

[54] **APPARATUS FOR LAYING A FILM WEB IN Z-SHAPED FOLDS OR FOR DEPOSITING PORTIONS OF FILM WEB IN OVERLAPPED CONFIGURATION**

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[58] **Field of Search** .... 270/80, 81, 82, 83, 84, 270/85, 30, 31, 71, 73, 74, 39, 62, 68, 69; 271/197, 276; 93/8 W, 18, 19, 35, 93, 84 TW

[56] **References Cited**  
UNITED STATES PATENTS

2,803,173 8/1957 Doyle..... 93/19

3,038,391	10/1962	Von Hoffe et al.....	271/276 X
3,154,726	11/1964	McClain .....	270/81 X
3,476,241	11/1969	Ungerer .....	271/197 X
3,572,694	3/1971	Wilde.....	271/197 X
3,790,157	2/1974	Crawford et al.....	270/69 X

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### [57] ABSTRACT

This invention relates to apparatus for laying a film web in Z-shaped folds or for depositing portions of film web in an overlapped configuration or for pushing in the ends of portions of a film web, the apparatus comprising a first conveyor means, a second gripping conveyor means which conveys at a slower speed than said first conveyor means and which has an entry nip arranged at a position spaced from the first conveyor means, and pusher means which can be moved transversely of the plane of conveyance of the first conveyor means and into the region of the entry nip of the second conveyor means, said first conveyor means being provided with suction means operative to cause the film web to be held thereon.

