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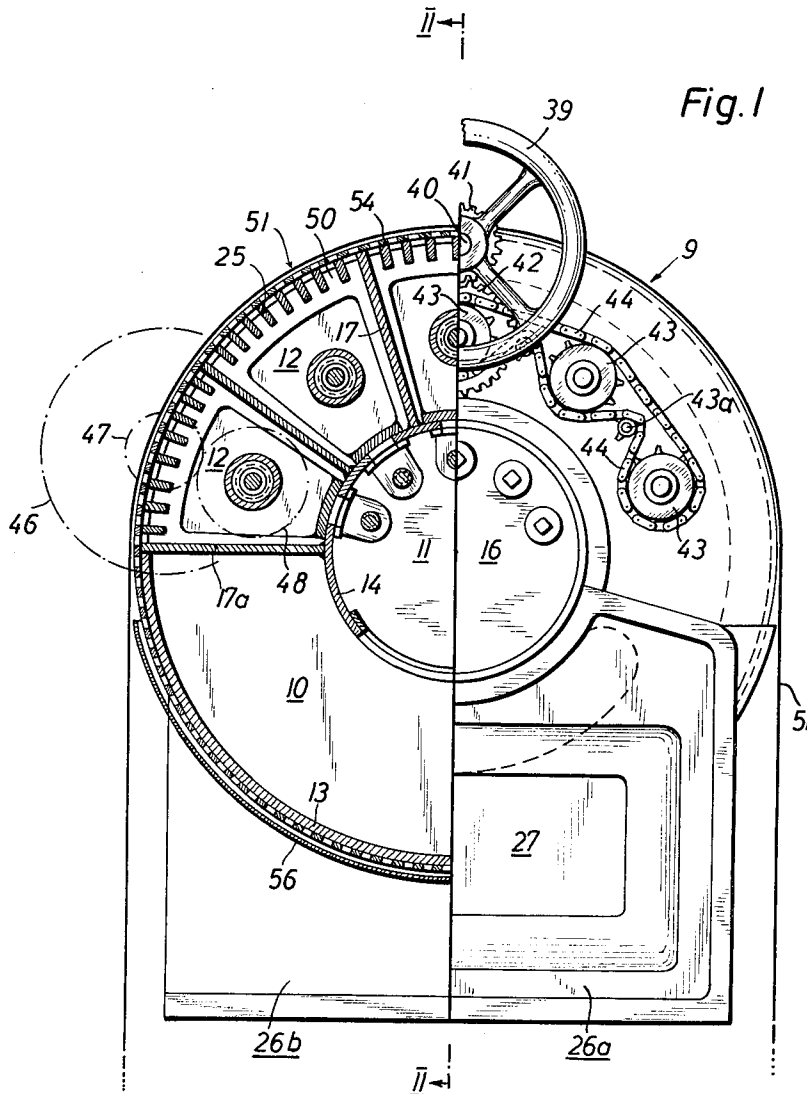
A. G. M. SCHMIDT

3,057,079

APPARATUS FOR CONTACTLESS GUIDING AND CONVEYING
OF FLEXIBLE SHEET-LIKE PRODUCTS

Filed July 16, 1958

3 Sheets-Sheet 1



INVENTOR
Adolf Georg M. Schmidt
BY *Michael S. Striker*
Attorney

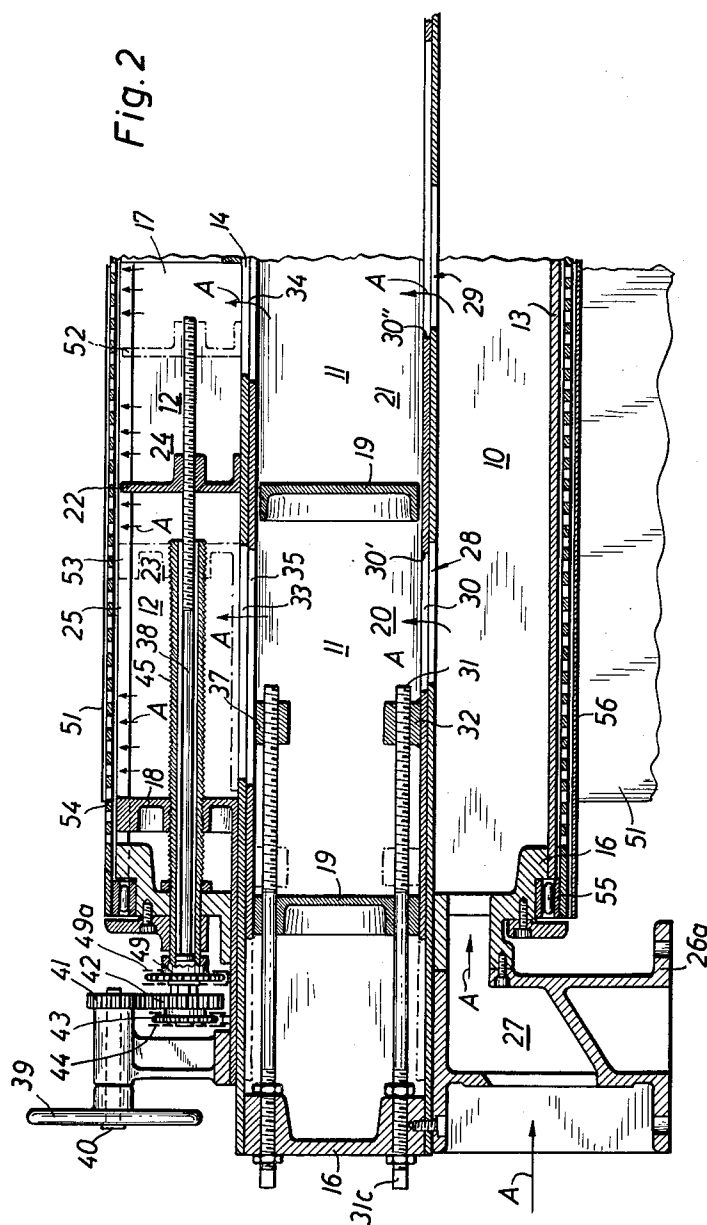
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INVENTOR
Adolf Leopold M. Schmidt
BY
Michael S. Striker
Attorney

