United States Patent

Herzhoff et al.

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[54] DEFLECTING GUIDE MECHANISM FOR BANDS COATED ON ONE SIDE

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **226/97,** 34/156

[51] **Int. Cl.** **B65h 17/32**

[58] **Field of Search** 226/97, 7; 39/23, 156

[56] **References Cited**

UNITED STATES PATENTS

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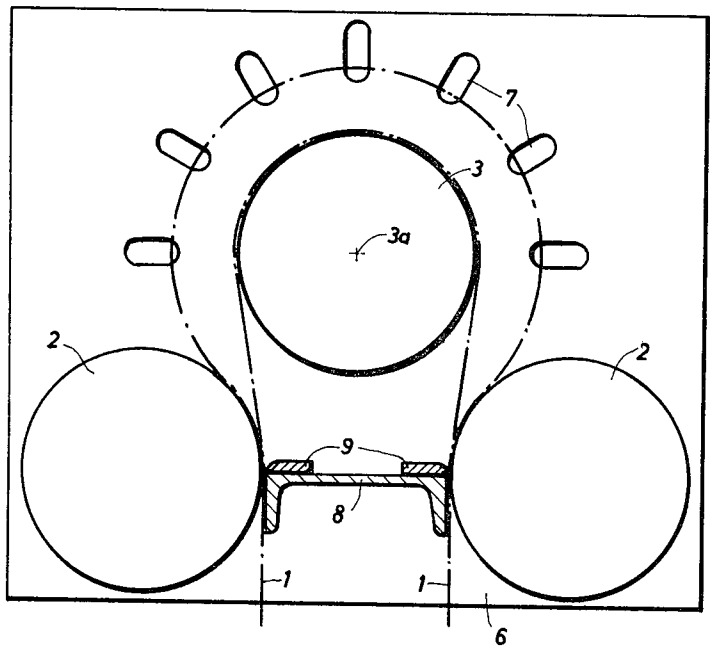
[57] **ABSTRACT**

In a deflecting guide mechanism for webs coated on one side, especially for drying chambers, a fixed support is arranged transversely of the direction of travel of the web in the vicinity of the guide loop and carries at both its ends side screens which are arranged perpendicularly of the surface of the web parallel to one another and which have openings arranged on an arc concentric to the deflection axis of the web. Means are provided for supplying compressed air to the space formed between the support, the side screens and the web, whose reverse side is guided over part of the periphery of the guide rollers.

3 Claims, 4 Drawing Figures



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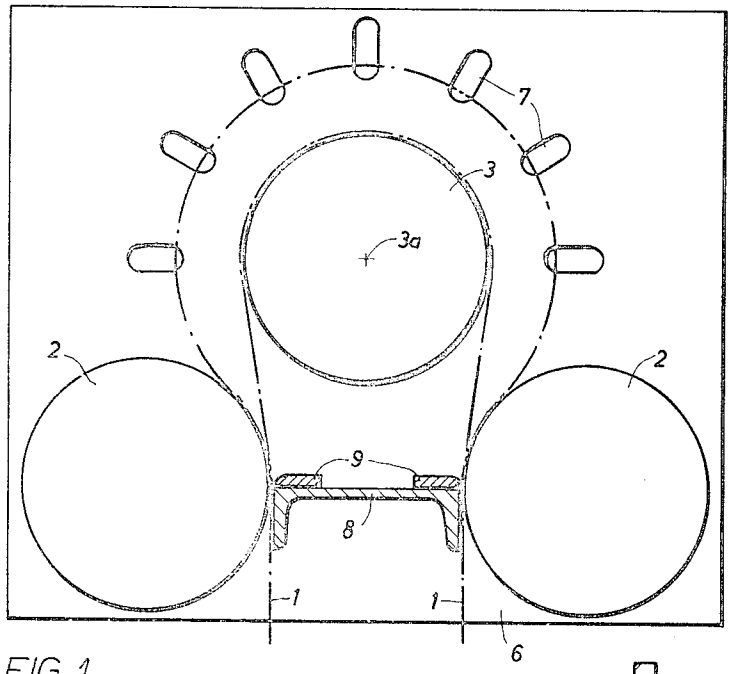

