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[54] **APPARATUS FOR CONTROL OF WEB TENSION IN MULTICOLOR PRINTING MACHINES**
1 Claim, 1 Drawing Fig.

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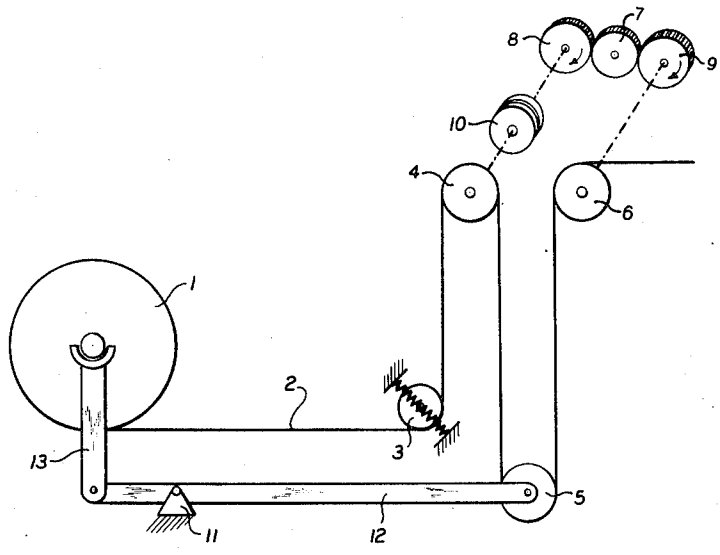
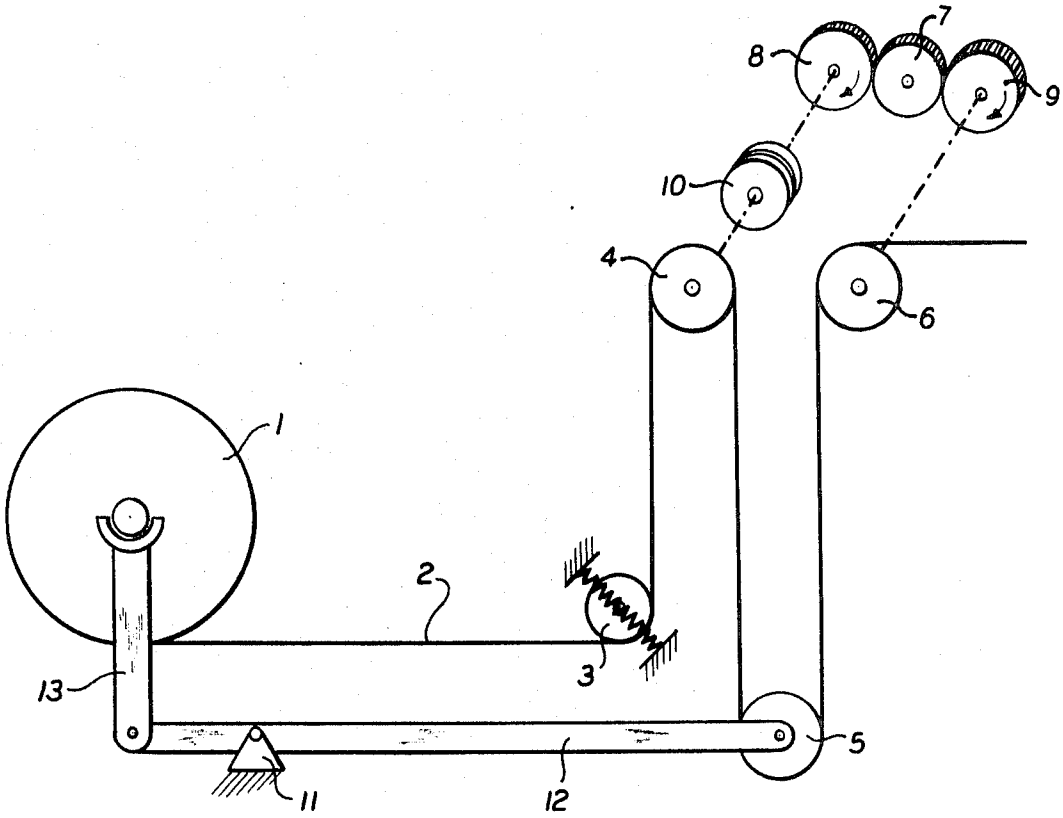
ABSTRACT: An apparatus for damping of tensile stress variations and for control of the web tension on braked unwinding devices for webs of flexible material, as paper, plastic foils, and the like, which comprises a dancer roller disposed between a first feeding roller and a second feeding roller. The first feeding roller is arranged on the roller side and serves as a moment compensation device. The second feeding roller serves as a feeding device for the web. A gear is provided for driving the first feeding roller, and a slip coupling is operatively disposed between the first feeding roller and the gear.





