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[54] **INSTALLATIONS FOR THE TREATMENT, IN GASEOUS MEDIUM, OF A STRIP PRODUCT**

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[52] **U.S. Cl.** **34/156,** 34/155

[51] **Int. Cl.** **F26b 13/00**

[58] **Field of Search** 34/156, 155, 23

[56] **References Cited**

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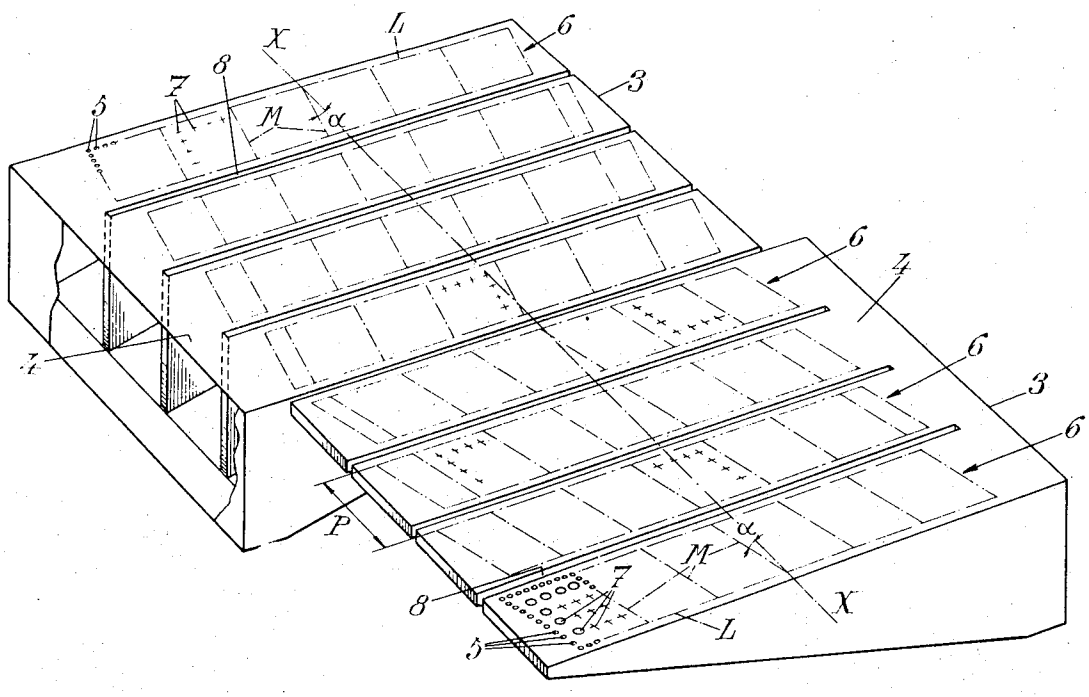
[57] **ABSTRACT**

The band of product moves through a treatment zone facing blower caissons. The blower walls of the caissons include apertures distributed according to a succession of contours and along middle lines joining the two large sides of each contour, transverse passages being arranged between each contour. The small side of the contour is greater than half the pitch by which the groups of blower apertures are distributed. The sum of the sections of the outlet passages is greater than the sum of the sections of the blower apertures and inlet apertures.