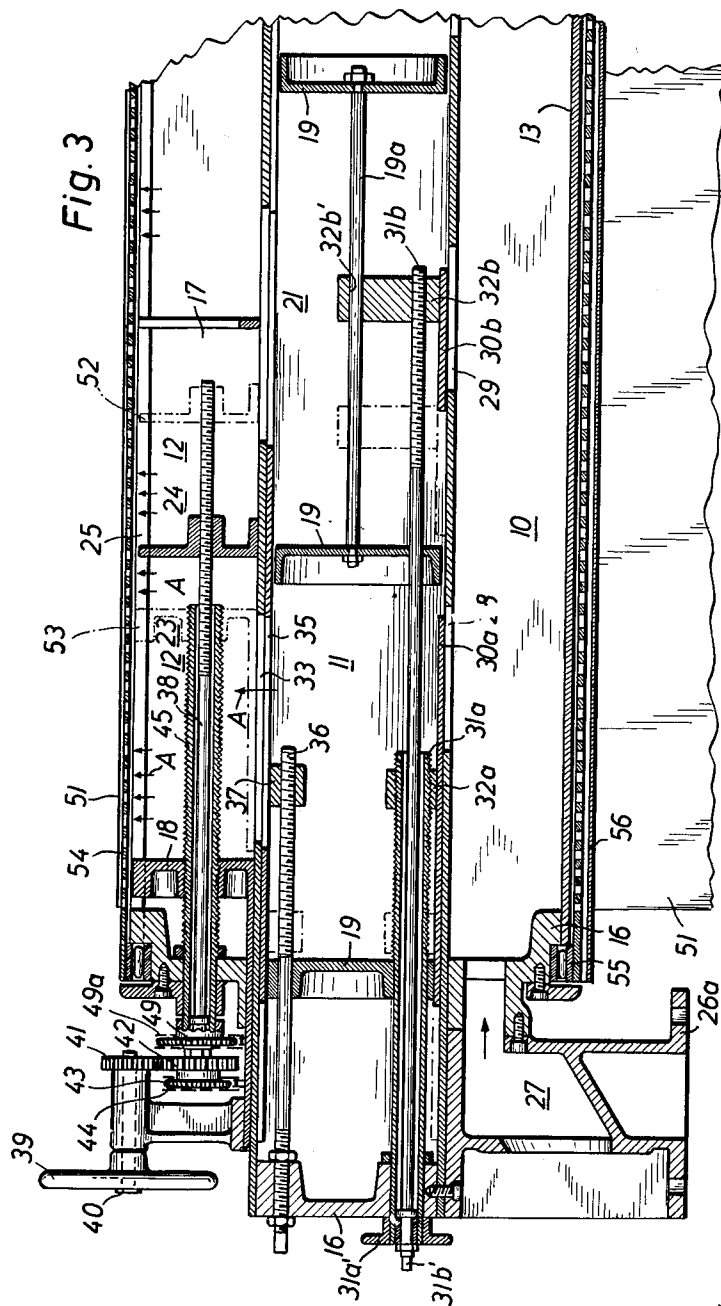
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62 **A. G. M. SCHMIDT**
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3 Sheets-Sheet 3



INVENTOR
Adolf Jerg M. Schmidt
BY
Michael S. Striker
Attorney

1

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APPARATUS FOR CONTACTLESS GUIDING AND CONVEYING OF FLEXIBLE SHEET-LIKE PRODUCTS

Adolf Georg Michael Schmidt, Bergisch-Gladbach, Germany, assignor to Firma J. W. Zanders Feinpapierfabrik G.m.b.H., Bergisch-Gladbach, Germany

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12 Claims. (Cl. 34—156)

The present invention relates to improvements in machines used in connection with manufacture and processing of paper and like products, and more particularly to an apparatus for guiding and conveying freshly coated and still wet paper strips or sheets without permitting their contact with solid bodies which could damage the coating composition.