FIG. 1

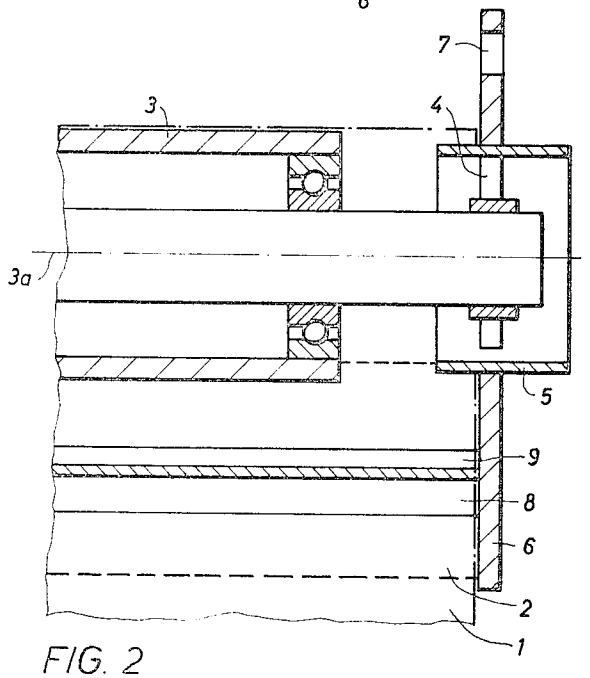

FIG. 2

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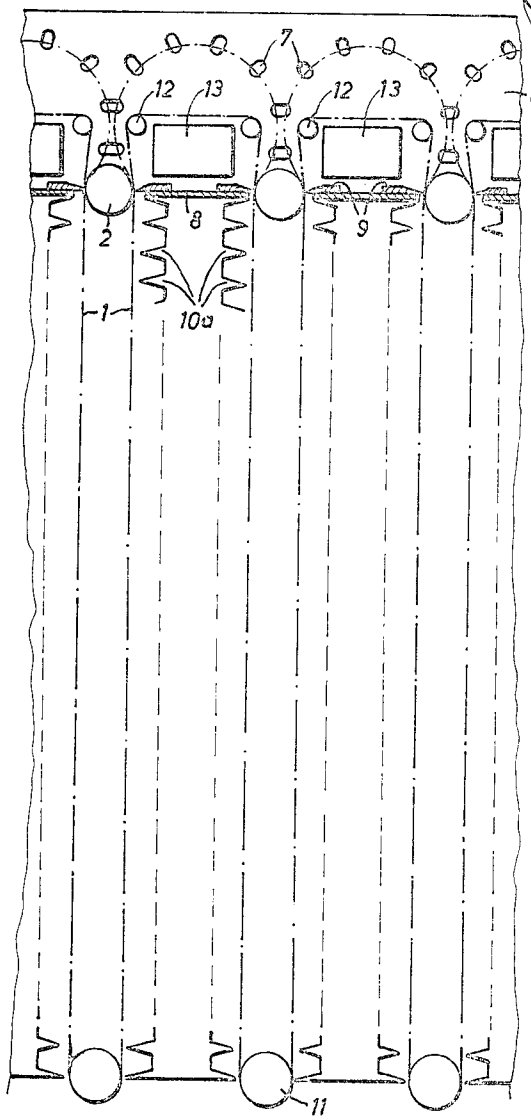