9 Claims, 3 Drawing Figures



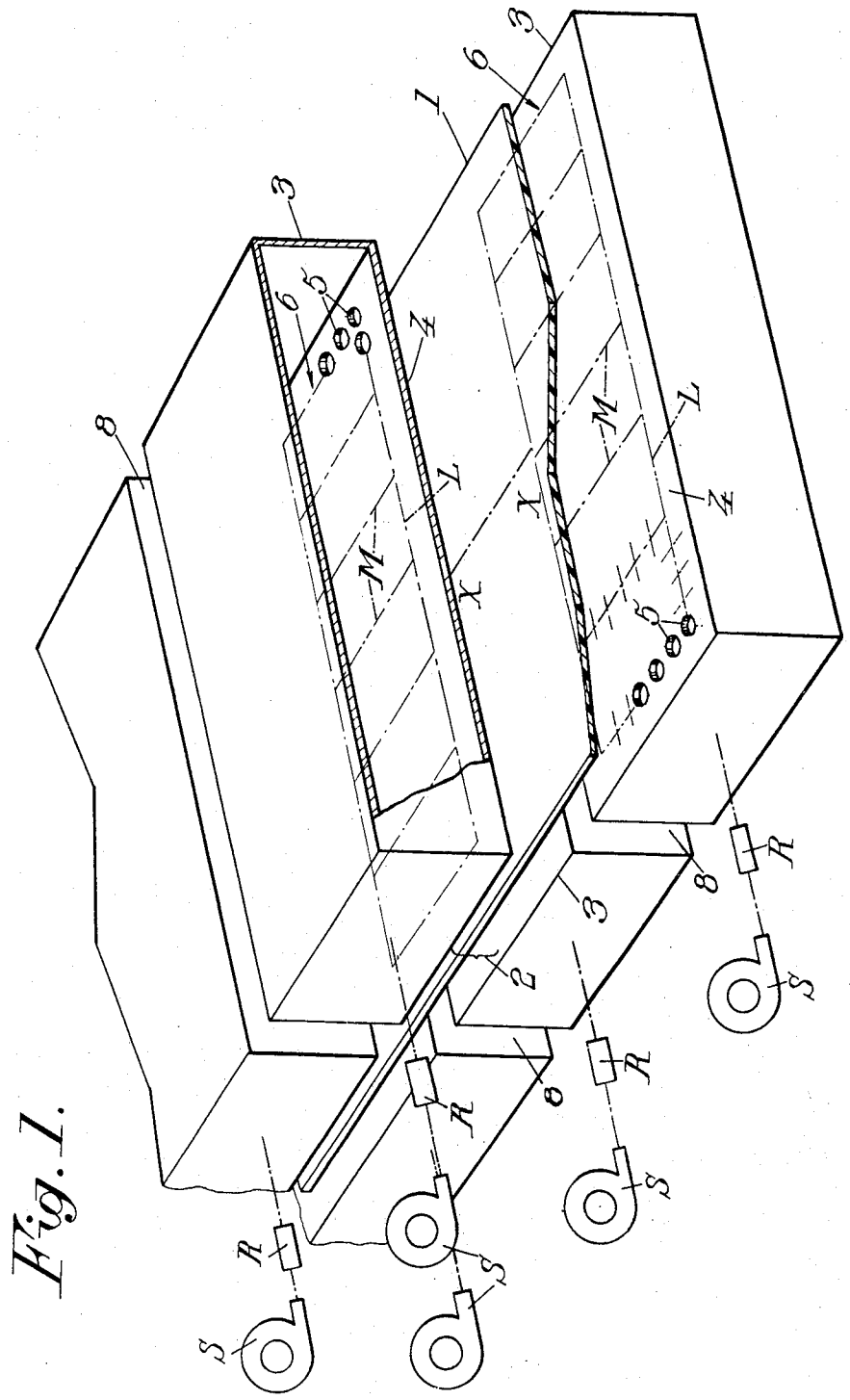


Fig. 1.

Fig. 2.

