DEVICE FOR WINDING AND/OR UNWINDING A FILM AT A CONSTANT SPEED

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Appl. No.: 10/888,490

Filed: Jul. 9, 2004

Related U.S. Application Data

Continuation of application No. PCT/FR03/00365, filed on Feb. 5, 2003.

Foreign Application Priority Data

Feb. 5, 2002 (FR) 02.01453

Publication Classification

Int. Cl. B65H 18/08; B65H 19/28; B65H 20/06

U.S. Cl. 242/535.4; 242/537; 242/532.7

ABSTRACT

A device for winding and/or unwinding a film at a constant speed includes a reel comprising two coaxial annular support areas, having the same diameter, which are separated by a concavity and which are spaced out from one another by a distance that is slightly smaller than the width of the film. The two support areas pivot freely. Guide means guide the film laterally in order to wind the film on the reel such that the lateral edges thereof rest on the two support areas of the reel respectively. Two parallel drive belts are supported respectively on said edges, along the length of an arc of circle with a predetermined angle at the center. The invention applied to a film in an optoelectronic apparatus, such as a scanning and analysis device.
DEVICE FOR WINDING AND/OR UNWINDING A FILM AT A CONSTANT SPEED

[0001] The present invention relates to a device for winding and/or unwinding a film at a constant speed. It applies particularly, but not exclusively, to a film in an optoelectronic apparatus such as a scanning analyzer.

[0002] Films are usually wound or unwound with the aid of a spool or reel driven by a motor.

[0003] It is observable that this method, although universal, creates many problems:

[0004] in the unwound state, the film is of an arched shape. This means that to wind the film onto a cylindrical surface requires a not insignificant resistive effort in order to flatten the film against the cylindrical surface of the spool. This tension therefore creates a risk of damage to the film. Moreover, as soon as the resistive force is removed, any film wound on the spool tends to bulge and work itself loose from the reel with all the inconveniences which this implies;

[0005] the film drive must be uniform across its entire width and must produce a constant speed of advance independently of the thickness of film currently wound on the reel. This result is found to be unobtainable using cylindrical motor-driven reels unless complicated and costly arrangements are used (varying the spool drive speed as a function of the wound thickness);

[0006] the use of cylindrical spools or reels for driving the film raises the risk of scratching or damaging (by friction) the functional part of the film.

[0007] It is therefore a more particular object of the invention to eliminate these inconveniences and solve these problems by:

[0008] driving the film uniformly across its entire width with a speed of advance that is independent of the amount of winding, and

[0009] winding the film onto an unmotorized reel.

[0010] To this end the invention provides a device comprising:

[0011] a reel comprising two coaxial annular support areas, of equal diameter, which are separated from each other by a concavity and which are spaced out from one another by a distance that is slightly smaller than the width of the film, these two support areas pivoting freely,

[0012] guide means which are designated so as to guide the film laterally in order to wind it onto the reel such that the lateral edges of the film bear on the two respective support areas of the reel, and

[0013] two parallel drive belts which are supported on said respective edges along the length of an arc of a circle subtending a predetermined angle at the center.

[0014] Advantageously, the support areas may be connected to each other or else may be independent of each other in rotation.

[0015] Either way, said belts, driven by a motor, carry the film forward with a constant linear speed and wind the film onto the reel independently of the wound thickness.

[0016] This device avoids all risk of damage for the reasons set forth above, unlike conventional devices.

[0017] An embodiment of the invention is described below, by way of non-restrictive example, with references to the appended drawings, in which:

[0018] FIG. 1 is an elevation showing the locations of the various component parts of the device for guiding, driving and winding a film;

[0019] FIG. 2 shows the cross section marked AA in FIG. 1;

[0020] FIG. 3 is a partial perspective view of FIG. 1.

[0021] In this example, the structure of the device comprises two parallel metal plates 1a, 1b separated by three spacers 2a, 2b, 2c arranged along the top side of the plates. These various parts form a rigid unit forming the device for guiding, driving and winding the film 3. The distance between the two metal plates 1a, 1b is slightly greater than the width of the film 3 to be analyzed.

