group of holes 2' acts through these items and all of them are sucked tightly together and so are withdrawn jointly from the stack. Such behavior may be observed relatively frequently with post cards for example. In order to hold back the multiple withdrawals occurring in the separator, such as the items 8' and 8'' illustrated for example, the device according to the invention is used, which is described below.

The device comprises a plurality of stripper members 10 which are arranged in succession in the conveying direction and each of which forms a flexible tongue which is provided with suction apertures 11 at its working face, that is, at its end face which faces the suction conveyor belt 2. Each of these tongues comprises one or more longitudinal cavities or channels 12 which terminates, at the end remote from the suction conveyor belt 2, in a vacuum chamber 13 which is in communication through a suction socket 13' with a suction unit, the suction direction of which is indicated by the arrow 14. At their ends nearer the vacuum chamber, the stripper members are secured in such a manner that the connecting line between the point at which the stripper members are fixed to the vacuum chamber elements and the end face forms not too small an acute angle with the conveying direction of the belt 2. This angle preferably amounts to about 30 to 80 degrees, about 45 degrees in the example illustrated. In their normal position, all the stripper members 10 bear with their suction apertures 11 against the conveyor belt 2. The possible constructions of these stripper members are discussed hereinafter with reference to examples of embodiments. Their mode of operation will be explained first.

4

As soon as the item 8', entrained at high speed in the direction of the arrow 9 as a double withdrawal, comes within range of the retaining device, the first two of the tongue-like stripper members 10, as shown in FIGURE 1, grip the item of mail 8' so firmly by suction that the item 8' is separated from the item 8 bearing directly against the belt 2 in the region of its movement past the end faces of the stripper members containing the suction apertures 11. As a result, it becomes possible for the surrounding air to enter the space between the items 8' and 8 so that the suction explained hereinbefore between the items 8' and 8 quickly disappears and the item 8' is reliably held back. Only the item 8 is then held by the group of holes 2' and conveyed by the suction conveyor belt 2. As soon as the next group of holes 2' (not illustrated) comes within region of the suction trough 5 as a result of the further movement of the belt 2, the item 8' is drawn against the belt against the retaining force of stripper 10 and is entrained by the belt, while the item 8'' now comes within reach of the stripper member by which it is held back. As in all vacuum strippers, the negative pressures and suction cross-sectional areas should be so dimensioned that the retaining force of the stripper members 10 is greater than the frictional force between two items bearing against one another, but less than the force with which the items are entrained by the suction conveyor belt 2.

The device according to the invention may also be used in a corresponding manner in connection with a separator wherein a suction drum, for example, serves as an endless rotating conveying device instead of a suction conveyor belt. It is likewise immaterial to the mode of operation of this device whether the items are conveyed on edge or lying flat.

The tongue-like stripper members 10 are made from materials having an adequate coefficient of friction, such as PVC (polyvinyl chloride), Vulkollan (cross-linked polyurethane), rubber, or, in certain circumstances, even leather. Their moment of resistance in the conveying direction is such that they can easily follow the suction force acting at their working surface. As a result, they can always bear reliably against the oncoming item of mail, even if this is relatively thick, in which case the stripper member is at first thrust aside by the impact.

In order to obtain a smooth entry for the items, it is an advantage to provide the stripper members 10 at their entry side with a covering of a material having a low coefficient of friction, or to mount in front of them a strip 15 of such a material, as seen in FIGURE 2.

The cross section of the stripper members 10, which are illustrated in the device shown in FIGURE 1, is a rectangle of which one side, extending transversely to the conveying direction, is substantially longer than the other. For reasons of manufacture, it is advisable to make each stripper member of two parts, the contact plane of which extends in the longitudinal direction of the tongue formed thereby and parallel to the long side of the cross section. These two parts may be rigidly connected by being stuck together, for example. It is an advantage, however, for the two parts to remain unconnected, that is to say, to bear loosely against one another. As a result, the suction apertures 11, and above all the passages or channels 12 present in the interior, can always be quickly and easily cleaned of adhering paper, dust and the like. The lateral sealing of the two loose parts is adequately ensured by the reduced pressure prevailing in the passages.

FIGURE 3 is a perspective view of the construction of such a stripper member 10 comprising two loose parts 10a and 10b. Whereas the part 10a, which is shown in a partially raised position, is flat, that is to say it is of equal thickness throughout, the part 10b is provided on the inside with lateral marginal strips 16. Similar intermediate strips 17 form on the one hand the suction apertures 11 in the region of the end face of the stripper member 10 and, on the other hand, support the two parts 10a and 10b

in relation to one another so that the passages 12 formed between them are retained against the action of the reduced pressure prevailing therein.

In order to counteract any unwanted stiffening of the stripper members, it is advisable to make provision for a satisfactory sliding capacity in the plane of the contact between the two parts 10a and 10b. For this purpose, both parts may simply be sprinkled with talcum. It is still better to apply to at least one of the two parts at the contact surface a sliding layer formed by a material which has a low coefficient of friction, such as Teflon, for example. This layer should then be so thin that it shows the same wear at the end face of the stripper member as the material of the two parts 10a and 10b. It is further possible, and advantageous, to produce one of the two flap-like parts 10a or 10b—and preferably the flat part 10a—as a whole of a material having a low coefficient of friction, such as Teflon, for example.

Similar considerations apply to the modified embodiments of stripper members which are illustrated in FIGURES 4 to 6. There, below each stripper member, which is partially folded back, a further stripper member is represented in the closed condition in each case.

