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(54) **Method of guiding a web through a dryer and apparatus for carrying out the method**

Verfahren zur Führung einer Gewebebahn in einem Trockner und Apparat zur Durchführung des Verfahrens

Procédé pour diriger un tissu à travers un sécheur et dispositif pour mise en oeuvre du procédé

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- **PATENT ABSTRACTS OF JAPAN vol. 10, no. 153 (M-484)(2209) 3 June 1986 & JP-A-61 007 161 (CHIYUUGAI RO KOGYO K.K.) 13 January 1986**
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EP 0 441 484 B1

Description

BACKGROUND OF THE INVENTION

This invention relates to a method of guiding a web in a substantially straight sinusoidal path as it passes through a web dryer apparatus and to an apparatus for carrying out such a method.

In drying a moving web of paper, film, or the like, it is desirable that the web be contactlessly supported during the drying operation, to avoid damage to the web itself or to an ink or coating on the web. One common arrangement for contactlessly supporting a web comprises upper and lower sets of air bars extending along a substantially horizontal stretch of the web. Air issuing from the lower set of air bars floatingly supports the web, and air issuing from the upper set of air bars steadies the web to maintain it substantially straight and at a substantially constant distance from the air bars of both sets. The air blown from both sets of air bars is usually heated to expedite web drying, and typically the air bar array is inside an enclosure which is maintained at a slightly subatmospheric pressure by an exhaust blower that draws off the volatiles emanating from the web.

Web dryers are used in many printing and graphics applications, such as the processing of photographic film, web offset printing, and other types of printing. In some applications, such as the processing of photographic film, web dryers having very long length, often as long as 45.7 m (150 feet), are commonly used. The greater the ratio of the length of the dryer to the width of the web (hereinafter referred to as the "length to width ratio"), the more susceptible the web is to minor forces that can cause the web to weave (move back and forth in a lateral direction) or shift (move laterally from the centerline and remain there). Also, some webs, such as thin plastic films, naturally take on a "banana-shaped" curve when they are laid flat, as in a dryer, thereby exacerbating the problems of web weave and shift. Web shifting and weaving may also result when the web tension is low, and when a lighter weight web, such as polyester film, is used.

When the travelling web exits the drying apparatus it is generally wrapped around one or more rotating take-up members, such as chill rolls. When web weave or shift takes place as the web travels through the dryer, the web will correspondingly shift or weave as it contacts the rotating take-up member. Unless the web can be brought back to a straight orientation with respect to the centerline, the web will not wrap properly and the press must be shut down. This results in costly downtime and waste.

Other problems may result from web weave or shift, e.g. if the web moves to one side or the other and stays in the new position it may not be centered on the press, resulting in an unacceptable product; if the web weave or shift is severe enough the web may break or tear, etc. These problems also force a shut-down of the press and thus a loss of valuable production time.

In the past, attempts have been made to circumvent web weave and shift by guiding the web using contact systems such as a series of rollers. These systems are undesirable as they may cause damage to the ink or coating on the web, and are therefore inefficient in situations where there is a high length to width ratio.

Thus it is desired to provide a means by which a web may be floatingly supported and urged in a substantially straight path at points in the dryer where it has a tendency to weave or shift as it travels through a web drying apparatus.

SUMMARY OF THE INVENTION

The problems of the prior art have been solved by the present invention, which relates to a method for handling and guiding a running web. More particularly, the present invention is as defined in claim 1. A further aspect of the present invention relates to the apparatus defined in claim 6. Yet a further aspect of the invention provides the apparatus defined in claim 7.

GB-A-905819 discloses means for swinging blast nozzle boxes collectively about their longitudinal axes so as to adjust the impingement direction of the discharged air when drying sensitive fabrics. In use the air bars are fixed in position so they will not result in steering of the web but simply altering the angle of incidence between the discharged air and the passing fabric.

DE-A-1460544 discloses introducing hot air in a direction approximately parallel to the surface of sensitive cloth materials in order to dry them without creating a damaging interface of hot air. The nozzle units are able to be rotated about their longitudinal axes so that they swivel with to the plane of the cloth layer. In use their position is fixed so there is no steering.

In a preferred embodiment of the present invention, each said surface rotates about an axis which is substantially parallel to the longitudinal centerline of the running web. In addition each said surface may rotate about an axis which is substantially perpendicular to the longitudinal centerline of the running web. One or more such assemblies of adjustable air bars can be used in a web dryer. The dryer can also include one or more fixed air bars.

In a still more preferred embodiment of the invention, the apparatus further comprises in combination with the steerable air bar assembly, back pressure means for creating an opposing force to urge the web back to a substantially centred position. Said back pressure means preferably comprises one or more edge dams preferably disposed at or near the ends of one or more fixed air bars in the web dryer.

In one embodiment of the apparatus of the invention each header is sealingly joined at one end to a flexible air duct.

In a further embodiment of the invention the orientation of the headers is altered by adjustment means

comprising a jack disposed at one end of the air bar assembly, and a pivoting support means disposed between the two ends.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a vertical cross-sectional schematic view taken along the length of a web drying apparatus containing an apparatus for handling and guiding the web according to one embodiment of the invention.

Fig. 2 is a fragmentary, enlarged perspective view of an air bar including an edge dam.

Fig. 3 is a schematic diagram showing the mechanism by which the edge dam alleviates web drift.

Fig. 4 is a perspective view of the steerable air bar assembly according to one embodiment of the invention.

Fig. 5 is a front view of the apparatus of a steerable air bar assembly illustrating the steering of the air bars.

Fig. 6 is a side view of an alternate air supply means.

DETAILED DESCRIPTION OF THE INVENTION

A web drying apparatus for floatingly suspending a running web is shown in Fig. 1. Fig. 1 is illustrative of one type of web drying apparatus in which the guiding apparatus of the invention may be used. This apparatus includes an elongated dryer housing 2 which is enclosed by top 3, bottom 4, one side 5 and an opposite side 6. An inlet end 7 has a horizontal slot 8 through which web W enters. The opposite exit end is formed by the end wall 10 and a corresponding slot 11 therein through which web W exits. The dryer includes upper fixed air bars 15 and lower fixed air bars 16; a header frame 26 supporting and in air-delivering communication with the fixed air bars; and upper and lower air supply ducts 20 and 22, and central air supply ducts 28 which supply air to the headers. The upper and lower air bars are transversely positioned across the web, and are in staggered, spaced relationship along the web with respect to each other, such that they cause the web W to assume a conventional sine wave form, as shown in Fig. 1, when the dryer is in operation.

