

①⑫ **EUROPEAN PATENT APPLICATION**

②① Application number: 83303950.6

⑤① Int. Cl.³: **B 65 H 23/24**

②② Date of filing: 06.07.83

③⑩ Priority: 08.07.82 US 396268

④③ Date of publication of application:
25.01.84 Bulletin 84/4

⑧④ Designated Contracting States:
AT BE CH DE FR GB IT LI NL SE

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⑤④ A method and apparatus for winding a running web of material onto a winding roll.

⑤⑦ A method and apparatus of winding a running web of material onto a winding roll to eliminate entrained air which becomes trapped between the layers of the web material as they are wound onto the roll wherein fluid pressure is applied to the running web in the vicinity of where the running web is placed in contact with the winding roll.

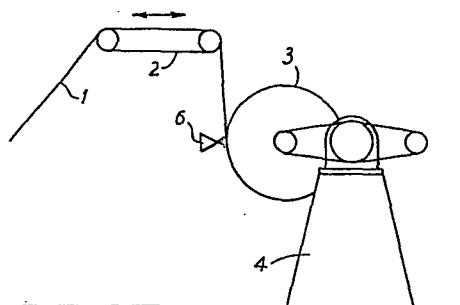


FIG.2

A METHOD AND APPARATUS FOR WINDING A RUNNING WEB OF
MATERIAL ONTO A WINDING ROLL

The present invention relates to a method and apparatus for winding a running web of material onto a winding roll in a tight and uniform manner. More particularly, the present invention is directed to a method of
5 substantially eliminating entrained air which becomes trapped between the layers of a web material as it is wound onto a winding roll.

When winding a running web of material onto a winding roll at very high speeds difficulty has been encountered in effecting a tight and uniform roll because
10 entrained air becomes trapped between the various layers of web being wound onto the reel. Thus, for example, on a high speed coating machine producing pressure-sensitive papers, difficulty has been experienced in winding straight
15 and tight rolls. The resulting loose wind causes the layers of the paper within the roll to move relative to each other. The result is manifested as a telescoped roll and damage to the paper surfaces caused by slippage between the respective surfaces of the paper as it is
20 wound onto the reel.

Two methods which have been utilized to control the air entrainment problem involve either increasing the tension in the running web of material or utilizing a contact roll to expel the air from between the web layers
25 immediately after a running web of material makes contact with a previously wound layer. However, both of these

methods have been found to be unsuitable for winding a running web of material, particularly when the web material is a paper web such as pressure sensitive paper. The use of increased tension frequently results in permanent, 5 undesirable sheet distortion in the web product and the use of a contact roll causes premature imaging of carbonless paper in rolls where the minor differences in cross machine profile are present. The imaging is caused by excessive pressure at the areas of larger diameter.

10 The use of pressurized air in association with a running web is known from U.S. Patent 3,257,734 which discloses in Figure 5 thereof an apparatus for controlling tension in a supported sheet material wherein a portion of a web 22 is subjected to an air jet 24 supplied by a head- 15 er 33 before passing onto a dryer roll 23. In reviewing this Patent it can be readily observed that since the roll 23 is not a winding reel and since the source of air pressure is positioned remote from the roll 23, there is no recognition in this patent that air pressure can be 20 utilized to achieve the advantageous results as defined by the present invention. U.S. Patent 2,678,173 and 2,796,223 are cumulative in showing that although air pressure is utilized in association with a running web, there is no recognition of the advantages achieved in positioning a 25 source of air pressure in the vicinity of the point of contact between the running web and the winding roll to achieve a tight and uniform web roll, particularly a tight

and uniform roll of carbonless paper which is substantially free of premature imaging, and the like.

An object of the present invention is to provide an improved method and apparatus for winding a running web
5 of material onto a winding roll in a tight and uniform manner.

Another object of the present invention is to provide an improved method and apparatus of eliminating entrained air which becomes trapped between the layers of
10 a running web of material as it is wound onto a winding roll.

A further object of the present invention is to provide an improved method and apparatus for winding a running web of material onto a winding roll whereby significantly harder rolls can be obtained at an increased
15 winding speed.

Still another object of the present invention is to provide an improved method and apparatus for winding a web of pressure sensitive paper onto a winding roll which
20 eliminates undesirable sheet distortion in the wound product and avoids premature imaging of the pressure sensitive paper as a result of excessive pressure being applied to the running web.

According to the present invention a method of
25 winding a running web of material onto a winding roll in a tight and uniform manner by substantially eliminating entrained air which becomes trapped between the layers of

the web material as they are wound onto the roll comprises applying a fluid pressure to the running web in the vicinity where the running web enters the winding roll.