8 Claims, 4 Drawing Figures

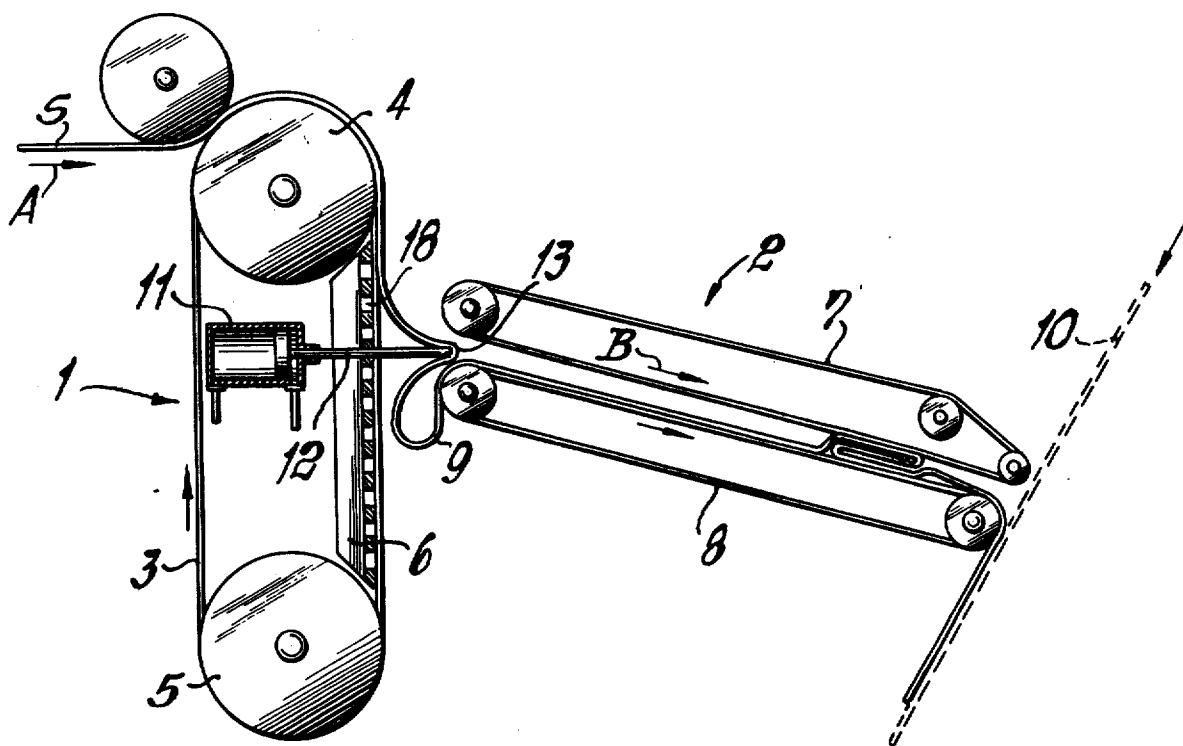


FIG. 1

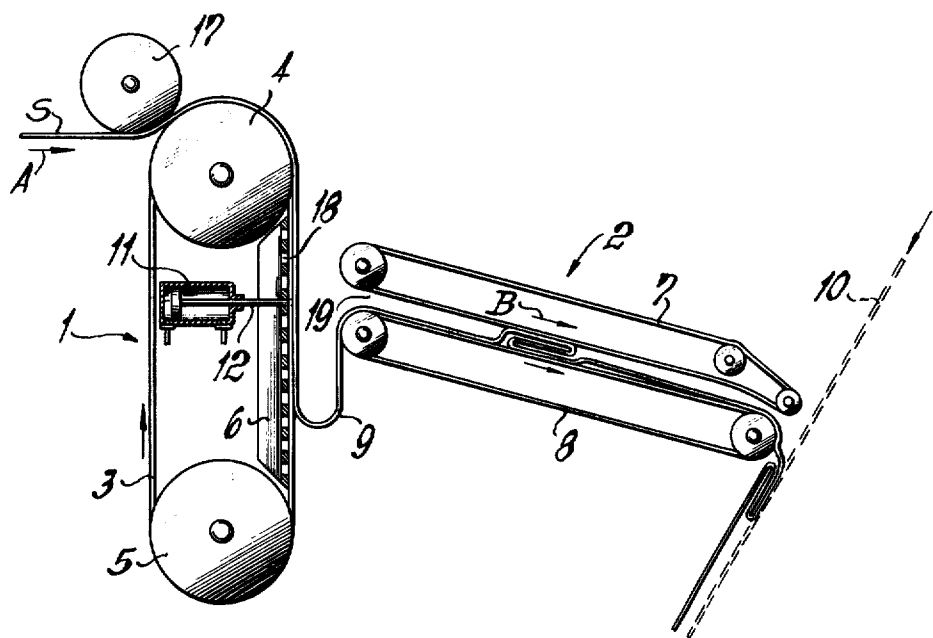
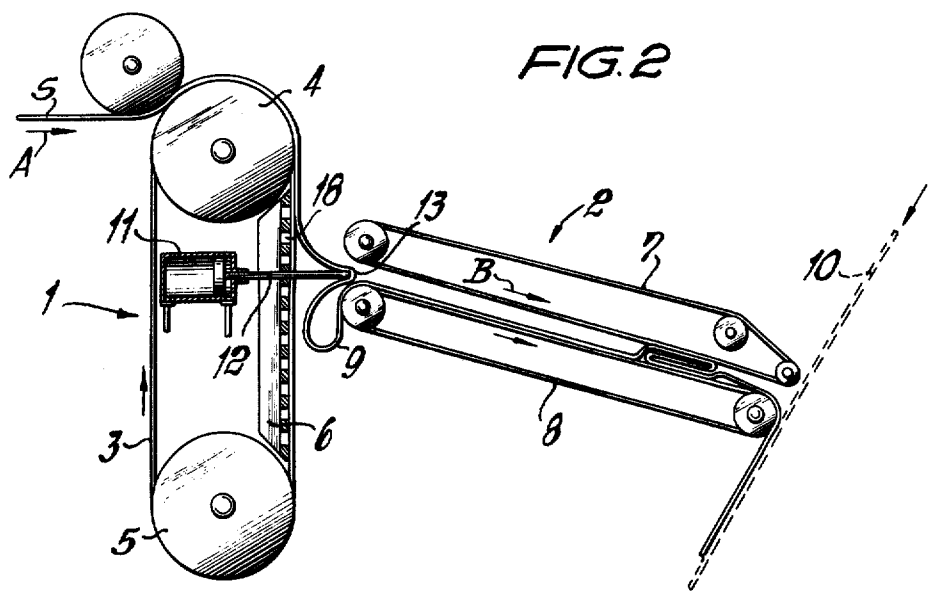


FIG. 2





# APPARATUS FOR LAYING A FILM WEB IN Z-SHAPED FOLDS OR FOR DEPOSITING PORTIONS OF FILM WEB IN OVERLAPPED CONFIGURATION

## BACKGROUND OF THE INVENTION

This invention relates to an apparatus for laying a film web in Z-shaped folds or for depositing portions of film web in an overlapped configuration, or for pushing in ends of film web portions, having a first conveyor means which conveys at a higher speed, and a second gripping conveyor means which conveys at a lower speed and which has an entry nip arranged at a spacing from the first conveyor means, and having pusher members which extend through the plane of conveyance of the first conveyor means and which are extensible into the region of the entry nip of the second conveyor means.