In the manufacture of certain types of paper, it is necessary that the freshly coated, still wet sheets be guided and conveyed in such manner that they do not come into contact with any solid bodies, for example, with component parts of paper making machinery. This is customarily attained by leading each elongated sheet of paper in a channel or guideway provided with a number of nozzles which direct jets of air in two opposing directions perpendicular to the plane in which the paper travels. The jets of air, impinging against both major surfaces of the freshly coated product, thus actually carry the same and prevent its contact with the walls which surround the guideway. At the same time, the jets of compressed air contribute to the drying of advancing product. The disadvantage of such apparatus is in that the air jets must carry and guide the paper sheet until the latter is sufficiently dry to allow its contact with rotating parts of certain machinery, such as draw tables or other types of conveying and processing apparatus. While the still wet product is so carried by the air jets, it travels either in a vertical or in a horizontal plane, that is, the aforementioned channels or guideways must be either vertical or horizontal. The channels form part of coating or emulsifying machines in which both major surfaces of the paper sheet are preferably coated at the same time.

In horizontal drying channels, a freshly coated sheet of paper has the tendency to run sidewise when carried solely by the air jets whereby its edges often roll inwardly toward the median portion thereof. In addition, due to rather labile guiding effect of the compressed aeriform medium, fluttering of so conveyed product is considerable and often causes contact of still wet paper with the channel-surrounding walls and eventual tearing thereof. In order to reduce the detrimental effect of just described phenomena, it is necessary to reduce the length of channels in which the paper is carried by air jets. This, in turn, imposes limits upon the speed of the conveyed product, since the latter must be sufficiently dry, when emerging at the discharge end of the drying channel, to withstand contact with and further treatment by conventional paper making and processing machinery.

In the so-called tower-type coating machines, a freshly coated and still wet product is led through a vertical drying channel which again imposes limits on the conveying speed since the tearing length of the downwardly advancing suspended sheet cannot be exceeded.

If the product is coated in machines which apply an emulsifying composition only to one of its major surfaces, the operation requires two steps the second of which can be carried out only after the coat applied to one side is completely dry. In addition, the product, with one of its surfaces already coated, must be rolled into a tubular body and thereupon transferred onto a different system

2

of carriers permitting its unrolling and a second passage through the coating machinery which latter then applies an emulsifying composition to the other of its major surfaces. This operation is time-consuming, more complicated, and the paper so coated necessarily is costlier than if both its surfaces were coated at the same time.

An important object of the present invention is to provide an apparatus so constructed that it avoids the above enumerated drawbacks of known systems.

Another important object of the invention is to provide an apparatus for guiding freshly coated and still wet paper sheets and like products which may be used with products discharged by a machine capable of coating only one or both of their surfaces.

An additional object of the instant invention is to provide a drying and conveying apparatus of the above described characteristics which may be used in connection with freshly coated paper sheets and like products of different widths.

A further object of the invention is to produce a machine of the type set forth which requires very little space as compared with apparatus of known construction.

A still further object of the invention is to provide an apparatus for conveying and drying freshly coated and still wet sheets of paper and like products which is so constructed that different zones of the conveyed product may be subjected to different pressures and different quantities of drying aeriform medium.

The above and other objects of the invention are attained by the provision of a device which consists essentially of an elongated, stationary, horizontal drum or housing having a cylindrical peripheral zone the upper half of which is formed with a plurality of discharge openings or slots for escape of compressed air to hold the freshly coated and still wet paper sheet or like product at a certain distance therefrom while the product travels in a loop about the upper half of the drum's periphery. An important feature of the invention resides in the provision of a plurality of radially disposed cellular pressure chambers through which the air passes before escaping from the drum to impinge against the inner surface of looped product. The pressure chambers are bounded by radial walls and are supplied with a compressed aeriform medium through passages or apertures so controlled that the pressure and quantity of air entering each pressure chamber may be adjusted within a desired range to act against the advancing product with such force as is necessary to counteract different weight components of the product in different zones of the drum's periphery.

Means are also provided for subdividing each cellular chamber preferably into three compartments or sections whereby the pressure of escaping air may be controlled in axial direction of the drum since the effective areas of passages through which the air enters each of said sections or compartments may be individually adjusted, preferably by means of suitable sliding plates and operating means therefor. The product is dried while traveling in a loop about the upper half of the drum's cylinder and is prevented from contacting the drum by a rotating perforated cylinder which latter at the same time causes more uniform distribution of the escaping air in different zones of the drum.