The fluid pressure can be, for example, pressurized
5 air supplied by an air knife and advantageously located slightly past the point of contact between the incoming web and the paper roll or reel. The high pressure air pad formed by the air knife expels the entrained air from between the web layers immediately after the web enters
10 the reel. Because there is no physical contact between a structural element and running web for forcing the web against the roll, the damage normally experienced with the use of a contact roll is avoided. The air pressure can be supplied to the air knife at a pressure which is suffi-
15 ent to achieve a tight and uniform winding of the web material onto the winding roll. Obviously, the pressure of the air can be reduced if the gap between the air knife and the surface of the web is narrowed. Alternatively, if the size of the gap is increased, then a greater amount
20 of air pressure will be required to achieve a uniform and significantly harder roll. Advantageously, the air pressure can vary from about 14 to 55 Kilo Pascals (about 2 to 8 psi) at the air knife with a gap varying from about 5 to 13 millimetres (about 3/16 to 1/2 inch) between the air
25 knife and the surface of the winding roll. Desirably, the air pad provided by the air knife is located approximately 13 millimetres (about 1/2 inch) past the point of contact

of the incoming web to the reel. Not only has the method and apparatus of the present invention been successful in producing significantly harder web rolls, but it has also been found that the speed of the winding machine can be
5 considerably increased by as much as 300 feet per minute while at the same time maintaining the desired roll quality.

The invention has particular advantages for the reeling of webs at speeds in excess of 600 metres per
10 minute and is of especial benefit for speeds in excess of 800 metres per minute.

The invention can be performed in many ways but one embodiment will now be described by way of example and with reference to the accompanying drawings in which :-

15 Figure 1 shows a known winding system wherein a pressure roll is utilized to force the running web against the winding roll; and, Figure 2 is illustrative of the present invention wherein a source of air pressure is utilized
20 zed to force the running web of material against the surface of the winding roll.

To determine the ability of air pressure to expel extrained air from between layers of paper, several layers of paper were wound around a large roll and a web
25 of paper was then wrapped partially over this roll and would normally. The motor load current and the web tension changes caused by the web slippage between the paper

wound roll and the web were then measured. With the use of an air knife and a large pipe with holes drilled therein as the distribution device, the air pressure was turned on and off with significant changes in tension and motor
5 current being noted when the use of air pressure was compared with no air pressure.

Referring now to the drawings wherein the same reference numerals are used throughout the various Figures to indicate like elements, Figure 1 shows the problem
10 which presently exists in high speed winding systems when utilizing a pressure roll 5 for forcing a running web of material 1 against the surface of the winding roll 3 which is supported by the winder 4. A retractable carriage 2 is utilized to position the running web for introduction onto
15 the winding roll 3. The contact roll 5 shown in Figure 1 is illustrative of the problem which the present invention is intended to obviate. Thus, the contact roll, through its pressure against the surface of the winding roll 3 causes premature imaging of carbonless paper being wound
20 onto the roll where the minor differences in cross machine profile are present. This imaging is caused by excessive pressure in the points of larger diameter. Replacement of the contact roll shown in Figure 1 with a source of pressurized air, such as an air knife 6 as shown in Figure 2,
25 and which produces a pad of air, eliminates the concentration of pressure in spots of larger diameter and thus avoids premature imaging created with the use of contact

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pressure rolls. The air knife extends transversely across the running web and provides a pad of air across the web with a pressure of about 15 to 55 Kilos as required to produce the desired tight roll of material.

CLAIMS

1. A method of winding a running web of material onto a winding roll in a tight and uniform manner by substantially eliminating entrained air which becomes trapped
5 between the layers of the web material as they are wound onto the roll, which comprises applying a fluid pressure to the running web in the vicinity where the running web enters the winding roll.

2. A method as claimed in claim 1 wherein the web of
10 material is paper.

3. A method as claimed in claim 1 or claim 2 wherein the web of material is carbonless paper.

4. A method as claimed in claim 1, 2 or claim 3 wherein the fluid pressure is air pressure.

15 5. A method as claimed in claim 4 wherein the air pressure is applied to the running web slightly past the contact point of the running web with the roll.

6. A method as claimed in claim 5 wherein the air pressure is about 14 to 55 Kilo Pascals (approximately
20 2-8 psi).

7. Apparatus for winding a running web of material onto a winding roll in a tight and uniform manner by substantially eliminating entrained air which becomes trapped between the layers of the web material as they are wound
5 onto the roll, which comprises a web winding roll, feed means for introducing a running web of material onto the web winding roll, and fluid pressure means to apply pressure to the running web in the vicinity where the web contacts the winding roll.
- 10 8. Apparatus as claimed in claim 7 wherein the non-contact pressure means is a pressurized air supply means.
9. Apparatus as claimed in claim 8 wherein the air supply means is an air knife.
10. Apparatus as claimed in claim 8 or claim 9 wherein
15 a small gap is provided between the air supply means and the web winding roll.
11. Apparatus as claimed in claim 7, 8, 9 or 10 wherein the feed means is a retractable carriage which conveys the running web to the web winding roll.