FIG. 3

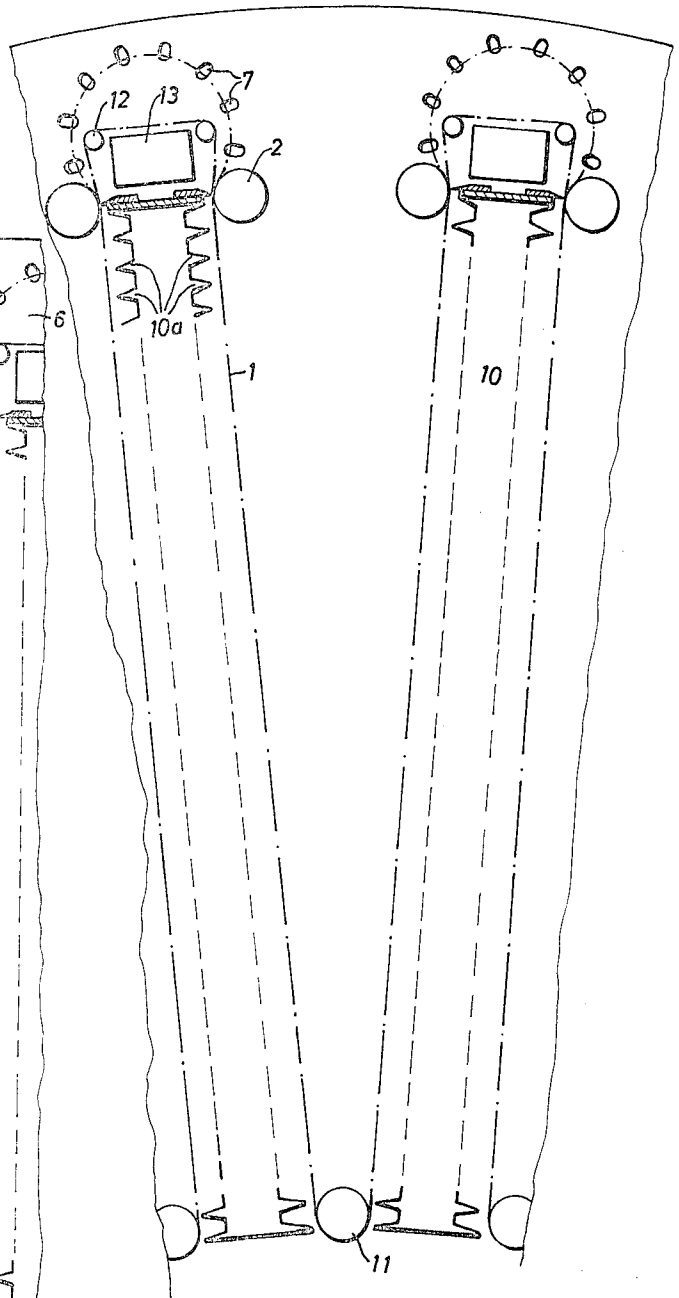

FIG. 4

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DEFLECTING GUIDE MECHANISM FOR BANDS COATED ON ONE SIDE

This invention relates to a deflecting guide mechanism for bands coated on one side, for example photographic films, especially for drying chambers through which the web is guided meander fashion in elongated loops.

The requirements which have to be met in connection with the drying of wet substrates coated with photographic emulsions have become increasingly more stringent over recent years. The particularly high demands in regard to quality, especially in the case of color material, call for completely uniform drying. In many instances, the drying temperatures have had to be reduced in view of the technological properties of the emulsions. Accordingly, development has been directed towards dryers with ever increasing web lengths and carefully controlled airflow. In addition, it is extremely important with photographic paper that drying should take place under minimal web tension, because otherwise the substrates usually provided with several photographic layers (color paper) curl undesirably when dry.

Conventional suspension dryers and spiral dryers, both of which are extremely favorable in regard to the volume they occupy in relation to the web length, are unfortunately unable to meet these increased demands. Accordingly, tunnel dryers are used in which the web travels at a uniform distance beneath blowboxes, usually provided with nozzles. The web is guided either with clips over rollers or over large drums with diameters of 10 meters and more.

Clip systems are mechanically complicated and are not suitable for use with paper substrates on account of the danger of tearing. Where the webs are guided over rollers, they undergo an increase in tension from roller to roller through bearing friction. Since in addition each roller must have a minimum looping and since only the reverse side of the wet web should come into contact with the roller, difficulties are encountered in guiding the web, and limits are soon imposed upon any increase in the size of the drying zone. In rotary dryers or drum dryers, however, the web does not undergo any increase in tension along the drying path. Another favorable factor is that the layer support lies uniformly on the surface of the drum throughout the entire drying cycle. Unfortunately, the dimensions of a drying drum cannot be structurally increased beyond a certain extent and the ratio of overall volume to web length is highly unfavorable in this otherwise extremely advantageous type of dryer.