Tubular webs of film material or tubular portions of film material, which have Z-shaped folds arranged at a spacing one after the other, are required for making bags with a so-called insert bag. Such bags comprise an outer bag which has one or more plies and which generally comprises paper, and an inner bag which is conventionally of plastics film, which bags were in earlier times made by inserting the plastics bags into the finished paper bags. The term "insert bag" for the inner bag is retained with the methods, which nowadays are altered, of producing such bags.

Insert bags of the above kind are preferably made with an inner bag which is provided with a Z-shaped fold, the fold being formed by the inner bag being laid in a Z-shaped fold over a part of its length. In use of the bags the inner bag is extended so that, before the inner bag is filled, the mouth end thereof which is at first positioned flush with the mouth of the outer bag, is drawn a little out of the outer bag, and can subsequently be welded up, so that it is possible for the inner bag to conform closely to the bottom folds of the outer bag. The Z-shaped fold is of such a length that it stores a part of the length of the inner bag such that, when the bag has been extended and filled, but is still open at one end, the edge of the inner bag projects beyond the edge of the outer bag. While the bags are stored and conveyed, obviously the open end of the inner bag lies flush with the end of the outer bag, so that the end of the inner bag is protected from fouling by means of the outer bag.

Also for the purposes of producing insert bags, tubular portions of film are laid down in an overlapping configuration one upon the other, and in this configuration delivered to a paper web which is provided with transverse perforations and which forms the outer bag. The transverse perforations lie in the region of the overlapping so that after the outer bag tube has been formed and the transverse perforations have been torn open, the overlapped part of the inner tube slips out of the following outer tube and has its overlap portion projecting out of the outer bag tube portion which is torn off. A method of producing bags with an insert bag in which the insert bags are laid down in an overlap configuration one upon the other and are delivered to an outer bag paper web, and an apparatus for laying down the insert bag tube portions in an overlap configuration is known from German Auslegeschrift No. 1,611,710. This known apparatus comprises a first double-belt conveyor which operates at a higher speed

than the second conveyor means which is arranged downstream thereof, while the pair of belt rollers which are arranged at the discharge end of the double-belt conveyor and which transfer the tube portions to the second conveyor means is reciprocal in the direction of conveyance in the rhythm of the machine, with the belt tension being maintained by tensioning rollers which engage both outside runs of the belt, in such a way that said pair of belt rollers thread the leading end of the tube portions into the second conveyor means which operates at a slower speed, and prematurely releases the trailing end of the tube portions. Because of the pair of belt rollers of the first double-belt conveyor, which rollers are moved in the rhythm of the machine, the known apparatus is of an expensive construction. In addition, trouble can occur, when threading the leading end of the tube portions into the second conveyor means, in particular when the tube portions are thin flaccid films.

German Offenlegungsschrift No. 2,110,815 discloses a method and an apparatus for producing bags with an insert bag, which bags are folded over through 180° at their upper end, by the amount projecting out of the outer bag when the bag is filled. The apparatus for pushing in the ends of the insert bags comprises a double-belt conveyor having an upper and a lower conveyor belt, which operates at a higher speed than a second double-belt conveyor which is arranged downstream thereof. Of the pair of belt rollers which are arranged at the discharge end of the first double-belt conveyor and which transfer the tube portions to the second double-belt conveyor, at least one roller is reciprocal in the direction of conveyance in the rhythm of the machine, with the belt tension being maintained by tensioning rollers engaging the outer runs of the belt, in such a way that the pair of belt rollers inserts into the converging entry nip of the second double-belt conveyor an inner bag tube portion, using a folding plate along a transverse line lying in the region of the leading end of the tube portions, which folding plate is also reciprocated and which in the foremost position projects with its folding edge into the entry nip of the second double-belt conveyor which operates at a slower speed, the pair of belt rollers also prematurely releasing the trailing end of the tube portions. The use of the reciprocated folding plate does in fact ensure that the tube portions are reliably transferred with their fold edge to the second, more slowly moving conveyor, but there is the disadvantage that it is not possible to forego a belt roller which is reciprocated in the rhythm of the machine.