In order to illustrate the invention, the web drying apparatus shown in Fig. 1 has two adjustable air bars 18 which each have two ends and which have back pressure means (as shown in Fig. 2 and discussed hereinbelow) disposed at at least one of each of their ends. The back pressure means serve to move the shifted web to its centered position, and are preferably present at least on those fixed air bars which are situated in areas of the dryer where the running web is prone to shifting. It is preferred that back pressure means be present on air bars which are situated approximately halfway along the length of the dryer, e.g. at 4.57m (15 feet) from the entrance to a 9.4m (30 foot)long dryer. It should be understood that as many of the air bars 15 and 16 as desired may also have back pressure means at their ends.

The steerable air bar assembly of the invention (shown in Figs. 4 and 5) is shown schematically by air bars 24 of Fig. 1. These steerable air bars are not engaged to the header and upper and lower air ducts in the same manner as the fixed air bars, but are separately connected to extensions from headers 26 which are joined to the headers by a sealing flange and sealing gasket, as shown in Fig. 6 and as described in detail hereinbelow, such that a flexible seal is created between the standard header and the adjustable air bar assembly. Like the back pressure means, the steerable air bar assemblies may be present in the web drying apparatus in any number, and may be substituted for any number of the fixed air bars. In fact, all, or a grouping of upper and lower fixed air bars could be replaced by a single steerable air bar assembly comprising a similar number of steerable air bars. When it is desired to use only a few steerable air bar assemblies it is again desirable to situate them at locations in the dryer where web shift is anticipated, such as the lengthwise midpoint of the dryer.

A fragmentary, enlarged view of an air bar comprising back pressure means according to one embodiment of the invention is shown in Fig. 2. An edge dam 34 is shown mounted at end 30 of air bar 18. In the embodiment shown in Fig. 2, the edge dam is bolted to the end of the air bar, however any conventional method could be used to mount the edge dam, or it could be integral with the air bar. The edge dam 34 could also be located at points along the surface of air bar 18, depending in part on the width of the web. The edge dam is preferably, as shown in Fig. 2, a T-shaped member, formed by elongated dam member 35, which, in the embodiment shown, extends above and approximately perpendicular to surface 33 of air bar 18, and is supported in this position by support member 31. Support member 31 may be attached to the air bar by any suitable means, such as bolts 64 and air bar mounting bracket 66, as shown in Fig. 2. It is preferred that the dam member 35 have a fin 17 disposed at each of its ends, such that the web does not have a tendency to snag on the entering and leaving edges of the edge dam. In one embodiment the lower edge of dam member 35 is adjustably raised above surface 33 by support member 31, such that the distance between the lower edge and the surface may be from about 5 cm to 60 cm. Vertical adjustment of dam member 35 provides a means for controlling the back pressure force, by allowing a portion of the escaping air to be relieved below the edge dam. This embodiment is typically used in applications where nozzle velocities are high, e.g. from 3050 to 4574 m/min (10,000 to 16,000 fpm), causing very high back pressure. In another embodiment of the invention, for use with lower nozzle velocities, dam member 35 could be fixed, with its lower edge close to or in contact with the surface of the air bar. It is generally preferred in this embodiment that the lower edge of the dam member be in intimate, sealing con-

tact with the surface of the air bar. Dam member 35, with fins 17, is also preferably of a length such that each end of the elongated member is approximately aligned with the corresponding air bar slot 32.

Although this configuration is preferred for the edge dam, any means may be used by which creates a back pressure against the web edge when the air bar is in use. This phenomenon is illustrated schematically in Fig. 3. In frame 1, one edge of web W approaches the edge dam 34 during web weave as the web passes over the air bar 30. In frame 2, the edge dam 34 creates a back pressure against web W, urging it back towards its initial path in frame 3. It is preferred that the back pressure means also be able to provide mechanical resistance against the web, should the air back pressure prove insufficient to return the web to its path. Thus if the web continued to travel toward the edge dam 34 in frame 2, it would eventually physically contact the edge dam and be forced back to its initial path.

Back pressure means may be disposed at either one or both ends of the air bar. It is generally preferred that back pressure means be disposed at both ends of the air bar, as it is usually difficult to predict in which direction the web will shift as it travels through the dryer. However, if the direction of web shift is known, then back pressure means may be placed only on the end of the air bar toward which the web will shift.

A perspective view of a steerable air bar assembly 24, according to one embodiment of the invention, is shown in Fig. 4. In this embodiment, the assembly includes three adjustable air bars 38 supported by, and in air-receiving communication with, upper and lower headers 44 and 42. (The combinations of the two lower air bars and the lower header, and the single upper air bar and upper header 44 will hereinafter be referred to as the lower and upper air bar/header assemblies, respectively). The upper and lower air bar/header assemblies are maintained in opposing spaced relation by spacer means comprising header carriage 36 and support member 50, and upper and lower headers 44 and 42 are each sealingly joined at one of their respective ends to upper and lower flexible air ducts 46 and 48. Header carriage 36 is connected at its lower edge to screw jack 40, and the lower air bar/header assembly engages on each side a pivot bearing 52, supported by a support member 54, by means of a connecting rod 53. Thus, when screw jack 40 is adjusted up or down, the ends of both air bar/header assemblies adjacent screw jack 40 will correspondingly move up or down, as shown schematically in Fig. 5. The angular adjustment of the air bar/header assemblies is thus facilitated by a pivoting support means, comprising pivot bearings 52 and connecting rods 53, and an angular adjustment means, comprising screw jack 40, which allow the air bar/header assemblies to be rotated about an axis A which is substantially parallel to the longitudinal centerline of the running web, while being prevented from translational or rotational movement in any other plane. The presence of header carriage 36 and support member 50, allows this movement to take place without the spatial relationship among the air bars being altered. This simultaneous adjustment of the orientation of both the upper and lower air bars is further facilitated by flexible air ducts 46 and 48, which allow a sealing relationship to be maintained between upper and lower headers 44 and 42 and the air supply, regardless of the position of the headers. One type of flexible air duct which may be used in the invention is described in U.S. Patent No. 4,480,859, the disclosure of which is incorporated herein by reference.