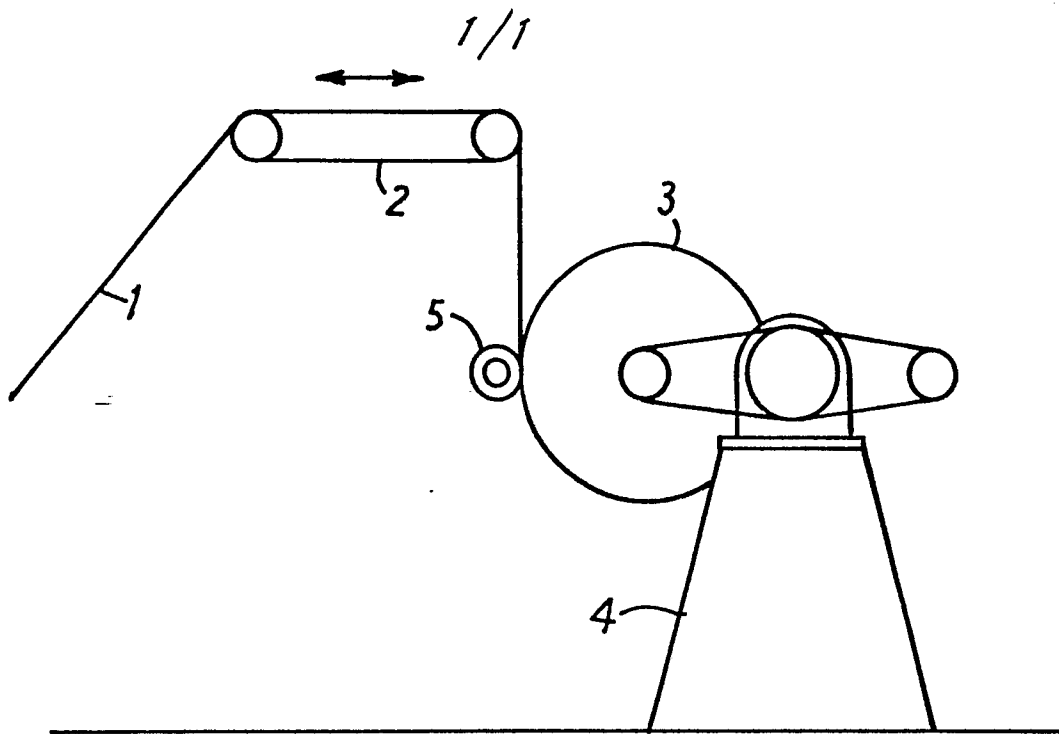


FIG. 1

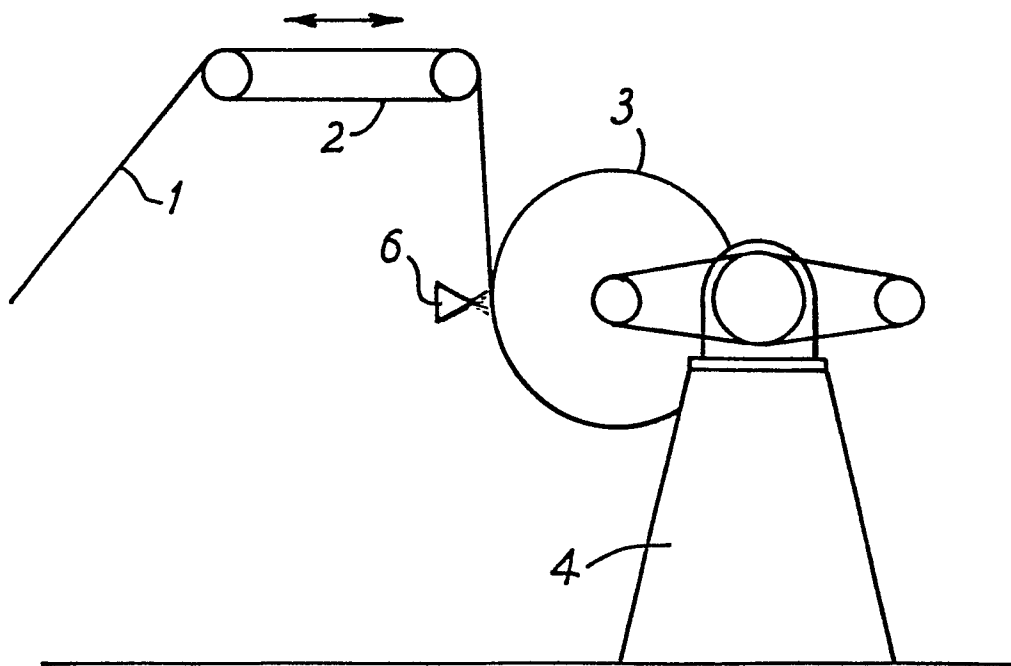


FIG. 2