A method and an apparatus for producing bags or sacks with an insert bag having its filling mouth end projecting out of the outer bag are known from U.S. Pat. No. 2,803,173 in which the web of insert bag material is laid into Z-shaped overlap folds in the direction of conveyance, at spacings corresponding to the length of each insert bag. These folds are formed by the tubular web of film which is delivered at an elevated speed by a pair of delivery rolls being conveyed away by a pair of rolls which rotate at a lower speed, the web thus forming a freely hanging loop, and by the loop being rhythmically pushed into the roll gap of the roller which conveys the tubular web on, the loop being so pushed in by a pivotal folding blade. A disadvantage with this known apparatus for forming Z-shaped folds is that the freely hanging web of film frequently does not form a precise loop, which can be pushed in to form a

defect-free Z-shaped fold.

A good Z-shaped fold formation is achieved in accordance with a previous proposal (P 22 44 697.5) by the applicants, with the apparatus described at the beginning, in that the loop which is formed between the two conveyor means is pushed so as to hang downwardly under the action of the air blast coming from a blowing nozzle, wherein a forward movement of the lower guide roller at the discharge end of the first conveyor towards the lower guide roller at the entry end of the second conveyor causes the loop to be further squeezed, and a forwardly moving comb-like folding blade folds the tubular web at the edge of the loop and by means of the transverse fold guides the loop into a gap formed by rollers which can be moved backwardly and forwardly. Apart from the fact that the forwardly and backwardly moved conveyors give rise to increased expenditure on machinery, it is still difficult to form tidy loops in the tubular web. Therefore, in order to improve the loop formation operation, it has also been proposed that a weighting rod be used to promote the formation of the loop, which rod is arranged between the free ends of two lateral levers and which is so constructed as to be pivotal. Before the loop passes into the second conveyor the weighting rod must be pivoted out of the loop again, which complicates the operating procedure and increases the structural expense.

#### SUMMARY OF THE INVENTION

It is the problem of the present invention to provide a simple and reliable apparatus for laying a film web in Z-shape folds and optionally for depositing portions of film web in an overlap configuration, or for pushing in the ends of portions of film web.

According to the present invention there is provided apparatus for laying a film web in Z-shaped folds or for depositing portions of film webs in an overlapped configuration or for pushing in the ends of portions of a film web, comprising a first conveyor means, a second gripping conveyor means which conveys at a slower speed than said first conveyor means and which has an entry nip arranged at a position spaced from the first conveyor means, and pusher means which can be moved transversely of the plane of conveyance of the first conveyor means and into the region of the entry nip of the second conveyor means, said first conveyor means being provided with suction means operative to cause the film web to be held thereon.

The proposal according to the present invention ensures that when the apparatus is used for laying a film web in Z-shaped folds, the limb portion of the U-shaped loop which is formed, which limb portion is remote from the second conveyor means, is held firmly on the first conveyor means and is drawn away therefrom by the forward fold edge of the Z-shaped fold being introduced into the entry nip of the second conveyor means. Forming a neat loop results in the precise formation of Z-shaped folds. The loop is peeled away from the first conveyor means to which it clings, by the second conveyor means, while due to its clinging to the first conveyor means the loop is kept under a tension so as to ensure that the Z-shaped fold is neatly formed. The apparatus according to the invention makes it possible not only to form continuous tubular webs into Z-shaped folds, but also to form Z-shaped folds in portions of film web. If the moment of extension of the pusher members which are extensible in the rhythm of the machine is suitably selected, the apparatus accord-

ing to the invention also permits portions of film web to have their ends pushed in, by folding over a marginal strip portion.

For forming an overlap configuration with portions of tubular web, the pusher members are extended into the entry nip of the second conveyor means only to provide a guide for the leading end of the tube portion, while the trailing end on to which the leading end of the next following tube portion is again laid is then drawn away from the first conveyor means.