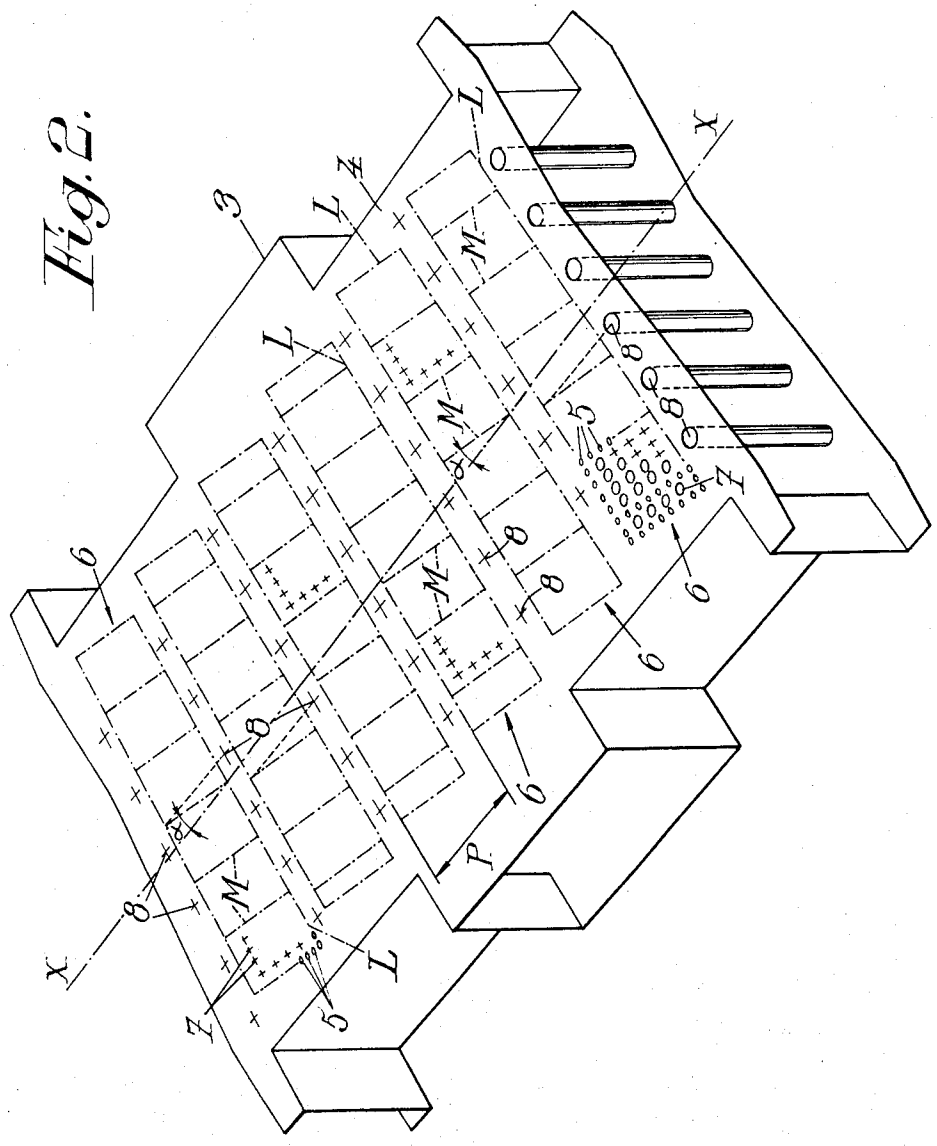
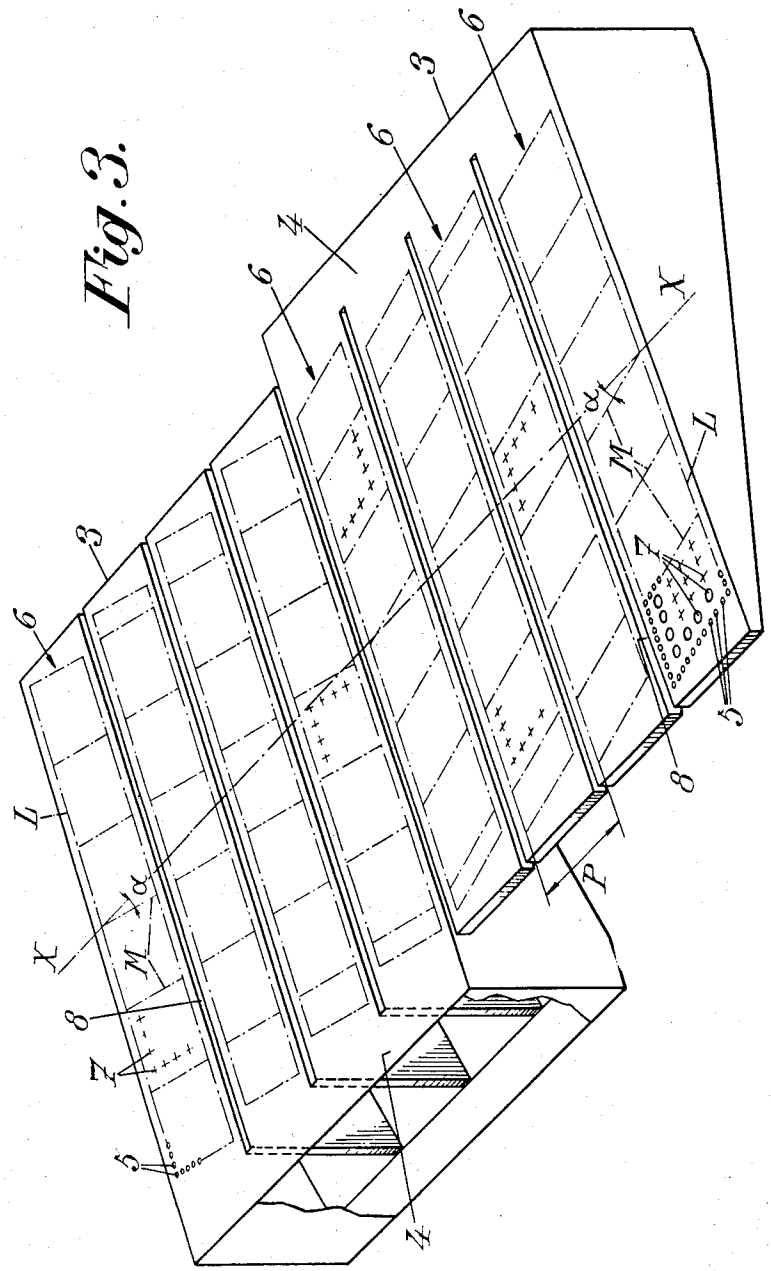


Fig. 3.