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APPARATUS FOR CONTROL OF WEB TENSION IN MULTICOLOR PRINTING MACHINES

The present invention relates to an apparatus for damping of tensile stress fluctuations and for control of the web tension on braked unrolling devices for webs of flexible material, for instance, paper, plastic films, and the like, by means of a dancing roller, as set forth in the copending patent application Ser. No. 709,108, filed Feb. 28, 1968, in which the dancing roller is disposed between two feeding rollers feeding to each other synchronously, the roller-side feeding roller of which operates as moment compensation device. By the roll-sided feeding roller as a moment compensation device, the web is fed with a speed equal with that of the dancing roller, as it is drawn from the latter by the other feeding roller into the working machine, so that the expansion of the web depending upon the web tension causes a movement of the dancing roller during compensation with the expansion of the web occurring by the mass of the dancing roller due to the web load, which movement of the dancing roller is exploited for the control of the braking of the roller and thereby of the web tension between the roller and the moment compensation device.

This apparatus permits a control of the web tension with minimal movements of the dancing roller, which do not require any more damping and which bring about an extremely stable control of the median web tension between the roller and the moment compensation device. Extreme web tension fluctuations are reliably equalized within the range between the moment compensation device and the feeding roller following the dancing roller, if the web tension peaks between the roller and the moment compensation device do not lead in case of pull-sensitive webs to a web extension beyond the elastic range or even to a tearing of the web. The disturbance-free feeding of pull-sensitive webs brings about certain difficulties and cannot be obtained always under all occurring operating conditions. A further drawback of this apparatus resides in the fact that, for restarting after an emergency braking, as well as upon inserting a new web, particular measures must be taken in order to render ineffective, temporarily, the control. At first, the brake must be switched off, so that the roller can rotate freely, then the counterpressure roller of the first feeding roller serving as a moment compensation device must be lifted, so that the web can be fed to the second feeding roller or can be pulled taut and when it is retained in the direction of movement forwardly, by the return rotation of the roller, the dancing roller is lifted into its normal position and thereafter the counterpressure roller is lowered again and the brake is again switched on. The performance of these particular measures with mechanical means in the manner of a follow control requires a certain not appreciable expenditure.

It is one object of the present invention to provide an apparatus for damping of tensile stress fluctuations and for control of the web tensions of unrolling devices, wherein these drawbacks of the known structures are eliminated and the possibility is created to roll off material with different security and expansion characteristics. In order to obtain this end, the problem must be solved, to make variable the effect of the moment compensation device on the web and the value of the moments to be compensated, respectively, so that web tensions which are extremely low, as well as median web tensions which surpass a settable limit value between the roller and the moment compensation device move beyond those and can influence the dancing roller directly for the purpose of an accelerated control.

It is another object of the present invention to provide an apparatus for damping of tensile stress fluctuations and for control of the web tension on braked unrolling devices, for webs of flexible material by means of a dancing roller, which is disposed between a feeding roller serving as moment compensation device and a second feeding roller serving the drive of the web, which is arranged in such manner, that between the moment compensation device and its drive, in accordance with the present invention, a slip coupling with settable or controllable moment, for instance a magnet coupling or an induction coupling is disposed.

It is still another object of the present invention to provide an apparatus for damping of tensile stress fluctuations and for control of the web tension on unrolling devices, wherein devices for variation of the winding angle of the web about the feeding roller serving as moment compensation device, for instance, guide rollers swingable about the feeding roller, are provided, with the assistance of which the winding angle of the web about the moment compensation device, and thereby the friction moment between the web and the moment compensation device is settable or controllable.

The effect of the last-mentioned device can be advantageously supported by a blowing ledge, which is swingable jointly with the guide rollers, is disposed in the incoming split between the moment compensation device and the web such, that it produces an air pillow between the web and the moment compensation device.

With these and other objects in view, which will become apparent in the following detailed description, the present invention, which is shown by example only, will be clearly understood in connection with the accompanying drawing, in which the only FIGURE is a schematic view of an unwinding device with a moment limitation between a moment compensation device and its drive.

Referring now to the drawing, the apparatus comprises a roller 1 from which a web 2 is fed by means of a spring-biased roller 3 and a first feeding roller 4 serving as a moment compensation device over a dancing roller 5 and by means of a second feeding roller 6 to a working machine (not shown). The feeding rollers 4 and 6 are driven with an equal number of revolutions in the same rotary direction by means of a driving gear 7 with the help of gears 8 and 9. The diameter of the feeding roller 4 is less than 3 percent preferably less than 0.3 percent larger than the diameter of the feeding roller 6, so that the peripheral speed of the feeding roller 4 is slightly larger, than the peripheral speed of the feeding roller 6. It is obvious that the larger peripheral speed of the feeding roller 4 can be obtained also by corresponding drive transmissions at equal or smaller diameter than the feeding roller 6.

