

TITLE OF THE INVENTION

WEB SUPPLYING DEVICE

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to a web supplying device in which a web is supplied from a web roll and by intermittent operation of a feeding or indexing mechanism is fed out by a predetermined length. A preliminary feeding mechanism or drive means is provided for drawing the web from the web roll and is operated in response to the intermittent feeding-out operation of the web. The drive means is in the midway part of the feeding-out path from the roll to the feeding mechanism.

Description of the Prior Art

A known web supplying device of this type is disclosed in Japanese Patent Laid-Open No. Sho 62-158629. In this device, a preliminary feeding-out mechanism is provided which has preliminary feeding-out rollers and tension levers swingably arranged at a downstream side of the preliminary feeding-out rollers. The web is trained over a plurality of rotatable tension rollers pivotally supported on the tension levers and a plurality of guide rollers is arranged opposite the tension rollers, whereby a specified tension is applied to the web due to the weight of the tension levers and the tension rollers. When the web is intermittently fed out by a predetermined length under an intermittent operation of the feeding-out mechanism, the web feed is detected by sensors which detect known roller movement, causing the preliminary feeding-out rollers to be driven to cause the web to be pulled out of the web roll. This returns the tension levers to their initial states, resulting in that the web is always tensioned.

However, in such a conventional type of web supplying device described above, the tension levers are oscillated at a frequency corresponding to frequency of the intermittent feeding-out of the web and are moved at a speed corresponding to the feeding-out speed of the web, so that if the web is intermittently fed out at a high speed, high inertia effects are expressed due to the weights of the tension levers and the tension rollers. These inertia effects may cause the tension roller movement and web feed to become out of phase resulting in that the web may be fed out more than required. As a result, a slackness in the web may easily be generated, and a displacement of the web in a width-direction perpendicular to the feeding-out direction may be produced, and in the event that registration marks are applied to the web, and a positioning of the web is dependent upon the registration marks, positioning accuracy of the web may be reduced.

Also, due to the numerous loops in the web formed by the several tension rollers, there is a problem that a winding of the web around the tension rollers is poor and uniform tension may not be applied to the entire web especially if the web has a resilient quality. If the web is stiff there is also the problem that applying the web over many driven rollers is troublesome work.

The above problems are to some extent overcome by the apparatus disclosed in British Patents Nos. 1469844 and 1446945 which disclose the provision of vacuum chambers as web tension devices but these devices do not provide for web centralising as the web is fed into the vacuum chambers.

The present invention solves this problem.

According to the present invention there is provided a web supplying device wherein a web is fed from a supply roll to a drive means for drawing the web from the roll and feeding it to a feeding out means arranged to feed the web intermittently in predetermined lengths, and including a

suction mechanism downstream of the drive means for controlling web tension by sucking a U-shaped loop of the web into a suction chamber and by controlling the drive means in response to the length of said U-shaped loop of the web, wherein the suction chamber is defined by guide surfaces which abut the edges of the said U-shaped loop of web, and where the web enters the chamber, said surfaces are provided with slant portions for guiding and centralising the web in the chamber.

Preferably the suction chamber is elongated and of rectangular cross section, and the web enters the chamber at one side of one end, which is open and leaves at the other side of one end, and at the other end is a suction part which suction is applied to the U-shaped loop of web, the suction mechanism further including sensors for sensing the length of the U-shaped loop in the chamber, and for controlling the drive means in response to each length.

Preferably, the device includes downstream of the suction mechanism, a forming means for forming the web into tubular form, and lateral sealing means for transversely sealing the said tubular form to produce bags and filling means for filling said bags, said feeding-out means being arranged downstream of said tube forming means.

Accordingly, the present invention is operated such that the web is sucked under an operation of the suction mechanism to cause the web to define a U-shaped loop so that a specified tension is applied to the web, the U-shaped web loop being positioned between the opposing guide surfaces. As the web is intermittently fed out, the length of the U-shaped loop is reduced and this is sensed to control an operation of the drive means so that the looseness length of the U-shaped web loop can again be measured.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings, wherein:-

Fig. 1 is a front elevational view showing a web supplying device illustrating the embodiment of the present invention; and

Fig. 2 is an enlarged sectional plan view, partly broken away, the centre being taken along line (II)-(II) of Fig. 1.