The first conveyor means advantageously comprises a belt conveyor with divided conveyor belts which are provided with rows of holes and which are arranged at a spacing from each other, the conveyor belts being guided over bars with suction slits at least in the region of the entry nip of the first conveyor means. The reduced pressure produced through the suction slits acts through the rows of holes in the conveyor belts at the surface thereof, so that the film web or the film web portions delivered thereto cling to the conveyor belts. It is also possible for the cling action to be produced by a static charge on the conveyor belts or by an adhesive coating.

In order to ensure that the film web is satisfactorily delivered, it is of advantage for the belt guide roller which is arranged between the return run and the conveyor run to be provided over its periphery with suction nozzles. A pressure belt can also be provided over the region of conveyance of the belt guide roller, instead of the above-mentioned suction nozzle.

The pusher members which extend through the plane of conveyance of the first conveyor means advantageously comprise a comb-like folding blade whose fingers engage through the gaps formed between the divided conveyor belts. The comb-like folding blades can be reciprocated in the operating rhythm of the machine by mechanical transmission members or by a compressed air cylinder.

The second conveyor means is advantageously in the form of a double-belt conveyor, in order to produce the desired clamping action.

In a further embodiment of the invention, arranged in the region of the entry nip of the second conveyor means, below the plane of conveyance of the first conveyor means, is a row of blower nozzles. For example when using the apparatus according to the invention for laying portions of film web in an overlap configuration, just the blast of air coming out of such nozzles can cause the forward end of the tubular portions to be introduced into the entry nip of the second conveyor means arranged downstream thereof.

#### BRIEF DESCRIPTION OF THE DRAWINGS

To the accomplishment of the foregoing and related ends, the invention then comprises the features hereafter fully described and particularly pointed out in the claims, the following description and annexed drawings setting forth in detail certain illustrative embodiments of the invention, these being indicative however, of but ways in which the principle of the invention may be employed.

In said annexed drawings:

FIG. 1 shows a diagrammatic side view of the apparatus for laying a film web in Z-folds, with formation of a loop.

FIG. 2 shows a view corresponding to FIG. 1, with the folding blade extended.

FIG. 3 shows an apparatus corresponding to that of FIG. 1, for depositing web portions of film in an overlap arrangement, and

FIG. 4 shows an apparatus corresponding to FIG. 3, with the folding blade extended.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

The apparatus diagrammatically illustrated in the drawings has the particular advantage that it can be used both for laying a film web in Z-folds and also for depositing web portions of film in an overlapped formation, or for pushing in the ends of web portions of film, without expensive conversion operations being necessary.

The apparatus is shown in FIGS. 1 and 2 in the configuration for forming Z-folds in a web of film.

The tubular web S of film is supplied for example by a winding-off device (not shown) in the direction of the arrow A to a first conveyor means 1. The first conveyor means 1 substantially comprises divided conveyor belts 3 which are provided with rows of holes and which pass around guide rollers 4 and 5, one of which is driven. Between the guide rollers 4 and 5 the narrow perforated conveyor belts 3 are guided on bars 6 which at their side which is disposed towards the conveyor belts 3, have slit-shaped suction nozzles 18. The holes in the conveyor belts 3 pass over the slit-shaped suction nozzles 18 so that a suction effect is produced at their upper face, while the suction gaps are covered for the rest by the conveyor belts. The suction slits are advantageously of such a length that they simultaneously embrace a plurality of holes in the conveyor belts. A comb-like folding blade 12 engages between the slits formed by the divided conveyor belts 3 and the suction bars 6 which support them. The folding blade 12 is actuated in the rhythm of the machine by a compressed air cylinder 11. Provided above the entry end guide roller 4 is a pressure belt or roller 17 which ensures that the film web S is fed neatly to the conveyor means.

The second conveyor means 2 comprises two conveyor belts 7 and 8, which delivers to a paper web 10 the film web S which is laid in Z-shaped folds. The web S is set down and fixed on the paper web 10 in known manner. The directions of conveyance of the conveyor means 1 and the conveyor means 2 are at an angle to each other.