A preferred type of steerable air bar assembly of the invention is shown in Figs. 4 and 5. In a preferred embodiment, one or both of the elongated surfaces is adjusted such that one or both of said surfaces rotate about an axis which is substantially parallel to the longitudinal centerline of the running web. Alternatively or additionally, the elongated surfaces may be rotated about an axis which is substantially perpendicular to the longitudinal centerline of the running web. In alternative embodiments of the invention, the adjustment means may comprise other angular adjustment means and pivoting support means, such as cables, air cylinders attached to rods, and other conventional means for providing adjustable movement. Additionally, in some applications it may be desirable to adjust the orientation of the upper and lower air bar/header assemblies individually. In these applications, the steerable air bar assembly would not include spacing means, e.g. the header carriage and support member described above. The spacing means would thus be eliminated, and separate adjustment means would be provided for each of the upper and lower air bar/header assemblies. The air bar/header assemblies may even in some instances be provided with adjustment means at each of their ends, as well as on both the upper and lower assemblies, such that each pair of air bar/header assemblies would have a total of four adjustment points.

Adjustment of the orientation of the air bar surfaces, via the adjustment means, may be accomplished manually by the dryer operator, by computer logic control, or by other means.

In a further embodiment of the invention, the steerable air bar assembly may further comprise back pressure means, as described hereinabove. The use of back pressure means on the steerable air bar(s) in the dryer may be in addition to or instead of such use on the fixed air bars as previously discussed.

The air supply means may alternatively comprise a plurality of headers, such as that shown in Fig. 6, each header comprising a standard header air supply duct 26 (e.g. a conventional header supply duct which is used to supply other air bars in the dryer) with sealing gasket 56 at one end, an extension 60 to the air supply duct, and a sealing flange 62 disposed between the extension and the sealing gasket, such that air delivery may be maintained during angular adjustments of the air bar/header assembly. As shown in Fig. 6, adjustable air

bars 18 are in air-receiving communication with extension 60, while fixed air bars 16 are in air-receiving communication with the standard header air duct 26. Additionally, other spacing means may be used in lieu of header carriage 36, provided that a fixed spatial relationship may be maintained between the upper and lower air bars. This type of air supply means is often preferred and would generally be necessary in a dryer such as the one shown in Fig. 1, as previously described.

Any type of air bar may be used in the present invention. Preferred types of air bars are described in U. S. Patent Nos. 3,549,070, 3,873,013, and 3,964,656. Furthermore, any desired number of air bars may be used in an air bar/header assembly, e.g. 50 or more.

The steerable air bar assembly of the invention may be assembled using conventional methods, such as described in U.S. Patent No. 3,776,440.

In practice, the position of the edge of the running web is monitored at one or more locations within the dryer, using conventional sensing means, such as fiber optics. Based on these measurements of the position of the web edge, the stearable air bars are adjusted periodically or continuously such that they provide a force which adjusts the web into a substantially straight path. Alternatively, instead of sensing the position of the web as it travels through the dryer, computer-generated data may be used to predetermine the desired web path and the anticipated web position, and to compare these two positions. The steerable air bars may then be adjusted based upon that comparison to adjust the position of the web to the desired web path. As mentioned hereinabove, back pressure means are placed on either fixed or steerable air bars at locations at which the web is expected to weave or drift. This also may be determined either experimentally, e.g. by conducting a dry run before running a given web through the dryer, or by the use of computer-generated data.

Thus, in its method aspects the present invention relates to a method of guiding a web in a substantially straight path, e.g. as it passes through a web dryer apparatus. This method comprises driving a web through the dryer, floatingly supporting said web, sensing the position of the web edge, and providing a force responsive to said sensing to adjust the position of the web. In an alternative embodiment of the invention, the method comprises predicting the position of the web, rather than sensing said position, either based on computer-generated data or experimentally obtained data. The adjusting force may be provided by one or more steerable air bars, by back pressure means, or a combination thereof.

Claims

1. A method of guiding a web in a substantially straight sinusoidal path as it passes through a web dryer apparatus, comprising the steps of:

   a) driving said web through the dryer while floatingly supporting said web;
   b) sensing the position of the web edge; and
   c) providing a force responsive to said sensing to adjust the position of the web;

   wherein the force is provided by one or more steerable air bar assemblies (18), and wherein the position of the web is adjusted by adjusting the position of a header (42, 44) to which the air bars are attached while the running web is being supported thereby.

2. A method according to claim 1 wherein force is additionally provided by back pressure means, preferably an edge dam.

3. A method according to any one of claims 1 or 2, comprising the steps of:-

   a) predetermining the desired web path;
   b) predetermining the anticipated position of the web edge;
   c) comparing the results of said predeterminations of steps (a) and (b); and
   d) providing said force based upon said comparison to adjust the position of the web to said desired web path.

4. A method according to any one of claims 1 to 3 comprising floatingly supporting said web by providing cushions of air at various points in a dryer enclosure through a plurality of air bars.

5. Apparatus for carrying out the method of claim 1, and comprising:-

   (a) an upper (44) and a lower (42) header respectively positioned above and below said web path;
   (b) one or more adjustable air bars (18) (24) each in air-receiving communication with a respective one of said headers and having an elongate surface from which air may be discharged, said surface being in opposing relation to the web, and adjustable such that it rotates about an axis substantially parallel to the longitudinal centerline of the web path;
   (c) air supplying means (26), in communication with said upper and lower headers for supplying air to said air bars for discharge therefrom;
   (d) means for monitoring the actual position of the edge of the running web passing along said path; and
   (e) adjustment means (40) responsive to said monitoring means for altering the orientation of elongated air-discharging surfaces of the adjustable air bars with respect to the web path;

wherein the adjustment means are effective to alter the orientation of one or both of said upper and lower headers with respect to the web path while said air supplying means supply air to said air bars.

6. Apparatus for carrying out the method of claim 1, and comprising:-

(a) an upper (44) and a lower (42) header respectively positioned above and below said web path;
(b) one or more adjustable air bars (18) (24) each in air-receiving communication with a respective one of said headers and having an elongate surface from which air may be discharged, said surface being in opposing relation to the web, and adjustable such that it rotates about an axis substantially parallel to the longitudinal centerline of the web path;
(c) air supplying means (26), in communication with said upper and lower headers for supplying air to said air bars for discharge therefrom;
(d) means for comparing computer-generated data representative of the desired web path with computer-generated data representative of the anticipated web position of the running web; and
(e) adjustment means (40) responsive to said comparing means for altering the orientation of elongated air-discharging surfaces of the adjustable air bars with respect to the web path;

wherein the adjustment means are effective to alter the orientation of one or both of said upper and lower headers with respect to the web path while said air supplying means supply air to said air bars.