Referring now to the drawings, one preferred embodiment of the present invention is illustrated therein.

As shown in Fig. 1, a web supplying device comprises a suction mechanism C which includes a suction chamber 2 and sensors 3 and which is arranged in the feed path B of a web W extending from a web roll A to a tube forming body D1 of a bag forming, filling and packaging machine D. A feeding-out belt acting as a feeding-out mechanism E is arranged at a downstream side of the tube forming body D1 and opposite to an outer surface of a bag forming cylinder D2 of the bag forming, filling and packaging machine D. By operation of feeding-out mechanism E, the web W is fed out by a predetermined length in the web in a direction towards a sealing means F.

The suction chamber 2 is longitudinal and box-like and has a rectangular cross section. It is defined by a plurality of flat plates, and its upper surface is open. Each of a pair of opposed edges 2a, at the top opening 2a is arcuate in section and the web W passes over both arcuate edges 2a1 and 2a1 in entering and leaving the chamber 2 and forms a U-shaped loop in the chamber 2.

A suction port 2b is provided at the lower end of the suction chamber 2, whereby the interior of the suction chamber 2 communicates with a suction source 2c such as a sirocco fan or the like which provides a large suction flow rate.

The suction port 2b is surrounded by an aeration means 2b1, such as a sponge, which is in the suction chamber 2, and there is a net arranged on top of the sponge, whereby sucking of the web W into the suction port 2b is prevented. Even if

the web W is accidentally sucked into the suction chamber to contact the net 2b₂ the vacuum can be released by adjusting the air discharging port 2c₁ of the suction source 2c. The suction force can be adjusted dependent upon the width size of the web by adjusting port 2c₁.

Each of spaced guide surfaces 2d, 2d where the web enters the vacuum chamber 2 is formed with slant portions 2d₁, 2d₁. These slant portions 2d₁ taper into the suction chamber 2 horizontally as shown in Fig. 2 and vertically as shown in Fig. 1. The slant portions 2d₁ taper to nothing at the lower end of the chamber so that at the lower end the chamber width is made approximately equal to the width of the web W. Thus, the guide surfaces 2d, 2d apart from the slant portions 2d₁ are abutted against the side edges W₂, W₂ of the U-shaped web loop W₁ and the slant portions 2d₁ will correct any widthwise displacement of the web W. Additionally, both flat plates forming the guide surfaces 2d and 2d are, or either one of them is, supported for movement in the width direction of the web W, and both guide surfaces 2d, 2d, or one side surface, can be moved by an adjusting means 2d such as a manual handle, so as to accommodate the W of different widths.

In addition, one side surface 2e extending from the opening 2a to the suction port 2b is provided with sensors 3 for detecting the loop length of the U-shaped web loop W₁. These sensors are fitted into the suction chamber 2 and serve for controlling the operation of the preliminary feeding-out mechanism or drive means 1.

In the preferred embodiment, two sensors 3, an upper 3b and a lower 3a are buried in an intermediate part of the guide surface 2e which is the downstream side having regard to the feeding-out direction of the web W. They are spaced apart in a vertical direction in relation to the U-shaped web loop. When the U-shaped web loop W₁ decreases in length due to an intermittent operation of the feeding-out mechanism E,

the lower sensor 3a senses this and starts an operation of the preliminary feeding-out mechanism 1 to restore the loop length. In turn, when the mechanism feeds the web into the chamber to increase the loop length, when the loop is moved downwardly to a position beyond its set position, the lower sensor 3a senses this and stops its operation of the preliminary feeding-out mechanism 1. The upper sensor 3b is used for sensing abnormal operation so as to stop the operation of the feeding-out mechanism E.

Reference numerals 4 in the drawing denote sensors for use in sensing registration marks, and reference symbols F denote lateral sealing means.

By the arrangement described, the web supplying device applies a constant tension force to the web W by a method wherein air in the suction chamber 2 is sucked from the suction port 2b and the web W is sucked into the suction chamber 2 in the form of a U-shaped loop W1 held by a negative pressure.