INSTALLATIONS FOR THE TREATMENT, IN GASEOUS MEDIUM, OF A STRIP PRODUCT

The invention relates to installations enabling the carrying out, in a gaseous medium, on a product in a band, of treatments of various natures, especially chemical, physical, or physical chemical treatments.

The invention relates more particularly, because it is in this case that its application seems to offer the most advantage, but not exclusively, among these installations, to those for the drying of a product in a band, especially in a flexible, deformable and fragile band.

It has already been proposed to include in such an installation a treatment zone in which the band or strip product is moved, this treatment zone being situated facing one or several blower caissons supplied by gas, called "treatment gas."

Each blower caisson has, on the side of the treatment zone, blower walls comprising,

blower apertures to ensure the maintenance and to contribute to the treatment of the band of product,

inlet apertures to complete the treatment of the band of product,

and outlet passages to remove the gas blown into the treatment zone by the abovesaid blower and inlet apertures.

In an installation of this type, the problems to be resolved consist principally,

of ensuring stable maintenance of the band of product in the treatment zone,

to avoid jets of gas emerging from the blower apertures causing marks on the band of product,

to ensure treatment, especially drying, as efficiently as possible.

It is a particular object of the invention to provide an installation which enables, stable maintenance of the band of product in the treatment zone to be ensured,

to avoid jets of gas emerging from the blower apertures causing marks on the band of product,

and to ensure efficient treatment, especially of drying.

It is a further object of the invention to provide an installation which lends itself particularly well to treatments, especially drying, to be effected on a band of flexible, deformable and fragile product.

It is a further object of the invention to provide an installation of which the bulk, especially the length, can be reduced.

The installation according to the invention is characterized by the fact that,

the blower apertures form groups which have distributed along the direction of movement of the band of product and which each comprise, on one hand, blower apertures arranged along a contour of rectangular shape, of which the large side is perpendicular to the direction of movement of the band of product and has a dimension at least equal to the maximum width of the band of product, and, on the other hand, blower apertures arranged along median lines regularly spaced and rejoining the two large sides of the abovesaid contour,

the inlet apertures are arranged inside the contour,

and extraction passages are arranged between each contour,

the section of each inlet orifice being greater than the section of each blower orifice,

the small side of the contour being greater than half the pitch along which are distributed the groups of blower apertures,

the sum of the sections of the outlet passages being greater than the sum of the sections of the blower and inlet apertures.

It will be appreciated then that, due to this distribution and this arrangement of the blower apertures, of the inlet apertures and of the outlet passages, there is ensured for the band of product a stable maintenance in the treatment zone, that jets of gas emerging from the blower apertures causing marks on the band of products are avoided, and that a treatment, especially drying, as efficient as possible is ensured.

It will also be appreciated that, in the same installation, it is possible to treat bands of product of different widths.

The invention consists, apart from this main feature, of certain other features which are preferably used at same time and which will be more explicitly considered in the further description which follows, illustrated by the accompanying drawings, this further description and these drawings relating to the preferred embodiments of the invention and not being of course of any limiting character.

FIG. **1**, of these drawings, is a diagrammatic view in perspective of one embodiment of an installation constructed according to a first embodiment of the invention.

FIG. **2** is a partial view in perspective of an installation constructed according to a second embodiment of the invention.

FIG. **3** is a partial view in perspective of a third embodiment of an installation constructed according to the invention.

In FIG. **1**, there is shown an installation for the drying of a band of product **1** moving horizontally in a treatment zone **2** from one side to the other of which occur arranged several blower caissons **3**.

Each blower caisson **3** has, on the side of the treatment zone **2**, a blower wall **4** comprising,

blower apertures **5** to ensure the maintenance and to contribute to the treatment of the band of product **1**,

inlet apertures **7** to complete the treatment of the band of product **1**,

and, outlet passages **8** to remove the gas blown into the treatment zone **2** by the abovesaid blower apertures **5** and inlet **7** apertures.