7. An apparatus according to claim 5 or 6, wherein the orientation of said elongate surfaces is adjustable such that each said surface also rotates about an axis which is substantially perpendicular to the longitudinal centerline of the web path.

8. An apparatus according to any one of claims 5 to 7, wherein the air supply means comprises a flexible duct (46, 48) sealingly joined to each of said headers.

9. An apparatus according to any one of claims 5 to 7, wherein each said header comprises a standard header air supply duct (26) having a sealing gasket (56) at one end, an extension (60) to the air supply duct, and a sealing flange (62) disposed between and in intimate contact with the extension and the sealing gasket.

10. An apparatus according to any one of claims 5 to 9, wherein the adjustment means comprises a jack, preferably a screw jack, and a pivoting support means (53) associated with the assembly.

11. An apparatus according to any one of claims 5 to 10, comprising at least three said adjustable air bars (18).

12. An apparatus according to any one of claims 5 to 11, wherein at least two said adjustable air bars (18) are situated in opposing spaced relation, such that the web path passes between the two air bars.

13. An apparatus according to claim 11 or 12, further comprising at least one spacing means (36;50) such that a fixed spatial relationship is maintained between said adjustable air bars (18).

14. An apparatus according to claim 13, wherein said spacing means comprises at least one header carriage (36).

15. Apparatus according to any one of claims 5 to 14, further comprising: a plurality of fixed air bars (15, 16), each having an elongate surface from which air may be discharged; back pressure means (34) disposed above each of said elongated surfaces; said fixed air bars (15, 16) being positioned in spaced relation to said adjustable air bars (18) along the length of the running web such that the running web is guided between said fixed and said adjustable air bars in a substantially straight path.

16. Apparatus according to claim 15, wherein said elongated surfaces of the fixed air bars (15, 16) are oriented substantially perpendicular to the longitudinal centerline of the web.

17. Apparatus according to any one of claims 5 to 16, further comprising back pressure means associated with each of the adjustable air bar elongate surfaces.

18. Apparatus according to any one of claims 15 to 17, wherein said back pressure means comprises at least one edge dam (34), preferably formed as a T-shaped member (31, 35) comprising an elongate dam member (35) and a support member (31).

19. Apparatus according to claim 18, wherein said elongate dam member (35) extends above and approximately perpendicular to the fixed air bar elongate surface and is supported in this position by said support member (31), which is attached to the air bar by attachment means (64).

20. Apparatus according to claim 18 or 19, wherein at

least one of said fixed air bars (15, 16) has more than one edge dam (34).

Patentansprüche

1. Verfahren zum Führen einer Bahn auf einem im wesentlichen geradlinigem, sinusförmigem Pfad, bei dem Durchtritt durch eine Bahntrocknungsvorrichtung, mit den Schritten:

   a) Antreiben der Bahn durch den Trockner bei einer schwebenden Unterstützung der Bahn;
   b) Messen der Position der Bahnkante; und
   c) Vorsehen einer Kraft in Abhängigkeit von der Messung zur Einstellung der Position der Bahn;

   wobei die Kraft durch eine oder mehrere Luftbalkenanordnungen (18) aufgebracht wird, und wobei die Position der Bahn durch Einstellen der Position eines Kopfstücks (42, 44) nachgestellt wird, an der die Luftbalken angebracht sind, und zwar während die laufende Bahn davon getragen wird.

2. Verfahren nach Anspruch 1, wobei die Kraft zusätzlich durch eine Rückstaueinrichtung vorgesehen wird, vorzugsweise durch einen Kantendamm.

3. Verfahren nach einem der Ansprüche 1 oder 2, mit den Schritten:

   a) Vorbestimmen des gewünschten Bahnpfades;
   b) Vorbestimmen der zu erwartenden Position der Bahnkante;
   c) Vergleichen der Resultate der Vorbestimmungen aus den Schritten a) und b); und
   d) Vorsehen der Kraft basierend auf dem Vergleich zum Einstellen der Position der Bahn auf den gewünschten Bahnpfad.

4. Verfahren nach einem der Ansprüche 1 bis 3, mit dem schwebenden Halten der Bahn durch Vorsehen von Luftkissen an verschiedenen Stellen in einem Trocknergehäuse durch eine Anzahl von Luftbalken.

5. Vorrichtung zum Durchführen des Verfahrens nach Anspruch 1, mit:

   a) einem oberen (44) und einem unteren (42) Kopfstück, das jeweils über und unter dem Bahnpfad angeordnet ist;
   b) einem oder mehreren einstellbaren Luftbalken (18, 24), von denen jeder mit Luftanschluß an eines der jeweiligen Kopfstücke angeschlossen ist und eine längliche Oberfläche hat, von der Luft ausgestoßen werden kann, wobei die Oberfläche der Bahn gegenüberliegt, und die so einstellbar ist, daß sie um eine Achse im wesentlichen parallel zur Längsmittellininie des Bahnpfades rotiert;
   c) Luftzuführmitteln (26), die in Strömungsverbindung mit dem oberen und unteren Kopfstück stehen, um Luft zu den Luftbalken für den Ausstoß daraus zu führen;
   d) Mitteln zum Aufzeichnen der tatsächlichen Position der Kante der laufenden Bahn, die auf dem Pfad läuft; und
   e) Einstellmitteln (40), die auf die Aufzeichnungsmittel ansprechen und zur Veränderung der Ausrichtung der länglichen Luftausstoßflächen der einstellbaren Luftbalken in bezug auf den Bahnpfad dienen;

   wobei die Einstellmittel wirksam sind, um die Ausrichtung des einen oder beider oberen und unteren Kopfstücke in bezug auf den Bahnpfad zu verändern, während die Luftzufuhrmittel Luft zu den Luftbalken zu führen.