Before entering the aforementioned cellular chambers, air must pass through a pair of relatively large enclosures one of which is subdivided into compartments to allow for additional control in the quantity and pressure of air entering the compartments or sections of individual cellular chambers. This is achieved by the provision of passages and of means for varying the effective areas of said passages whereby to adjust the flow of air passing from one into the other of said enclosures.

More particularly, the novel apparatus consists of a stationary drum over which the still wet product passes without contacting same. The product advances in a path which consists of two tangential portions adjacent to the respective lateral sides of the drum and of an arcuate semicircular portion adjacent to and slightly spaced from the upper half of the drum's periphery. The aforementioned cellular chambers are provided within and adjacent to the upper half of the drum's cylindrical wall, i.e. they are closely adjacent to the arcuate portion of the path in which the product travels. Due to the provision of above mentioned partitions, controlled passages and enclosures, the pressure and quantity of air escaping from the upper half of the drum and impinging against the inner surface of a looped product traveling in an arcuate path adjacent to the drum may be adjusted in axial and radial directions of the drum to insure optimum and uniform guidance of the product, i.e. to hold same at a uniform distance from the upper half of the drum's peripheral zone.

Partitions in cellular chambers tightly seal the compartments which they define from one another and thus control not only the length of each compartment but also the overall axial length of that portion of the drum's peripheral zone through which the compressed air may escape, the effective length of each cellular pressure chamber normally corresponding to the width of advancing product. The position of partitions and of end walls in each cellular chamber is controllable by suitable actuating devices extending from the drum, such actuating devices being preferably operable by a single member, such as a hand wheel, a crank or the like, to uniformly displace said partitions and end walls in each cellular chamber.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of certain specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is half sectional and half elevational view of the improved apparatus as seen from the left hand end of FIG. 2;

FIG. 2 is a longitudinal central section through approximately one-half of the apparatus, the section being taken on line II—II of FIG. 1 as seen in the direction of arrows; and

FIG. 3 is a section similar to that of FIG. 2, illustrating a slight modification of the apparatus.

Referring first to FIGS. 1 and 2, the apparatus for guiding and conveying freshly coated paper strips and like products therein shown comprises a stationary housing or drum 9 having a cylindrical peripheral zone whose interior is divided into a lower enclosure 10, a central enclosure 11, and a number of radially arranged cellular pressure chambers 12. The peripheral zone or cylinder of drum 9 comprises a lower half 13 and an upper half consisting of parallel bars or ribs 25.

Enclosure 10 is bounded by the lower half 13 of the cylindrical peripheral zone of drum 9, by the lower half of a central tubular member 14 which latter is preferably coaxial with the drum, and by two substantially horizontal radially disposed partitions 17a, one of which is shown in FIG. 1.

Central enclosure 11 constitutes the interior of tubular member 14 and has its longitudinal ends bounded by end caps 16 (one shown in FIG. 2).

Cellular pressure chambers 12 are disposed in the upper half of drum 9 and are bounded by the upper half of tubular member 14, by the radially disposed separating walls 17, 17a which extend the full length of drum 9, and by the upper half 25 of the peripheral zone of member 9.

Partitions 19 divide the enclosure 11 in tubular member 14 into sections or compartments 20, 21, respectively, and each cellular pressure chamber 12, in turn, is subdivided by partitions 22 into two end sections 23 and a median section 24.

Partitions 19 and 22 tightly seal sections 20 and 23 from respective sections 21 and 24. Bars or ribs 25 define therebetween elongated slots 50 which permit escape of compressed air from compartment 23 and 24 of chambers 12.

Drum 9 is supported on two legs or bases 26a, base 26a being formed with an inlet or passage 27 for compressed air which flows therethrough from a suitable source, e.g. a compressor (not shown), and enters into the lower enclosure 10. The latter communicates with partitions 20, 21 of central enclosure 11 through respective apertures 28, 29. A sliding plate or pusher 30 controls the effective area of aperture 28 and hence the supply and pressure of aeriform medium passing from enclosure 10 into compartment or section 20. Pusher 30 is operated by a threaded spindle 31 whose threads mesh with the internal threads in a nut 32, the latter being rigidly connected to member 30. Spindle 31 is rotatable in and extends through left-hand partition 19 and end cap 16 of tubular member 14, and has a non-circular end portion 31c to facilitate its rotation by a wrench or other suitable tool when the operator desires to change the effective area of aperture 28.

As shown in FIG. 2, the area of aperture 29 between the lower enclosure 10 and section 21 of central enclosure 11 remains constant; thus, the amount and pressure of compressed air may be changed only in the compartment or section 20. This is due to the provision of an opening or cutout 30' in member 30 which is larger than the cutout 30', the latter serving to permit passage of air from enclosure 10 into section 20 to the extent determined by momentary position of pusher 30. The position of pusher 30 does not influence the passage of air through aperture 29 because the area of cutout 30' is so selected that said cutout at all times surrounds aperture 29 regardless of the pusher's position.