The blower apertures **5** form groups **6** which are distributed along the direction of movement of the band of product **1** and which comprise each,

on one hand, blower apertures **5** arranged along a contour L of rectangular shape, of which the large side is perpendicular to the direction of movement XX of the band of product **1** and has a dimension at least equal to the maximal width of the band of product **1**,

and, on the other hand, blower apertures **5** arranged along median lines M spaced regularly and rejoining the two large sides of the abovesaid contour L.

The inlet apertures **7** are arranged inside the contour L.

And the outlet passages **8** are arranged between each contour L.

The section of each inlet aperture **7** is greater than the section of each blower aperture **5**.

The small side of the contour L is greater than half of the pitch P along which are distributed the groups 6 of blower apertures 5.

The sum of the sections of the outlet passages 8 is greater than the sum of the sections of the blower 5 and inlet 7 apertures.

Preferably, the median lines M of a same group 6 of blower apertures 5 are parallel between themselves.

These median lines M may be parallel to the direction of movement XX of the band of product 1 (FIG. 1), or preferably inclined with respect to this direction of movement XX (FIGS. 2 and 3).

As shown in these FIGS. 2 and 3, the median lines M are inclined with respect to the direction of movement XX of the band of product 1, the value of this inclination α being less than or equal to 45°.

The small sides of contour L are then advantageously parallel to the median lines M, the said contour L having the shape of a parallelogramme.

Under these conditions, all the groups 6 can have median lines M parallel between themselves from one group to the other (FIG. 2).

However, the groups 6 can be distributed in series, the groups of a same series having median lines M parallel, two successive series of groups 6 having median lines M inclined in symmetrical manner with respect to the direction of movement XX of the band of product 1 (FIG. 3).

When all groups 6 have median lines M inclined with respect to the direction of movement XX of the band of product 1 and parallel between themselves, these median lines M can be displaced from one group to the following group so that there are presented in identical manner in the contour L all the *n* groups, *n* being greater than unity (FIG. 2).

With regard to the embodiment illustrated in this FIG. 2, the periodicity with which an identical arrangement recurs, of the median lines M in the contour L, is four.

As regards the inlet aperture 7, it should be specified that they are preferably arranged, inside the contour L, so as to be aligned, in the transverse direction along parallels to the large sides of the contour L,

and, in the longitudinal direction, along parallels to the median lines M.

As for the extraction passages 8, they may be constituted by recovery chimneys aligned along a direction perpendicular to the direction of movement XX of the band of product 1 (FIG. 2), or by slots perpendicular to the direction of movement XX of the band of product 1 (FIG. 1 and 3).

In the case where the outlet passages 8 are constituted by recovery chimneys, it is advantageous to arrange the said recovery chimneys at regular intervals, equal to the intervals of the median lines M, and by following a displacement, from one group to the following one, identical to the displacement of the abovesaid median lines M (FIG. 2).

In the case where the outlet passages 8 are constituted by slots, it is advantageous to give the said slots a length greater than the dimension of the large side of the contour L (FIG. 3).

As regards the blower apertures 5 distributed, for a group 6, along a contour L and median lines M, they may be constituted by circular holes of 3 to 5 mm diameter spaced regularly along a pitch of 5 to 10 mm.

However these blower apertures 5 could be constituted by elongated holes in the direction of the contour L or in the direction of the median lines M.

As regards the inlet apertures 7, they can be also constituted by circular holes of 5 to 15 mm diameters spaced regularly.

However these inlet apertures 7 could also be constituted by elongated holes extending perpendicularly to the direction of movement XX of the band of product 1.

Referring to FIG. 2, in which the extraction passages 8 are constituted by chimneys, it may be indicated by way of example that,

the section of each inlet aperture 7 is two to three times greater than the section of each blower aperture 5,

the small side of the contour L is equal to 62 percent of the value of the pitch P along which are distributed the groups 6 of blower apertures 5,

and the sum of the sections of the outlet passages 8 is greater by 94 percent than the sum of the sections of the blower 5 and inlet 7 apertures.

Referring to FIG. 3, in which the outlet passages 8 are constituted by slots, it may be indicated by way of example that,

the section of each inlet aperture 7 is two to three times greater than the section of each blower aperture 5,

the small side of the contour L is equal to 77 percent of the value or the pitch P along which are distributed the groups 6 of blower apertures 5,

and the sum of the sections of the extraction passages 8 is greater by 44 percent than the sum of the sections of the blower 5 and inlet 7 apertures.