The dancing roller 5 is secured to a two-armed level 12 mounted in a lever bearing 11, which lever 12 causes by means of a brake mechanism 13 or another transmission device a braking of the roller 1, if the dancing roller 5 is lowered, while the braking is released when the dancing roller 5 is raised. It is to be understood, that by means of the dancing roller 5, not only a core braking of the roller 1, but under circumstances also a peripheral braking of the roller 1 can be brought about.

Between the gear 8 and the feeding roller 4 is arranged a slip coupling 10, the slipping moment of which is adjustable. The function of this control is as follows:

If the web tension on a first web section between the roller 1 and the feeding roller 4 serving the moment compensation corresponds with the reference value or nominal value, the expansion of the second web section between the roller 1 and the feeding roller 4 corresponds also with the expansion caused by the load of the web 2 by the dancing roller 5 between the feeding roller 4 and the feeding roller 6. In the slip coupling 10, a slip occurs which corresponds with the peripheral speed difference between the feeding roller 4 and the feeding roller 6, so that both feeding rollers rotate with equal peripheral speed.

If the web tension in the first web section increases between the roller 1 and the feeding roller 4 up to the slip moment set on the slip coupling 10, then also the expansion of the web in this section increases and the expansion difference between nominal expansion and the actual expansion reaches the second web section between the feeding rollers 4 and 6 with a slight reduction of the slip in the slip coupling 10. In this second web section, the expansion of the web is equalized, the dancing roller 5 is slightly raised and, thereby, the braking of the roller 1 is reduced.

If the web tension increases for a short period above the value, which is preset by the set slip moment of the slip

coupling 10 as well as by the load of the web 2 by the dancing roller 5, then the web 2 is braked, the slip in the slip coupling 10 increases and the dancing roller 5 is raised by reducing of the winding due to constant unrolling of the web 2 by the feeding roller 6 and the expansion compensation in the winding quickly and, nevertheless, for a small path only, which makes superfluous the damping of the dancing roller movement, so that the braking of the roller 1 is quickly reduced. The control is, thereby, completely stable, since first the additional non-damped influence of the dancing roller 5 is lower than the damping influencing of the dancing roller 5 by the expansion compensation, and furthermore, after the reduction of the web tension peak directly and alone the dampened influencing of the dancing roller 5 by the expansion compensation becomes effective.

By the reduction of the web tension, at first the control over the expansion effect takes place upon stronger reduction, a faster feeding of the web section fed into the winding is brought about by a reduction of the slip, so that in both cases the dancing roller 5 is lowered and the braking of the roller 1 is increased. If no web tension is present, for instance, after a quick braking and an emergency braking, respectively, after a web tear or during insertion of a new web, then in accordance with the laws of rope friction, no friction between the feeding roller 4 and the web 2 occur and during insertion of a new web with standing feeding rollers 4 and 6, respectively, the feeding roller 4 can, upon engagement of the web with the slip coupling 10, freely rotate, so that the new web 2 can be inserted without prevention by the roller 4 since it can freely rotate over slip coupling 10 and without any particular measures.

Suitable slip couplings can be automatically adjusted or controlled by the web tension or by other values.

By example, the switching-on of the slip coupling with the switching and control of the driving machine, can be obtained electrically or mechanically.

With the device in accordance with the present invention, it can be assured that the web tension cannot go below and not above the limit value determined by the slip moment, without starting an accelerated control and that the permissible tension limit value can be set selectively by setting of the devices determining the slip.

The slip makes possible a disturbance-free restarting after an emergency braking, as well as a comfortable and fast insertion of a new web.

While I have disclosed several embodiments of the present invention, it is to be understood, that these embodiments are given by example only and not in a limiting sense.

I claim:

1. An apparatus for damping of tensile stress variations and for control of the web tension on braked unwinding devices for webs of flexible material, as paper, plastic foils, and the like comprising

a first feeding roller and a second feeding roller,

a roll of web material to be unwound,

a brake means for said roll of web material,

a means for actuating said brake means,

a dancer roller disposed between said first feeding roller and said second feeding roller and connected with said means for actuating said brake means,

said first feeding roller being arranged on the side of said roll of web material and serving as a moment compensation device,

said second feeding roller serving as a feeding device for the web,

said web passing from said roll of web material being unwound therefrom to said first feeding roller, said dancer roller and said second feeding roller, in that order,

a gear for driving said first and second feeding rollers, and

a slip coupling operatively disposed between said first feeding roller and said gear.

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