6. Vorrichtung zur Durchführung des Verfahrens nach Anspruch 1, und mit:

   a) einem oberen (44) und einem unteren (42) Kopfstück, das jeweils über und unter dem Bahnpfad angeordnet ist;
   b) einem oder mehreren einstellbaren Luftbalken (18, 24), von denen jeder mit Luftanschluß an eines der jeweiligen Kopfstücke angeschlossen ist und eine längliche Oberfläche hat, von der Luft ausgestoßen werden kann, wobei die Oberfläche der Bahn gegenüberliegt, und die so einstellbar ist, daß sie um eine Achse im wesentlichen parallel zur Längsmittellininie des Bahnpfades rotiert;
   c) Luftzuführmitteln (26), die in Strömungsverbindung mit dem oberen und unteren Kopfstück stehen, um Luft zu den Luftbalken für den Ausstoß daraus zu führen;
   d) Mitteln zum Vergleichen von computererzeugten Daten, die den gewünschten Bahnpfad darstellen, mit computererzeugten Daten, die die erwartete Bahnposition der laufenden Bahn angeben; und
   e) Einstellmitteln (40), die auf die Vergleichsmittel ansprechen und zur Veränderung der Ausrichtung der länglichen Luftausstoßflächen der einstellbaren Luftbalken in bezug auf den Bahnpfad dienen;

   wobei die Einstellmittel wirksam sind, um die Ausrichtung des einen oder beider oberen und unteren Kopfstücke in bezug auf den Bahnpfad zu verändern, während die Luftzufuhrmittel Luft zu den

Luftbalken zu führen.

7. Vorrichtung nach Anspruch 5 oder 6, wobei die Ausrichtung der länglichen Flächen derart einstellbar ist, daß sich jede der Flächen auch um eine Achse dreht, die im wesentlichen senkrecht zur Längsmittellinie des Bahnpfades ist.

8. Vorrichtung nach einem der Ansprüche 5 bis 7, wobei das Luftzufuhrmittel eine flexible Leitung (46, 48) aufweist, die abgedichtet an jedes der Kopfstücke angeschlossen ist.

9. Vorrichtung nach einem der Ansprüche 5 bis 7, wobei jedes Kopfstück eine Standardkopfstück-Zufuhrleitung (26) mit einer Abdichtungsdichtung (56) an einem Ende, einen Fortsatz (60) zu der Luftzufuhrleitung und einen Dichtungsflansch (62) aufweist, der zwischen dem Fortsatz und der abdichtenden Dichtung liegt und in engem Kontakt damit steht.

10. Vorrichtung nach einem der Ansprüche 5 bis 9, wobei das Einstellmittel eine Winde aufweist, vorzugsweise eine Schraubwinde, und wobei ein schwenkbares Haltemittel (53) der Anordnung zugeordnet ist.

11. Vorrichtung nach einem der Ansprüche 5 bis 10, mit mindestens drei einstellbaren Luftbalken (18).

12. Vorrichtung nach einem der Ansprüche 5 bis 11, wobei mindestens zwei der einstellbaren Luftbalken (18) im Abstand zueinander gegenüberliegend angeordnet sind, so daß der Bahnpfad zwischen den zwei Luftbalken durchläuft.

13. Vorrichtung nach Anspruch 11 oder 12, ferner mit mindestens einem Abstandsmittel (36; 50), das dazu dient, einen festen räumlichen Abstand zwischen den einstellbaren Luftbalken (18) aufrechtzuerhalten.

14. Vorrichtung nach Anspruch 13, wobei das Abstandsmittel mindestens einen Kopfstückwagen aufweist.

15. Vorrichtung nach einem der Ansprüche 5 bis 14, ferner mit: einer Anzahl von fixierten Luftbalken (15, 16), die jeweils eine längliche Fläche haben, aus der Luft ausgestoßen werden kann; Rückstaumittel (34), die über jeder der länglichen Flächen angeordnet ist; wobei die fixierten Luftbalken (15, 16) in einem Abstand zu den einstellbaren Luftbalken (18) entlang der Länge der laufenden Bahn derart angeordnet sind, daß die laufende Bahn zwischen den feststehenden und den einstellbaren Luftbalken in einem im wesentlichen geraden Pfad hindurchgeführt wird.

16. Vorrichtung nach Anspruch 15, wobei die länglichen Flächen der fixierten Luftbalken (15, 16) im wesentlichen senkrecht zu der Längsmittellinie der Bahn angeordnet sind.

17. Vorrichtung nach einem der Ansprüche 5 bis 16, ferner mit Rückstaumitteln, die jeder länglichen Fläche der einstellbaren Luftbalken zugeordnet sind.

18. Vorrichtung nach einem der Ansprüche 15 bis 17, wobei das Rückstaumittel mindestens einen Kantendamm (34) aufweist, der vorzugsweise von einem T-förmigen Teil (31, 35) gebildet ist, der ein längliches Dammelement (35) und ein Halteelement (31) aufweist.

19. Vorrichtung nach Anspruch 18, wobei das längliche Dammelement (35) sich über und etwa senkrecht zu der länglichen Fläche des fixierten Luftbalkens erstreckt und in dieser Position von dem Halteelement (31) gehalten wird, das an dem Luftbalken durch Befestigungsmittel (64) angebracht ist.

20. Vorrichtung nach Anspruch 18 oder 19, wobei mindestens einer der feststehenden Luftbalken (15, 16) mehr als einen Kantendamm (34) aufweist.

Revendications

1. Procédé pour diriger une bande suivant un trajet sinusoïdal sensiblement rectiligne pendant qu'elle passe à travers un appareil de séchage de bande, comprenant les étapes consistant à :

   a) entraîner ladite bande à travers le séchoir tout en supportant ladite bande de manière flottante ;
   b) détecter la position du bord de la bande ; et
   c) fournir une force réagissant à ladite détection pour ajuster la position de la bande ;

   dans lequel la force est fournie par un ou plusieurs ensembles à barres d'air dirigeables (18), et où la position de la bande est ajustée en ajustant la position d'un collecteur (42, 44) auquel les barres d'air sont fixés pendant que la bande en mouvement est supportée par celles-ci.

2. Procédé selon la revendication 1, où la force est fournie additionnellement par un moyen de contre-pression, de préférence une barrière de bord.

3. Procédé selon l'une des revendications 1 ou 2, comportant les étapes consistant à :

a) prédéterminer le trajet de bande voulu ;
b) prédéterminer la position anticipée du bord de bande ;
c) comparer les résultats desdites prédéterminations des étapes (a) et (b) ; et
d) fournir ladite force sur la base de ladit comparaison pour ajuster la position de la bande audit trajet de bande recherché.