The modified structure shown in FIG. 3, on the other hand, permits adjustments in the effective areas of both apertures 28, 29. To that end, in addition to pusher 30a, corresponding broadly to pusher 30 shown in FIG. 2 as it controls the aperture 28, a second pusher 30b is installed to control the aperture 29 and hence the supply of compressed air into section 21. Pusher 30a carries a nut 32a which receives a threaded spindle 31a, and the other pusher 30b is operable in similar fashion by a spindle 31b and a nut 32b. To prevent rotation, nut 32b is extended in upward direction and is formed with a bore 32b' for the passage of a rod 19a which latter extends between a pair of adjacent partitions 19. Spindle 31a is hollow and coaxially receives the second spindle 31b, whereby the two spindles may be rotated independently of each other to selectively control effective areas of apertures 28, 29, respectively. The left-hand end portion of hollow spindle 31a extends through and beyond the end cap 16 and carries a hand wheel 31a' enabling the operator to adjust the position of member 30a. Spindle 31b has a non-circular end portion 31b' for application thereto of a wrench or the like when a change in the position of pusher 30b becomes necessary.

Compartments 20, 21 of enclosure 11 communicate with each cellular pressure chamber 12 through apertures or passages 33, 34, respectively. Pushers 35, one for each pressure chamber 12, are installed in tubular member 14, each being operable by a threaded spindle 36 which engages with a nut 37 fixed to each member 35. This arrangement permits independent adjustments in the supply of compressed air into the compartments of each cellular chamber 12. In the illustrated embodiment of my novel apparatus, pushers 35 operate in such manner that the apertures 33, 34 must be adjusted simultaneously

5

even though an arrangement similar to that of members 36a—32b shown in FIG. 3 may be utilized if it is desired to provide separate control means for apertures 33 and 34. Thus, one would merely need to install coaxially disposed spindles and separate pushers for apertures 33, 34 leading into each pressure chamber 12 which would enable the operator to individually control the supply and pressure of compressed air in compartments 23, 24 of the pressure chambers.

The length of sections or compartments 23, 24 forming part of each pressure chamber 12 may be adjusted by end walls 18 and partitions 22 which are slidable in axial directions of the drum 9. Such adjustments of partitions 22 are controlled by actuating means comprising threaded spindles 38 which are rotatable by a hand wheel 39 mounted on a shaft 40. The latter carries a gear 41 meshing with pinion 42 installed on one of spindles 38. Only one hand wheel 39 is provided; it drives one spindle 38 over members 41, 42, the other spindles being driven by a chain 44 traveling over idler rollers 43a and sprockets 43 which latter are rigidly fixed to members 38.

The positioning of end walls 18 in each chamber 12 is controlled by a hollow spindle 45 rotatable by a hand wheel 46 over gear train 47, 48, chain sprockets 49 and a chain 49a. As shown in FIG. 2, each hollow spindle 45 receives and is rotatable with respect to a spindle 38.

In operation, compressed air is introduced through passage or inlet 27 in base member 26 and enters the lower enclosure 10 whence it proceeds into compartments 20, 21 of central enclosure 11 in tubular member 14 and further into sections or compartments 23, 24 of each cellular pressure chamber 12. The air escapes in radial directions from each chamber 12 through the elongated passages or slots 50 formed between parallel ribs 25 and impinges against the paper sheet 51 which is led about the upper half of cylindrical periphery of drum 9 formed by said members 25. The advancing sheet 51 is prevented from contacting ribs 25 by radially escaping jets of compressed air. The direction in which the compressed air travels is indicated by arrows A.

Due to the provision of separate pressure chambers 12, the apparatus may so control the freshly coated and still wet paper sheet 51 that the pressure of escaping air will effectively counteract radially inwardly directed weight components of the product. As is known, such weight components vary in different zones of the upper half of cylindrical periphery of drum 9. Thus, central cellular chamber 12 closest to the apex of drum 9 will be supplied with air under highest pressure, the pressure in adjacent chambers 12 thereupon decreasing proportionally with the diminishing radial weight components of product 51, these weight components dropping to zero at points adjacent to the two diametrically opposed horizontal walls 17a.

The subdivision of each cellular chamber 12 into compartments 23, 24 and the provision of independently adjustable pushers or sliding plates 30 and 35 allows for control of and variations in the air pressure in a direction transverse to the direction in which the product 51 advances, i.e. in the longitudinal direction of drum 9. This arrangement allows for such control of the advancing sheet 51 that each of its zones adjacent to ribs or bars 25 is equidistant from the latter. Under normal operating conditions, it is advisable to lead air under a higher pressure into the compartments 23 adjacent to the edges of advancing sheet 51 as the air escaping transversely between ribs 25 and sheet 51 meets less resistance than the air escaping from central compartments 24 since the air passing from a compartment 24 must travel a longer distance between sheet 51 and bars 25 before it reaches the one or the other longitudinal edge of the advancing product. In other words, the frictional resistance met by air escaping from compartments 23 is considerably less than the friction of air emerging from central compartments 24; therefore, the pressure of air in compart-

6

ment 24 of each pressure chamber 12 should be less than the air pressure in the compartments 23.