[0022] In accordance with the invention the device comprises film guiding, driving and winding means.

[0023] The film 3 guiding device comprises in an imaging zone two parallel coaxial spools 4a, 4b (of which only spool 4a is shown) mounted rotatably via ball bearings and held in position by a pair of flat opposing elements 5a, 5b, 6a, 6b (of which only flat opposing elements 5a and 6a are shown). Each lateral edge of the film 3 comes into contact with a respective one of these two spools around an arc of a circle in such a way that the film follows a circular path. Thus, along this circular path its shape is cylindrical, with a straight generatrix. This position produces in the imaging area a straight transverse area, directly in front of which is a slit in a wall 7 connected to the two plates, forming a rectangular space through which the light rays passing through the film can travel.

[0024] The film 3 driving device comprises two belts 8a, 8b (of which only belt 8a is shown) which move in a synchronized manner and which each bear on a respective lateral edge of the film 3 along the arc of the circular path. This gives a friction drive of the two lateral edges of the film which eliminates any possibility of a variation of speed between these two edges. The two belts 8a, 8b have teeth on the non-film 3 side, the belts being driven by means of two coaxial sprockets 9a and 9b mounted on a spindle 10 and driven by an electric motor 11, as well by idle sprockets (of which only sprocket 12a is shown). The two belts 8a, 8b are tensioned and positioned by two sets of spools, of which only set 13a, 13b, 13c is shown.

[0025] The film 3 winding device consists of a necked reel 14 comprising an axisymmetric concave form situated between its two ends. The necked reel 14 is mounted rotatably on a spindle 15 parallel to the spindle of the spools 4a, 4b with a spring return. This spindle is guided in such a way that it is able to move along an oblong drilling 16 according to the thickness of film 3 wound on the necked reel 14. The main axis of the oblong drilling 16 runs perpendicular to the tangential plane of application of the
belts to the edges of the film (the force of application being colinear with the main axis of the oblong hole 16). Two pairs of arms 17a, 17b, 18a, 18b (of which only arms 17a and 18a are shown) guide the film around the necked reel 14. The arms 17a, 17b (of which only arm 17a is shown) pivot on the axis O and are designed to press on the lateral edges of the film 3, this independently of how much film 3 is wound onto the necked reel 14. The volume of the wound part of the film therefore varies as a function of the length of film wound onto the necked reel. The arms 18a, 18b (of which only arm 18a is shown) are for guiding the film 3 during its insertion or removal.

[0026] It should be observed that since the necked reel has no drive means of its own, its angular velocity is a function of how much film 3 has been wound. The film 3 is thus wound onto the necked reel 14 without any friction or tension.

1. A device for winding and/or unwinding a film at a constant speed, including:

a reel comprising two coaxial annular support areas of equal diameter, which are separated from each other by a concavity and which are spaced out from one another by a distance that is slightly smaller than a width of the film, the two support areas pivoting freely,

guide means which guide the film laterally in order to wind it onto the reel such that lateral edges of the film bear on the two respective support areas of the reel, and

two parallel drive belts supported on said respective edges along a length of an arc of a circle subtending a predetermined angle at a center.

2. The device as claimed in claim 1, wherein said support areas are connected to each other.

3. The device as claimed in claim 1, wherein said support areas are independent of each other in rotation.

4. The device as claimed in claim 1, wherein said belts are driven by a motor.

5. The device as claimed in claim 1, wherein the reel is a necked reel comprising two circular lateral ends on which the lateral edges of the film rest.

6. The device as claimed in claim 5, wherein said necked reel comprises an axisymmetric concave form situated between two ends.

7. The device as claimed in claim 1, wherein said reel comprises a spindle on which it rotates.

8. The device as claimed in claim 7, wherein said spindle is able to move translationally and is guided along an oblong drilling.

9. The device as claimed in claim 8, wherein a main spindle of said drilling is oriented perpendicular to a tangential plane of application of the belts to the edges of the film.

10. The device as claimed in claim 1, wherein said guide means comprise guide arms mounted around the reel.

11. The device as claimed in claim 10, wherein at least one of said guide arms pivots about an axis.

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