4. Procédé selon l'une des revendications 1 à 3 comprenant le support par flottement de ladite bande en réalisant des coussins d'air à divers points dans une enceinte de séchoir par une pluralité de barres d'air.

5. Appareil pour exécuter le procédé de la revendication 1 et comprenant :

(a) un collecteur supérieur (44) et un collecteur inférieur (42) positionnés respectivement au-dessus et en dessous dudit trajet de bande ;
(b) une ou plusieurs barres d'air ajustables (18), (24), chacune en communication de réception d'air avec l'un desdits collecteurs et comportant une surface oblongue à partir de laquelle l'air peut être évacué, ladite surface étant en relation opposée à la bande et ajustable de façon qu'elle tourne autour d'un axe sensiblement parallèle à la ligne centrale longitudinale du trajet de bande ;
(c) un moyen d'amenée d'air (26) en communication avec lesdits collecteurs supérieur et inférieur pour fournir de l'air auxdites barres d'air pour l'évacuation à partir de celles-ci ;
(d) un moyen pour surveiller la position actuelle du bord de la bande en mouvement passant le long dudit trajet ; et
(e) un moyen d'ajustage (40) réagissant audit moyen de surveillance pour modifier l'orientation des surfaces oblongues d'évacuation d'air des barres d'air ajustables relativement au trajet de bande ;

dans lequel les moyens d'ajustage interviennent pour modifier l'orientation d'un ou des deux collecteurs supérieur et inférieur précités relativement au trajet de la bande pendant que lesdits moyens d'amenée d'air fournissent de l'air auxdites barres d'air.

6. Appareil pour exécuter le procédé de la revendication 1 et comprenant :

(a) un collecteur supérieur (44) et un collecteur inférieur (42) positionnés respectivement au-dessus et en dessous dudit trajet de bande ;
(b) une ou plusieurs barres d'air ajustables (18), (24) chacune en communication de réception d'air avec l'un desdits collecteurs et présentant une surface oblongue à partir de laquelle l'air peut être évacué, ladite surface étant en relation opposée à la bande et étant ajustable de façon qu'elle tourne autour d'un axe sensiblement parallèle à la ligne centrale longitudinale du trajet de bande ;
(c) des moyens d'amenée d'air (26) en communication avec lesdits collecteurs supérieur et inférieur pour fournir de l'air auxdites barres d'air pour l'évacuation à partir de celles-ci ;
(d) un moyen pour comparer des données produites par ordinateur représentatives du trajet de bande recherché avec des données produites par ordinateur représentatives de la position de bande anticipée de la bande en mouvement ; et
(e) un moyen d'ajustage (40) réagissant audit moyen de comparaison pour modifier l'orientation des surfaces oblongues d'évacuation d'air des barres d'air ajustables relativement au trajet de bande ;

dans lequel les moyens d'ajustage interviennent pour modifier l'orientation de l'un ou des deux collecteurs supérieur et inférieur précités relativement au trajet de bande pendant que lesdits moyens d'amenée d'air fournissent de l'air auxdites barres d'air.

7. Appareil selon la revendication 5 ou 6, dans lequel l'orientation desdites surfaces oblongues est ajustable de façon que chacune desdites surfaces tourne également autour d'un axe qui est sensiblement perpendiculaire à la ligne centrale longitudinale du trajet de bande.

8. Appareil selon l'une des revendications 5 à 7, dans lequel les moyens d'amenée d'air comprennent un conduit flexible (46, 48) relié de manière étanche à chacun desdits collecteurs.

9. Appareil selon l'une des revendications 5 à 7, dans lequel chacun desdits collecteurs comprend un conduit d'amenée d'air standard de collecteur (26) comportant un joint d'étanchéité (56) à une extrémité, une extension (60) vers le conduit d'amenée d'air et un rebord d'étanchéité (62) disposé entre et en contact intime avec l'extension et le joint d'étanchéité.

10. Appareil selon l'une des revendications 5 à 9, dans lequel le moyen d'ajustage comprend un vérin, de préférence un vérin à vis et un moyen de support pivotant (53) associé à l'ensemble.

11. Appareil selon l'une des revendications 5 à 10 comprenant au moins trois desdites barres d'air ajustables (18).

12. Appareil selon l'une des revendications 5 à 11, dans lequel au moins deux desdites barres d'air ajustables (18) se situent suivant une relation opposée et espacée de façon que le trajet de bande passe entre les deux barres d'air.

13. Appareil selon la revendication 11 ou 12, comprenant en outre au moins un moyen d'espacement (36 ; 50) de façon qu'une relation spatiale fixe soit maintenue entre lesdites barres d'air ajustables (18).

14. Appareil selon la revendication 13, dans lequel ledit moyen d'espacement comprend au moins un chariot de collecteur (36).

15. Appareil selon l'une des revendications 5 à 14, comportant en outre : une pluralité de barres d'air fixes (15, 16), chacune comportant une surface oblongue à partir de laquelle l'air peut être évacué ; un moyen de contre-pression (34) disposé au-dessus desdites surfaces oblongues ; lesdites barres d'air fixes (15, 16) étant positionnées suivant une relation espacée relativement auxdites barres d'air ajustables (18) le long de la bande en mouvement de façon que la bande en mouvement soit guidée entre lesdites barres d'air fixes et ajustables suivant un trajet sensiblement rectiligne.

16. Appareil selon la revendication 15, dans lequel lesdites surfaces oblongues des barres d'air fixes (15, 16) sont orientées sensiblement perpendiculairement à la ligne centrale longitudinale de la bande.

17. Appareil selon l'une des revendications 5 à 16, comportant en outre un moyen de contre-pression associé à chacune des surfaces oblongues des barres d'air ajustables.

18. Appareil selon l'une des revendications 15 à 17, dans lequel ledit moyen de contre-pression comporte au moins une barrière de bord (34), réalisée de préférence sous forme d'élément en T (31, 35) comprenant un élément de barrière oblong (35) et un élément de support (31).

19. Appareil selon la revendication 18, dans lequel ledit élément de barrière oblong (35) s'étend au-dessus et à peu près perpendiculairement à la surface oblongue des barres d'air fixes et est supporté dans cette position par ledit élément de support (31) qui est fixé à la barre d'air par le moyen de fixation (64).

20. Appareil selon la revendication 18 ou 19, dans lequel au moins l'une desdites barres d'air fixes (15, 16) comporte plus d'une barrière de bord (34).