Each of the stripper members 18 and 19 shown in FIGURES 4 and 5 likewise comprises a flat part 18a or 19a and a second profiled part 18b or 19b, respectively. This second part is provided in both cases with lateral marginal strips 16 on the inside and with stud-like raised portions 20 in the region of the end face of the tongue formed by the two parts. The cavity 12' formed between the two parts is maintained in the stripper member 18 by a large number of spike-like members 21, while studs 22 of larger cross section are provided for this purpose in the stripper member 19.

In FIGURE 6, two stripper members 23 are shown as a further modification, each comprising two like parts 23a and 23b. These parts are similar in construction to the part 10b of the stripper member 10 (FIGURE 3). They differ from this only in the fact that the lateral marginal strips 16' are provided with recesses 24 on the inside and the strips 17' are provided with wedge-shaped incisions 25. In this manner a reduction in the moment of resistance of this stripper is obtained in the direction of the short side of the cross section.

In FIGURE 7, an embodiment of a device according to the invention is illustrated which comprises a large number of stripper members 26, each of which is formed by an elongated hollow body of substantially circular cross section forming a flexible tube. These stripper members are particularly simple to produce, but are not so easy to clean as those described previously.

In order to loosen up flat items of mail to be separated, it is known to use jets of air which are blown obliquely against the leading edges of the items counter to the direction of conveying. This means can also be applied in conjunction with a device according to the present invention. One example of a device constructed in this manner is shown in FIGURE 8. A plate 13" for securing the device to the separator is illustrated in the housing 13 of the vacuum chamber. Here two groups of stripper members 10, succeeding one another in the conveying direction, are arranged side by side (one above the other). A tube 27, which is in communication with a blower or air compressor and which is provided with jet forming nozzles 28, extends between the two groups. A jet of air emerges from each nozzle in a direction obliquely and in opposition to the direction of conveying 9, as indicated by the arrow 29, which facilitates the stripping process under certain conditions.

The embodiments of stripper members explained with reference to the drawing are constructed in such a manner that the end face of the tongue acts as a working surface, this is to say the suction apertures are in this end face. This is not a basic requirement, however. It would also be possible, within the scope of the invention, to ar-

range or construct the tongue-like stripper members in such a manner that they bear against the conveying device with the end of the wide surface adjacent to the separating conveying device, and that the suction apertures are in the portion of this surface.

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. In a device for holding back double or multiple withdrawals in a separator for conveyed articles which are flat or in the form of sheets and including an endless moving suction conveying means and at least one movable stripper member having at its active surface facing the conveying means at least one suction aperture in communication with a vacuum chamber via a suction line, with the retaining force exerted by the stripper member being less than the entrainment force of the conveying means, the improvement wherein each stripper member is a flexible tongue having at least one suction aperture at its working surface facing the moving conveying means and bearing against the conveying means in its rest position, and at least one passage extending longitudinally through each tongue to define its own suction line.

2. A device for assuring that flat articles are separated from each other, comprising, in combination:

endless conveying means for moving the shipments by exerting a transporting force thereon; and

at least one yieldable stripper means for exerting a retaining force on articles which is less than the transporting force exerted by the conveying means on articles, the stripper means having a suction opening in a surface thereof which faces the conveying means and said surface lying against the conveying means in the rest position of the stripper means, and the stripper means being in the form of a flexible tongue having a suction passage extending longitudinally there-through for placing the suction opening in communication with a vacuum pressure chamber.

3. A device as defined in claim 2, wherein each tongue is secured at the end which is remote from the conveying means and is in communication with the vacuum chamber in such a manner that the connecting line between the secured end and the suction openings forms an angle of substantially 30 to 80 degrees with the conveying direction.

4. A device as defined in claim 2, wherein there are a large number of tongues each of which is formed by an elongated hose-like hollow body of substantially circular cross section.

5. A device as defined in claim 2, wherein the cross section of each tongue is a rectangle, of which one side extending transversely of the conveying direction is substantially longer than the other.

6. A device as defined in claim 5, wherein each tongue is of two parts, the contact surfaces of which extend in the longitudinal direction of the tongue which they form and parallel to the long side of the cross section.

7. A device as defined in claim 6, wherein at least one of the two parts is provided on the inside with lateral marginal strips and with raised portions which on the one hand form the suction openings in the region of said surface and on the other hand support the two parts in relation to one another in such a manner that the passages formed between them are retained against the action of the negative pressure prevailing therein.

8. A device as defined in claim 6, wherein the two parts of which the tongues are composed rest loosely one against the other.

9. A device as defined in claim 8, wherein at least one of the two parts is provided at the contact surface with a layer of a material having a low coefficient of friction.

10. A device as defined in claim 8, wherein one of the two parts has a flat shape and this part is of a material with a low coefficient of friction.

11. A device as defined in claim 2 comprising a layer of a material having a low coefficient of friction disposed at the side of the tongue facing the arriving articles.

12. A device as defined in claim 2, wherein there are a plurality of tongues which are independent of one another and are arranged side by side in one row perpendicular to the conveying direction.

13. A device as defined in claim 2, wherein there are a plurality of tongues which are independent of one another and which succeed one another in the conveying direction.

14. A device as defined in claim 13, wherein there are

at least two groups of tongues succeeding one another in the conveying direction, and that at least one jet-forming nozzle is arranged in the gap between these groups for directing a jet of air substantially in a direction opposite to the conveying direction.

References Cited by the Examiner

UNITED STATES PATENTS

3,126,201	3/1964	Rehm	271—32
3,194,552	7/1965	Buchwald	271—26

M. HENSON WOOD, JR., *Primary Examiner*.

J. N. ERLICH, *Assistant Examiner*.