The conveyor means 1 operates at a higher speed of conveyance than the conveyor means 2, resulting in the formation of a loop 9 corresponding to the length of the Z-shaped fold. The loop 9 is shown in FIG. 1. The limb portion of the U-shaped loop 9 which lies against the first conveyor means 1 clings to the conveyor belts 3 due to the suction action. To form the Z-shaped folds, the compressed air cylinder 11 is actuated to extend the comb-like folding blade 12 which, in the manner shown in FIG. 2, disengages the upper edge of the loop 9 from the conveyor belts 3 and pushes the fold edge 13 formed thereby into the entry nip 19 of the conveyor means 2. The lower part of the loop 9 still remains clinging to the suction belts 3 so that the loop remains stretched, thereby ensuring that the Z-shaped fold is clearly inserted into the conveyor means 2. The film web 5 which is folded in a Z-shape is then conveyed away in the direction indicated by the arrow B. As the loop 9 is not formed by the action of the force of gravity but by virtue of its clinging to the suction belts 3, the

conveyor means 1 and 2 can also be associated with each other in a different manner from that illustrated.

FIGS. 3 and 4 show the apparatus in its mode of operation for depositing portions ES of a tubular web of film, in an overlapping configuration. The tubular portions ES are delivered in the direction of the arrow A to the conveyor means 1 which operates at a higher speed. As soon as the front edge 16 of the tubular portions ES on the conveyor means 1 has reached the region of the entry nip 19 of the conveyor means 2, air is blown out of blowing nozzles 14 and releases the front edge 16 of the tube portions ES from the suction belts 3 and introduces the front edge 16 into the entry nip 19 of the conveyor means 2. The front edge of the tubular portions ES can also be inserted by extending the folding blade 16 which then represents a guide means for the leading end of the tubular portions ES. The folding blade 12 can also provide for guiding of the front edge 16 of the tubular portions, in addition to the blast of air from the nozzles 14. After the front edge 16 of the tubular portions ES have been inserted into the conveyor means 2, the trailing end 15 of the tubular portions ES still remains clinging to the suction belts 3, forming the loop 20, and is drawn away by the conveyor means 2. The leading end 16 of the following tubular portion ES is then deposited in the manner shown in FIG. 4 on to the rearward end 15 of the tubular portion ES in front, to form the overlap configuration.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

We, therefore, particularly point out and distinctly claim as our invention:

1. Device for laying a film web in Z-shaped folds and optionally for the overlapped positioning of sections cut from said film web, or for inserting sections of film, comprising: a first conveyor means conveying at a high speed; a second gripping conveyor means with clamping capacity operating at a conveying speed slower than that of the first conveyor means disposed to convey at an angle to the conveying direction of said first conveyor means and said angle having its intercept on the first conveyor means, the second conveyor means having an entry nip located at a distance from the first conveyor means and opening toward the first conveyor means; an extendable pusher means adapted to pass through the conveyor plane of the first conveyor means and reach as far as the opening of the entry nip of the second conveyor means, the first conveyor means having adhering means for adhering said film web to the first conveyor means in at least the region of its travel which is opposite the opening of the entry nip, the adhering means causing the film web to be held firmly on the first conveyor means until drawn away by the action of introducing the forward fold edge of the Z-shaped fold into the entry nip.

2. Apparatus as claimed in claim 1, in which the first conveyor means comprises a belt conveyor having a plurality of conveyor belts which are provided with holes and which are arranged side-by-side and spaced from each other, said conveyor belts being guided over bars provided with suction slits, at least in the region of the entry nip of the second conveyor means.

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3. Apparatus as claimed in claim 1, in which a belt guide roller of the first conveyor means, which is arranged between a return run and the conveyor run, is provided with suction nozzles over its periphery.

4. Apparatus as claimed in claim 1, in which a pressure belt or roller is associated with a belt guide roller of the first conveyor means.

5. Apparatus as claimed in claim 1, in which the pusher means comprises a comb-like blade whose fingers engage through gaps formed between conveyor belts of the first conveyor means.

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6. Apparatus as claimed in claim 1, in which the pusher means is actuated in the working rhythm of the apparatus by a compressed air cylinder.

7. Apparatus as claimed in claim 1, in which the second conveyor means is formed as a double-belt conveyor.

8. Apparatus as claimed in claim 1, in which a row of blowing air nozzles is arranged in line with the region of the entry nip of the second conveyor means, beneath the plane of conveyance of the first conveyor means.

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