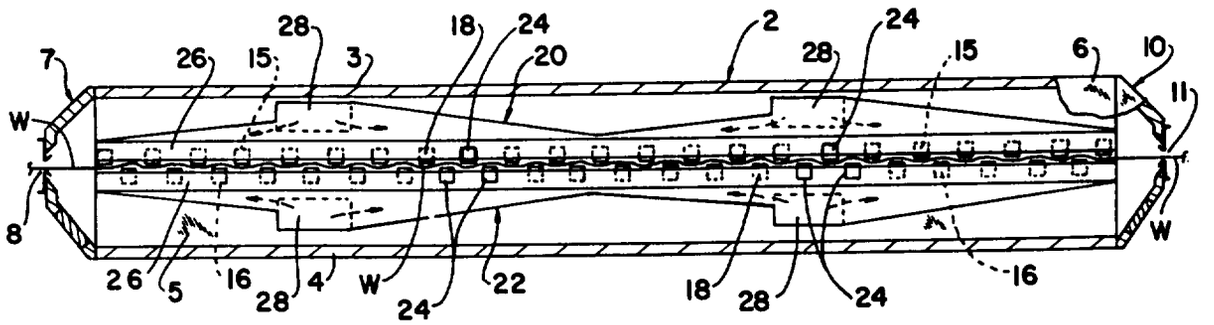
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Fig. 1

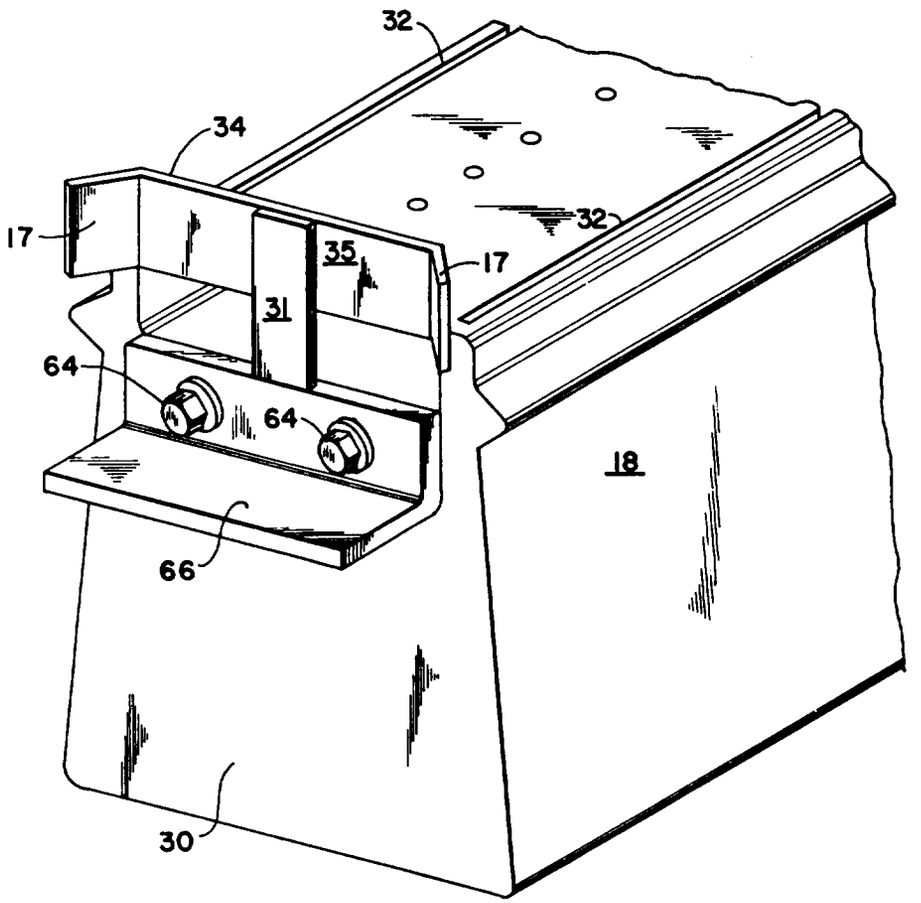
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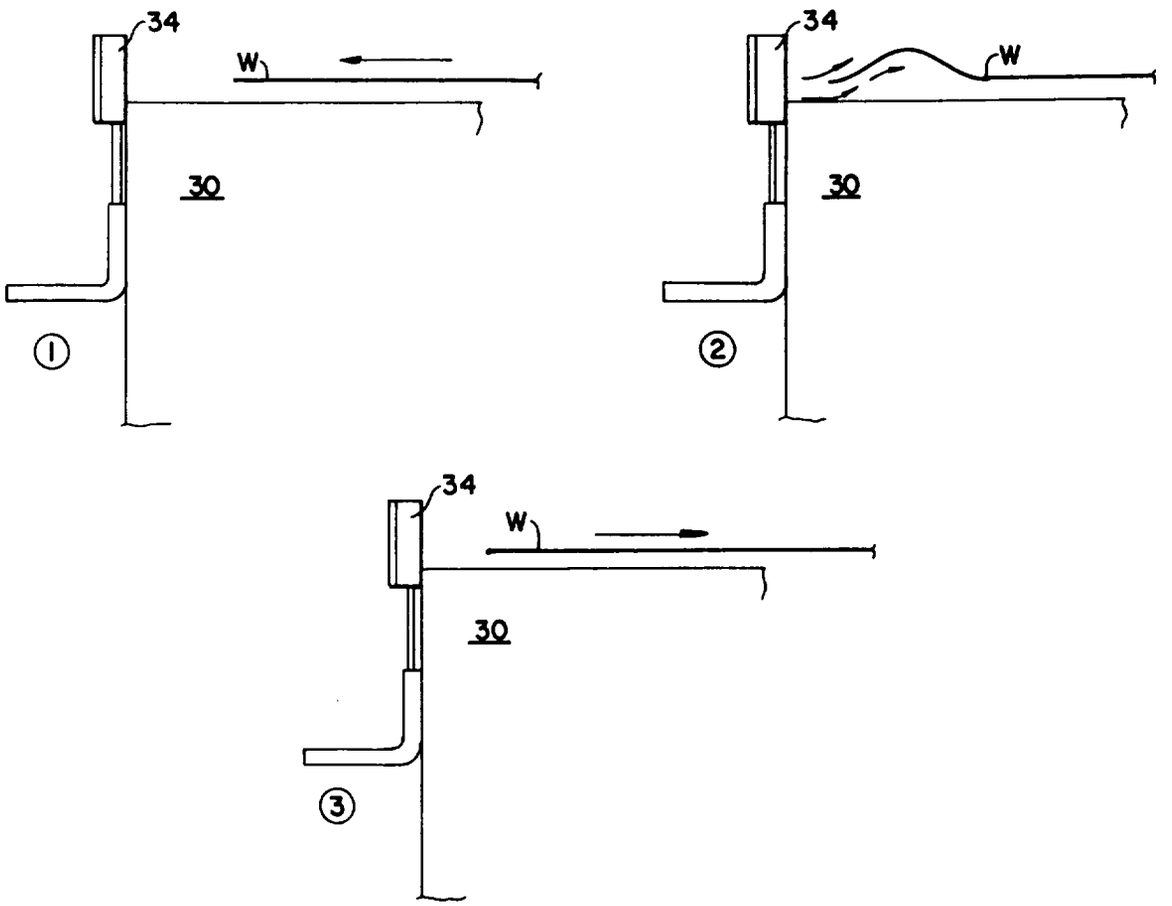
Fig. 2