FIG. 2 illustrates an alternate position 52 of partition 22 in dot-dash lines. As above stated, each pressure chamber comprises two compartments 23 and a compartment 24 therebetween, only the left-hand compartment 23 being shown in FIG. 2. Similarly enclosure 11 in tubular member 14 is divided into two compartments 20 and a central compartment 21.

Due to the provision of enclosures 10 and 11 through which the compressed air must pass before reaching cellular chambers 12, and due to the provision of aforementioned pushers, spindles, chains, gears and hand wheels, the supply of air into the compartments 23 and 24 of various chambers 12 may be uniformly controlled in a desired way as best suited for the operation of my apparatus. In addition, all partitions 22 may be displaced simultaneously which enables the advancing sheet 51 to pass gradually and quietly from the area of one pressure chamber 12 into the zone of influence of an adjacent pressure chamber.

As before mentioned, the end walls 18 of compartments 23, too, may be moved in axial directions of chambers 12 by means of hollow spindles 45. Thus, the end wall 18 shown in FIG. 2 may be moved into the dot-dash line position 53 to adjust the total length of compartments 23 and 24 of each pressure chamber 12 to the actual width of paper sheet 51. In other words, the position of end walls 18 is adjusted in such manner that the distance between the two members 18 in each chamber 12 corresponds substantially to the actual width of sheet 51.

If, for whatever reason, the supply of air should be interrupted, the adherence of sheet 51 to stationary ribs 25 and eventual damage to the product is prevented by the provision of a perforated cylindrical member or sleeve 54 which is coaxial with the drum 9 and rotates on antifriction rolling elements 55. For this purpose the perforated cylinder may be driven by a belt and pulley assembly, by a chain and sprocket system or the like. The member 54 may also be rotated by escaping compressed air. By inclining ribs 25 with respect to the longitudinal axis of drum 9 at an angle to the lines of perforations in sleeve or cylinder 54, the latter will revolve automatically whenever compressed air escapes through passages or slots 50 between ribs 25. In addition, to preventing direct contact of sheet 51 with ribs 25, cylindrical member 54 causes in both cases certain equalization of pressures acting against the inner surface of the advancing product which is particularly important in the zones adjacent to end faces of walls 17 where a graduation in pressure of compressed air escaping from adjacent cellular chambers 12 would normally occur. This further contributes to undisturbed advance of the product about the upper half of the cylindrical periphery of drum 9.

The lower half 13 of stationary drum 9 is surrounded by an arcuate semicylindrical protecting metallic sheet 56 closely adjacent to the outer face of revolving cylinder 54.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic and specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas comprising, in combination, a stationary hollow housing closed at ends thereof and having a wall portion over which the elongated flexible sheet material is to be advanced without contacting said wall portion, said wall portion being curved in direction of movement of said

7

flexible sheet material and being formed with a plurality of closely spaced openings therethrough; a plurality of adjacent pressure chamber means each extending from said wall portion inwardly into said housing substantially over the whole length thereof and adjacent pressure chamber means being angularly displaced in direction of the curvature of said wall portion from each other; gas inlet means communicating with each of said pressure chamber means for feeding compressed gas thereinto; and means for individually adjusting the amount and pressure of gas fed through each of said inlet means so that the amount and pressure of gas ejected from each of said pressure chamber means through said openings in said wall portion may be individually adjusted.

2. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas comprising, in combination, a stationary hollow housing closed at the ends thereof and having a cylindrical wall portion over which the elongated flexible sheet material is to be advanced without contacting said wall portion, said wall portion being curved in direction of movement of said flexible sheet material and being formed with a plurality of closely spaced openings therethrough; a plurality of adjacent pressure chamber means each extending from said wall portion inwardly into said housing substantially over the whole length thereof and adjacent pressure chamber means being angularly displaced in direction of the curvature of said wall portion from each other; gas inlet means communicating with each of said pressure chamber means for feeding compressed gas thereinto; and means in said gas inlet means for individually adjusting the cross section of each of said inlet means so that the amount and pressure of gas ejected from each of said pressure chamber means through said openings in said wall portion may be individually adjusted.

3. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas comprising, in combination, a stationary hollow cylindrical housing closed at ends thereof, said housing having a horizontal axis and having an upper semi-cylindrical wall portion over which the elongated flexible material is to be advanced without contacting said wall portion, said wall portion being formed with a plurality of closely spaced elongated slots extending therethrough substantially over the whole length of said cylindrical housing; a plurality of adjacent pressure chamber means each extending from said wall portion inwardly into said housing substantially over the whole length thereof and adjacent pressure chamber means being angularly displaced in direction of the curvature of said wall portion from each other; gas inlet means communicating with each of said pressure chamber means for feeding compressed gas thereinto; and means in said gas inlet means for individually adjusting the cross section of each of said inlet means so that the amount and pressure of gas ejected from each of said pressure chamber means through said openings in said wall portion may be individually adjusted.

4. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas comprising, in combination, a stationary hollow cylindrical housing closed at ends thereof, said housing having a horizontal axis and having an upper semi-cylindrical wall portion over which the elongated flexible material is to be advanced without contacting said wall portion, said wall portion being formed with a plurality of closely spaced elongated slots extending therethrough substantially over the whole length of said cylindrical housing; a plurality of adjacent pressure chamber means each extending from said wall portion inwardly into said housing substantially over the whole length thereof and adjacent pressure chamber means being angularly displaced in direction of the curvature of said wall portion from each other; gas inlet means communicating with each of said pressure chamber means for feeding compressed gas thereinto; means in said gas inlet means for individually adjusting the cross section

8

of each of said inlet means so that the amount and pressure of gas ejected from each of said pressure chamber means through said openings in said wall portion may be individually adjusted; a perforated hollow cylindrical member arranged coaxially with said housing closely spaced from the outer surface thereof and being mounted on said housing for rotation about the axis thereof; and means for rotating said cylindrical member about the axis thereof.

5. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas comprising, in combination, a stationary guide unit having an upper wall portion over which the elongated flexible sheet material is to be advanced without contacting said wall portion, said wall portion being convexly curved in direction of movement of said flexible sheet material and being formed with a plurality of closely spaced openings therethrough; a plurality of adjacent pressure chamber means each extending from said wall portion inwardly substantially over the whole length thereof and adjacent pressure chamber means being angularly displaced in direction of the curvature of said wall portion from each other; a plurality of adjustable partition means extending spaced from each other transversely through each of said pressure chamber means to divide each of said pressure chamber means in a plurality of compartments spaced along the length of the respective pressure chamber means; means operatively connected to said partition means for adjusting the positions thereof in longitudinal direction of said chamber means; gas inlet means communicating with each of said compartments for feeding compressed gas thereinto; and means for individually adjusting the amount and pressure of gas fed through said inlet means into each of said compartments so that the amount and pressure of gas ejected from each of said compartments through said openings in said wall portion may be individually adjusted.

6. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas comprising, in combination, a stationary guide means having an upper guide face over which the elongated flexible sheet material is to be advanced without contacting said guide face, said guide face having a width substantially equal to the width of said elongated flexible sheet material and being convexly curved in direction of movement of said flexible sheet material; a plurality of groups of close spaced gas outlet means for emitting gas in substantial radial direction through said guide face and each comprising a plurality of angularly displaced rows of outlet means respectively extending over the whole width of said guide face; a plurality of gas passage means communicating respectively with said groups of gas outlet means; gas inlet means communicating with each of said gas passage means for feeding compressed gas thereinto; and means for individually adjusting the amount and pressure of gas fed through said inlet means into each of said gas passage means so that the amount and pressure of gas ejected from each group of said gas outlet means may be individually adjusted.

7. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas, comprising, in combination, a stationary drum closed at opposite ends thereof and having a horizontal axis and an upper wall portion of substantially semi-cylindrical configuration and formed with a plurality of closely spaced openings therethrough; a tubular member closed at opposite ends thereof located in and coaxial with said drum and extending through the length of the latter; a plurality of walls extending longitudinally between said opposite ends of said drum and spaced from each other between said upper wall portion and said tubular member to define therebetween a plurality of pressure chambers, said tubular member being formed with a plurality of apertures respectively providing communication between said tubular member and each of said pressure chambers; means for adjusting the areas of

each of said apertures; and gas inlet means communicating with the interior of said tubular member, whereby when compressed gas is introduced through said gas inlet means and an elongated flexible sheet material is advanced about said upper wall portion, said sheet material can be maintained substantially uniformly spaced from said upper wall portion by adjusting the areas of said apertures and thereby the amount and pressure of gas escaping from each of said chambers through said openings.

8. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas comprising, in combination, a stationary drum closed at opposite ends thereof and having a horizontal axis and an upper wall portion of substantially semi-cylindrical configuration and formed by a plurality of elongated ribs extending closely spaced from each other substantially parallel to said axis between said closed ends of said drum and defining between themselves a plurality of elongated slots; a tubular member closed at opposite ends thereof located in and coaxial with said drum and extending through the length of the latter; a plurality of walls extending longitudinally between said opposite ends of said drum and spaced from each other between said upper wall portion and said tubular member to define therebetween a plurality of pressure chambers, said tubular member being formed with a plurality of apertures respectively providing communication between said tubular member and each of said pressure chambers; means for adjusting the areas of each of said apertures; and gas inlet means communicating with the interior of said tubular member, whereby when compressed gas is introduced through said gas inlet means and an elongated flexible sheet material is advanced about said upper wall portion, said sheet material can be maintained substantially uniformly spaced from said upper wall portion by adjusting the areas of said apertures and thereby the amount and pressure of gas escaping from each of said chambers through said slots.

9. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas comprising, in combination, a stationary drum closed at opposite ends thereof and having a horizontal axis and an upper wall portion of substantially semi-cylindrical configuration and formed with a plurality of closely spaced openings therethrough; a tubular member closed at opposite ends thereof located in and coaxial with said drum and extending through the length of the latter; a plurality of walls extending longitudinally between said opposite ends of said drum and spaced from each other between said upper wall portion and said tubular member to define therebetween a plurality of pressure chambers, a plurality of adjustable partitions in each of said chambers and extending respectively transversely therethrough and being movable in direction of said axis, said partitions subdividing each of said chambers into a plurality of compartments; means for moving each of said partitions in direction of said axis, said tubular member being formed with a plurality of apertures respectively providing communication between said tubular member and each of said compartments; means for adjusting the areas of each of said apertures; and gas inlet means communicating with the interior of said tubular member, whereby when compressed gas is introduced through said gas inlet means and an elongated flexible sheet material is advanced about said upper wall portion, said sheet material can be maintained substantially uniformly spaced from said upper wall portion by adjusting the areas of said apertures and thereby the amount and pressure of gas escaping from each of said compartments through said openings.

10. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas comprising, in combination, an elongated stationary drum

closed at opposite ends thereof and having a horizontal axis and a cylindrical peripheral wall, the upper half of said peripheral wall being formed with a plurality of closely spaced openings therethrough; a tubular member closed at opposite ends thereof located in and coaxial with said drum and extending through the length of the latter; a plurality of walls extending longitudinally between said opposite ends of said drum and spaced from each other between said upper wall portion and said tubular member to define therebetween a plurality of pressure chambers, said tubular member being formed with a plurality of apertures respectively providing communication between said tubular member and each of said pressure chambers; means for adjusting the areas of each of said apertures; gas inlet means communicating with the interior of said tubular member; a perforated cylindrical member coaxial with said drum and disposed about said peripheral wall thereof and supported by said drum rotatable about said axis; and means for rotating said cylindrical member about said axis, whereby when compressed gas is introduced through said gas inlet means and an elongated flexible sheet material is advanced about said upper wall portion, said sheet material can be maintained substantially uniformly spaced from said upper wall portion by adjusting the areas of said apertures and thereby the amount and pressure of gas escaping from each of said chambers through said openings while said perforated cylindrical member will prevent accidental contact between said flexible sheet material and said stationary drum.

11. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas comprising, in combination an elongated stationary drum closed at opposite ends thereof and having a horizontal axis and a cylindrical peripheral wall, the upper half of said peripheral wall being formed by a plurality of elongated ribs extending closely spaced from each other substantially parallel to said axis between said closed ends of said drum and defining between themselves a plurality of elongated slots, each of said elongated ribs being inclined to a plane connecting the outer edge of the respective rib with said axis and all of said ribs being inclined in the same direction and substantially at the same angle to the respective plane; a tubular member closed at opposite ends thereof located in and coaxial with said drum and extending through the length of the latter; a plurality of walls extending longitudinally between said opposite ends of said drum and spaced from each other between said upper wall portion and said tubular member to define therebetween a plurality of pressure chambers, said tubular member being formed with a plurality of apertures respectively providing communication between said tubular member and each of said pressure chambers; means for adjusting the areas of each of said apertures; gas inlet means communicating with the interior of said tubular member; and a perforated cylindrical member coaxial with said drum and disposed about said peripheral wall thereof and supported by said drum rotatable about said axis, whereby when compressed gas is introduced through said gas inlet means and an elongated flexible sheet material is advanced about said upper wall portion, said sheet material can be maintained substantially uniformly spaced from said upper wall portion by adjusting the areas of said apertures and thereby the amount and pressure of gas escaping from each of said chambers through said slots, while said perforated cylindrical member, rotated by the compressed gas escaping between said inclined ribs, will prevent accidental contact between said flexible sheet material and said stationary drum.

12. An apparatus for contactless guiding of an elongated flexible sheet material by means of compressed gas comprising, in combination, a stationary guide means having an upper guide face over which the elongated flexible sheet material is to be advanced in a predetermined direction without contacting said guide face, said upper

11

guide face being curved in said predetermined direction; a plurality of groups of closely spaced gas outlet means for emitting gas outwardly through said guide face and located consecutively in said predetermined direction angularly displaced from each other; and means for adjusting the emission of gas through each of said angularly displaced groups of closely spaced gas outlet means separately, whereby the total pressure of gas emitted through each of said groups of outlet means might be individually adjusted as required.

5

10

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