It has now been found that these disadvantages can be obviated by providing, in tunnel dryers, deflecting guide means which according to the invention are distinguished by the fact that they comprise a fixed support which is arranged transversely of the direction of travel of the web in the vicinity of the loop to be deflected and which, at both its ends, carries side screens which are arranged perpendicularly of the surface of the web parallel to one another and which have openings arranged on an arc concentric with the deflection axis of the band and between which guide rollers for the web are rotatably mounted, compressed air being supplied to the space formed between the support, the side screens and the band whose reverse side is guided over part of the periphery of the guide rollers. By supplying compressed air, a contactless band guide element is obtained because the web rests on a cushion of air.

This invention will be more readily understood in view of the attached drawings in which:

FIG. 1 is a radial section of a web deflector;

FIG. 2 is an axial section of a web deflector of this invention;

FIG. 3 is a longitudinal section through a dryer; and

FIG. 4 is a longitudinal section through a modified dryer.

FIGS. 1 and 2 show by way of example an element of this kind for deflecting the web through 180° in longitudinal section and cross section respectively.

A band 1 travelling in the direction of the arrow is guided over guide rollers 2, the reverse (i.e., uncoated) side of the

web facing the guide rollers 2. Before the dryer is started up, the web initially lies on an "emergency" roller 3 (FIG. 2). The deflection axis for the web is denoted by the reference 3*a*. The edges of the web are almost in contact with screens 6 acting as lateral guides, narrow gaps being left between the screens and the edges of the web. The screens 6 are arranged on a support 8 and are provided with fan sockets 5. The fixed axle of the roller 3 is secured by means of spokes 4 in the fan socket 5. Strips 9 seal off the space above the support 8, leaving a narrow gap for the passage of the web 1. Openings 7 are arranged on an arc in the screens 6. When the dryer is brought into operation, the space above the support 8 is placed under excess pressure by means of air blown in through the fan socket 5. As a result, the web 1 is blown into an arclike loop until the inner space of the loop under excess pressure partly covers the radially arranged openings 7, thus providing an escape path for the air blown in.

The relation

$$S=\Delta p \cdot R$$

known from the design of thin-walled containers (R = the radius of curvature of the loop), applies to the equilibrium ultimately adjusted between the web tension S and the excess pressure Δp.

The guide rollers 2 are preferably mounted in air bearings (not shown).

FIG. 3 is a longitudinal section through a web-deflecting element for use in a space-saving dryer.

The contactless deflecting elements are arranged above vertically arranged blowing ducts 10 provided with nozzles 10*a* directed toward the plane of the web. The web 1 is guided in parallel elongated loops over guide rollers 2 and 11. In this instance there are two emergency rollers 12 for each deflecting element. The air required to inflate the loop is delivered through rectangular sockets 13. The rollers 11 are optionally driven to reduce and stabilize web tension. To facilitate insertion of the web the rollers 11 can be displaced vertically until they are just below the rollers 2 either individually or in groups by a suitable mechanism (not shown), for example vertical spindles and nuts on which the bearings of the rollers 11 are arranged. By virtue of this possibility of shortening the elongated loops between the rollers 2 and 11, the drying cycle can be conveniently adapted to a technologically predetermined temperature-time curve by appropriately shortening the distance which the web has to travel through a drying zone without any change in its speed.

FIG. 4 shows another example of a dryer. The overall volume originally provided for a drum dryer is in this case very favorably utilized by the starlike arrangement of the elongated loops shown in sections. A much more favorable overall volume: web length ratio is obtained than in a drum dryer of the same diameter.

We claim:

1. A deflecting guide mechanism for webs coated on one side, for example photographic films, especially for drying chambers, through which the web is guided meander fashion in elongated loops, comprising a fixed support (8) which is arranged transversely of the direction of travel of the web 1 in the vicinity of the guide loop and which at both its ends carries side screens (6) which are arranged perpendicularly of the surface of the web parallel to one another and which have openings (7) arranged on an arc concentric to the deflection axis (3a) of the web (1) and between which guide rollers (2) for the web are rotatably mounted, and means for supplying compressed air to the space formed between the support (8), the side screens (6) and the web (1), whose reverse side is guided over part of the periphery of the guide rollers (2).

2. A guide mechanism as claimed in claim 1, wherein one or more emergency rollers (3, 12) are arranged in the deflection loop.

3. A guide mechanism as claimed in claim 1, wherein the support (8) is provided with strips (9) which seal off the guide rollers (2) from the support (8) leaving a narrow gap for the passage of the web (1).

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