The operation of the installation which has just been described is then as follows :

The jets of gas delivered by the inlet apertures 7 and the blower apertures 5 distributed along the median lines M strike the band of product 1, and there are then produced between the gas jets and this band terminal exchanges by force to convention.

The gas tends to escape towards the extraction passages 8 which are closest and it encounters on its path the whole of the jets of gas delivered by the blower apertures 5 distributed along the large sides of the contours L of the groups 6.

These jets of gas being very close to one another, form a closed gaseous wall and the gas delivered by the inlet aperture 7 and the blower apertures 5 distributed along the median lines M causes the said walls to flare outwardly.

It will then be understood that the difference in static pressure which thereby results is (at least to first approximation) inversely proportional to the distance which separates the band of product 1 from the blower walls 4 considered.

The average pressure which exists in the space situated between the band of product 1 and the zones of the blower walls 4 which are comprised between the group 6 will also tend to increase if the abovesaid band approaches the blower wall considered under the action of an external force (for example under the action of the weight of the damaged product).

Finally, the band of product 1 occurs therefore subject to static pressures on both sides of its two surfaces, and the vectorial sum of these static pressures is op-

posed to any movement of approach to one another of the opposite blower walls **4**.

The position of the band of product **1** is hence automatically ensured in the treatment zone **2**, as well in the case envisaged by way of example, where this band is moved horizontally, as in the case where this band is moved vertically.

It should be pointed out that the jets of gas delivered by the blower apertures **5** distributed along the small sides of the contour L enable the delivery of a preferential escape of the gas in the transverse direction, which transverse escape would have a tendency to reduce the effect of the jets of gas delivered by the blower apertures **5** distributed over the large sides of the contour L.

Moreover, it will be understood that in the case of a band of product **1**, very flexible, hence deformable and fragile, the partitioning of the contour L by the median lines M enables the obtaining of a plurality of elemental lifting zones capable of reacting independently of one another to local pulling of the band of product **1**.

Finally and whatever the embodiment, there is obtained an installation for the drying of a strip product which has a certain number of advantages among which may be summarized the following :

— stable holding of the band of product in the treatment zone,

— absence of marking on the strip product,

— homogeneous treatment over the whole surface of the strip,

— possibility of preceding with treatment on fragile bands and of slight rigidity,

— possibility of treating, in a same installation, strip products of different widths.

I claim :

1. In an installation for the treatment, in a gaseous medium, of a band of product moving in a treatment zone situated between blower caissons supplied with treatment gas, the caissons having, on each side of the treatment zone, blower walls comprising groups of inlet and blower apertures for connection to a gas supply means and groups of outlet passages for exhausting gaseous medium from the treatment zone, these groups being arranged alternately with respect to the direction of movement of the band, the improvements comprising means in each group of apertures for forming a closed gaesous wall extending in a closed contour of rectangular configuration and surrounding the inlet apertures to impose a degree of confinement on the gaseous medium inside the contour, said means including a plurality of closely spaced, relatively small blower apertures arranged along a contour or rectangular shape, of which the larger side is perpendicular to the direction of movement of the band and is at least equal to the width of this band, said inlet apertures being relatively large and arranged inside said contour, the section of each inlet aperture being at least twice as great as the section of each blower aperture, and additional blower apertures equally arranged and closely spaced along median lines regularly spaced and joining the two large sides of the said contour, the small side of each contour being greater than half the pitch along which the groups of inlet and blower apertures are distributed, and the sum of the sections of the outlet passages being greater than the sum of the sections of the inlet and blower apertures.

2. Installation according to claim **1**, wherein the median lines of a same group of blower apertures are parallel between themselves.

3. Installation according to claim **2**, wherein the median lines are parallel to the direction of movement of the band of product.

4. Installation according to claim **2**, wherein the median lines are inclined with respect to the direction of movement to the band of product.

5. Installation according to claim **4**, wherein the angle of inclination of the median lines with respect to the direction of movement of band of product is less than 45°.

6. Installation according to claim **4**, wherein the small sides of the contour are parallel to the median lines.

7. Installation according to claim **4**, wherein all the groups of blower apertures have median lines parallel between themselves from one group to the other.

8. Installation according to claim **4**, wherein the groups of blower apertures are distributed in series, the groups of a same series having parallel median lines, whilst two successive series of groups have median lines inclined symmetrically with respect to the direction of movement of the band of product.

9. Installation according to claim **3**, wherein the median lines are staggered from one group to the other, such they have in identical manner in the contour all the *n* groups, *n* being equal to or greater than unity.

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