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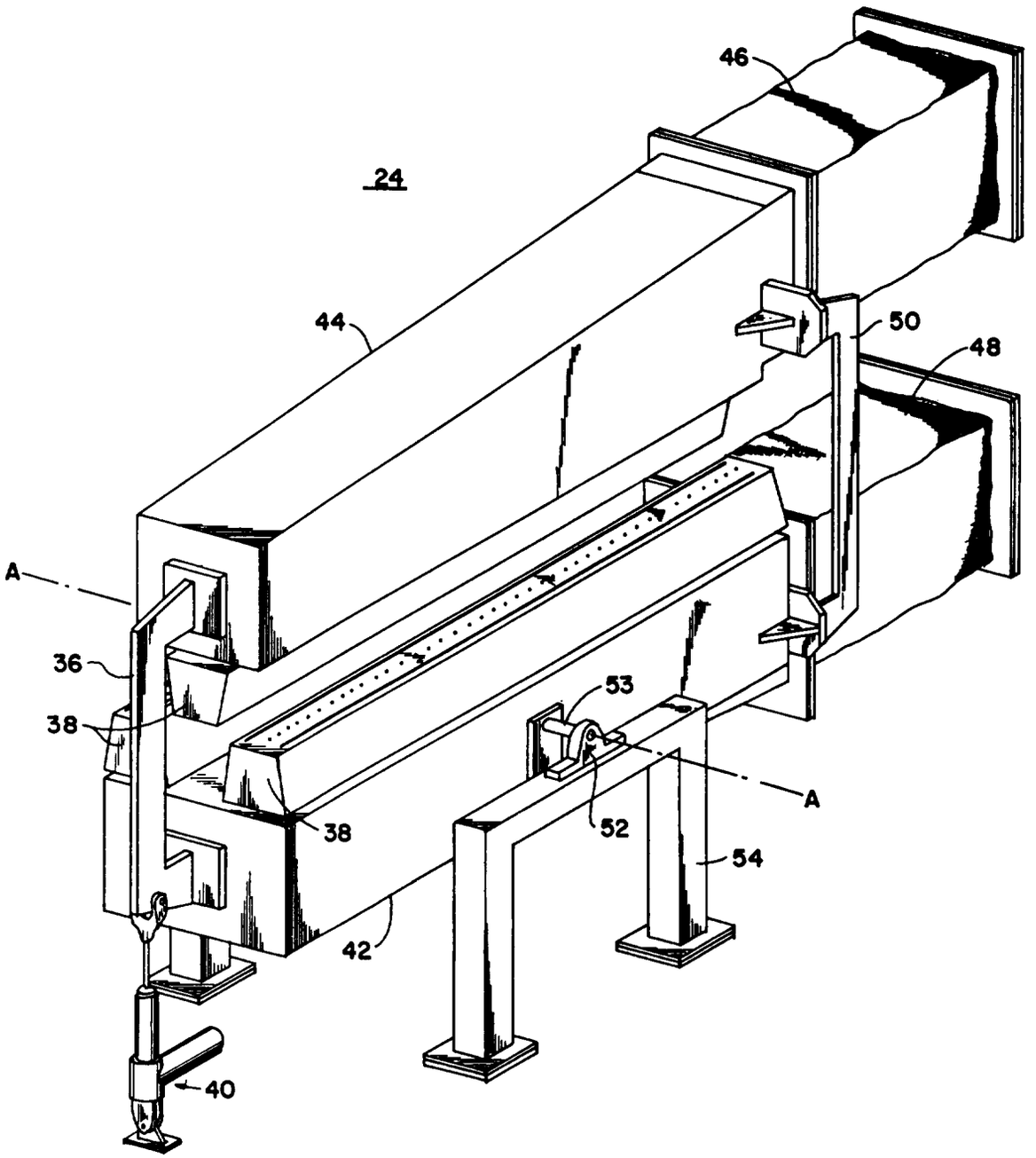

Fig. 4

Fig. 5

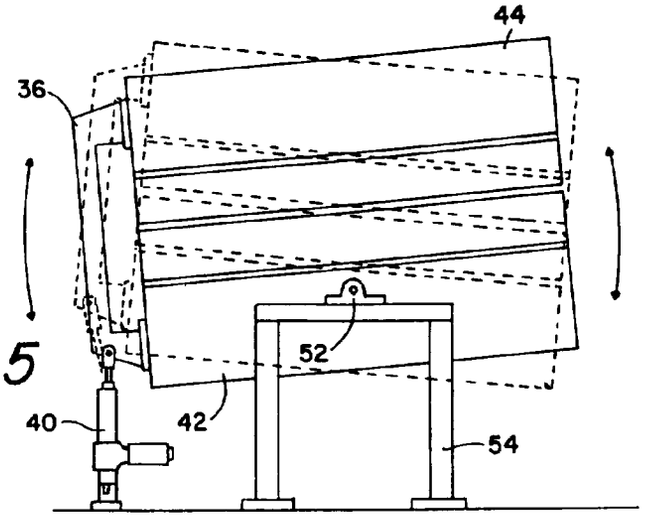

Fig. 6