When a predetermined length of the web W is pulled out toward the downstream side in a feeding-out direction by the intermittent operation of the feeding-out mechanism E, the lower end portion of the U-shaped web loop W1 is moved upwardly to cause the loop length to be shortened, and this is detected by the lower sensor 3a to start the operation of the preliminary feeding-out mechanism 1 and in turn the web W3 is pulled out of the web roll A and is fed out towards and into the suction chamber 2, so that the lower end portion of the U-shaped loop W1 is moved downwardly and the length of the web loop is gradually increased.

When the U-shaped web loop W1 reaches the lower sensor 3a, this state is detected by the sensor 3a, and operation of the preliminary feeding-out mechanism 1 is stopped and the length of the U-shaped web loop W1 is kept constant.

Subsequently, every time the feeding-out mechanism E is operated, the aforesaid operation is repeated.

The structure of the aforesaid suction chamber 2 is not limited to the one illustrated in the drawings. Although both arcuate edges $2a_1$, $2a_1$, are formed at the same height position, the arcuate edge $2a_1$ at the upstream side in the feeding-out direction may be formed at a lower position as compared with that of the arcuate edge $2a_1$ at the downstream side, whereby a sucking of the web W supplied from the preliminary feeding-out mechanism 1 is facilitated and at the same time the contact area between the side surface 2e at the downstream side and the U-shaped loop W1 is increased which increases the friction on the web to provide a brake for preventing running away of the U-shaped web loop W1.

The present embodiment of the invention has the following advantages.

1) The web is sucked so as to form it into a U-shaped loop, and a specified tension force is applied to the web. The U-shaped web loop is positioned to engage the opposing guide surface as the intermittent feeding-out operation of the web is performed. As the loop is pulled out, control sensors control the operation of the preliminary feeding-out mechanism whereby the length of the U-shaped loop is kept constant. Thus, the web can be applied without using any inertia member and the number of bends in the web is reduced. The tension can always be applied uniformly in such a way preventing widthwise movement of the web.

Accordingly, as compared to the conventional type of mechanism in which there are many looped portions on the web and a tension force is applied to the web by inertia members such as tension levers or several driven rollers or the like, even if the web is intermittently fed out at a high speed, a slack condition of the web in which no tension is supplied thereto at all can be completely prevented and so the possibility of displacement in the width direction of the webs is avoided. In case the patterns on the web are to be aligned to each other, positioning accuracy is improved. In

addition, even if the material quality of the web has a certain resiliency, a uniform tension can be given to the entire web and so the web applying operation can be simply performed.

2) As the tension force is increased in order to prevent a slackness of the web, an intermittent feeding-out force must correspondingly be increased. However, the web supplying device of the present invention can prevent any slackness of the web completely, so that the tension to be applied to the web can be set as low as possible and along with this effect, the feeding-out force may also be reduced and the driving source for performing the feeding-out operation can be made small in size.

3) Since the web is sucked, dust adhered on the surface of the web or the like can be removed and web feeding enhanced.



What is claimed is:

1. A web supplying device wherein a web is fed from a supply roll to a drive means for drawing the web from the roll and feeding it to a feeding out means arranged to feed the web intermittently in predetermined lengths, and including a suction mechanism downstream of the drive means for controlling web tension by sucking a U-shaped loop of the web into a suction chamber and by controlling the drive means in response to the length of said U-shaped loop of the web, wherein the suction chamber is defined by guide surfaces which abut the edges of the said U-shaped loop of web, and where the web enters the chamber, said surfaces are provided with slant portions for the guiding and centralising the web in the chamber.
 2. A web supplying device according to claim 1 wherein the suction chamber is elongated and of rectangular cross section, and the web enters the chamber at one side of one end, which is open and leaves at the other side of one end, and at the other end is a suction part which suction is applied to the U-shaped loop of web, the suction mechanism further including sensors for sensing the length of the U-shaped loop in the chamber, and for controlling the drive means in response to each length.
 3. A web supplying device according to claim 1 or 2, including downstream of the suction mechanism, a forming means for forming the web into tubular form, and lateral sealing means for transversely sealing the said tubular form to produce bags and filling means for filling said bags, said feeding-out means being arranged downstream of said tube forming means.
 4. A web supplying device substantially as hereinbefore described with reference to the accompanying drawings.
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