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(71) Applicant : **The Wiggins Teape Group Limited**
P.O. Box 88 Gateway House Basing View
Basingstoke Hampshire RG21 2EE (GB)

(72) Inventor : **Hodgson, David**
8 Swn-Y-Nant, Pencoed
Bridgend, Mid-Glamorgan, South Wales (GB)
Inventor : **Clemett, David Alun**
Twyn Shippin, Heol Spencer, Coity
Bridgend, Mid-Glamorgan, South Wales (GB)

(74) Representative : **Bridge-Butler, Alan James et al**
G.F. REDFERN & CO. High Holborn House
52/54 High Holborn
London WC1V 6RL (GB)

(54) Improvements in apparatus for limiting the entrainment of air between the turns of a reel of web material during the reeling thereof.

(57) A lay-on roll (7) for co-operative engagement with a reel of pressure-sensitive sheet material carrying chemical residues during the reeling of said material, so as substantially to prevent the entrainment of air between the turns of said sheet material as they form on the reel, comprising a cylindrical support shell, a resilient base layer (31) of material carried by said support shell (30) and having a compressibility within a range to prevent said air entrainment at the reeling speed without damage to the sheet material, and a surface layer (32) substantially thinner than said base layer, of flexible material inert to said chemical residues.

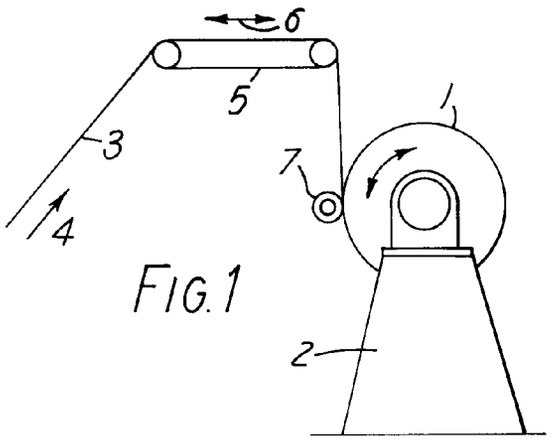

FIG. 1

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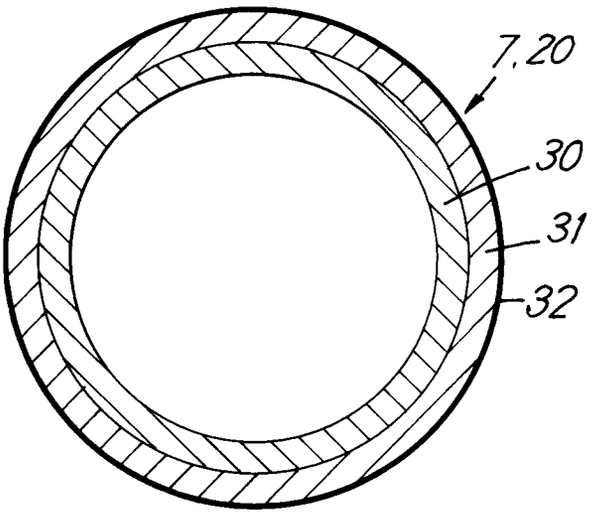

FIG.3

The present invention relates to improvements in apparatus for reeling web material, and more particularly pressure-sensitive sheet material such as carbonless copying paper, without damage thereto and so as to limit the entrainment of air between the turns of the reel.

When reeling a running web of material at very high speed, difficulty has been encountered in forming a tight and uniform reel due to entrained air being trapped between the various turns of material being wound onto the reel. Particular problems have occurred in the reeling of pressure-sensitive carbonless copying papers. Such papers are susceptible to damage and also for functional reasons, utilise a relatively impervious base sheet, the impermeability then being further enhanced by the application of coatings to one or both sides of the sheet.

The air trapped between the turns of the reel acts effectively as a lubricant so as to permit the turns to move axially relative to each other. The result is manifested as a telescoped roll and damage to the carbonless paper caused by slippage between the paper surfaces as the paper is wound onto the reel.

Three techniques have previously been proposed to control the air entrainment problem. First, tension in the running web of material has been increased. This however results in permanent undesirable sheet distortion in the product. Secondly, a relatively hard rubber covered roll has been used to contact the reel immediately after the running web of material makes contact with the previously wound layer so as to expel air from between the turns of the reel as they form. The use of such a contact roll however has been found to produce premature imaging of carbonless paper in reels where minor differences in cross machine profile are present. The imaging is caused by excessive pressure at the areas of larger diameter.

Thirdly, a planar jet of pressurised air has been directed at the reel at the point immediately after a running web of material makes contact with a previously wound layer. However, it was found impossible to stabilize the jet across the width of the reel sufficiently to expel air from between the turns of the reel.

Reference is also made to United States Patent No. 3304017 and European Patent Application No. 83303950.6 (Publication No. 99242) as being of relevance particularly to the second and third prior art techniques described above.

It is among the objects of the present invention to provide an apparatus which is capable substantially of preventing the entrainment of air between the turns of a reel during the high speed reeling thereon of pressure sensitive material carrying chemical residues without damage to such sheet material or chemical degradation of the apparatus.

The invention therefore provides a lay-on roll for cooperative engagement with a reel of pressure-sensitive sheet material carrying chemical residues during the reeling of said material, so as substantially to prevent the entrainment of air between the turns of said sheet material as they form on the reel, comprising a cylindrical support shell, a base layer of material carried by said support shell and having a compressibility within a range to prevent said air entrainment at the reeling speed without damage to the sheet material, and a surface layer, substantially thinner than said base layer, of flexible material inert to said chemical residues.

The base layer may for example comprise a layer 16 to 18 mm thick of a chlorosulphonated polyethylene, such as that sold under the Registered Trade Mark "HYPALON" by Du Pont (UK) Limited. The hardness of the base layer is preferably within the range 30-40°, and optimally 35° Shore hardness.

The surface layer is typically 2 mm thick and may be formed from a vinylidene fluoride-hexafluoro propylene copolymer such as that sold under the Registered Trade Mark "VITON" by Du Pont (UK) Limited. The surfacing layer preferably has a Shore hardness of 50-60° and is optimally 55°. The material used affords good release, high wear resistance and resistance to any solvent residues which may be present on the paper.

The invention will now be further described with reference to the accompanying drawing in which:-

Figure 1 is a diagrammatic side elevation of a simple paper reeling apparatus embodying a lay-on roll according to the invention,

Figure 2 is a diagrammatic sectional side elevation of a rewind apparatus for sheet material embodying a flying splice in which the bump roll is constructed according to the invention so as to also function as a lay-on roll and,

Figure 3 is a sectional end elevation of a lay-on roll constructed according to the invention.

Referring first to Figure 1, the winding roll 1 is supported by a winder 2 so as to reel a sheet 3 of carbonless copying paper moving in the direction of the arrow 4 from a coating machine (not shown). A retractable carriage 5 movable in the direction of the arrow 6 is used to position the paper sheet 3 for introduction onto the reel 1. Immediately after the sheet 3 enters into contact with the reel 1, pressure is applied thereto by a lay-on roll 7 which is described below in further detail with reference to Figure 3.

Turning now to Figure 2, this shows a diagrammatic sectional side elevation of a well known paper machine winder system, incorporating a flying splice, and which embodies a bump roll which is constructed according to the invention so as to also function as a lay-on roll.

Referring to the drawing, this shows a base 10 carrying support trunnions 11 between which is journalled a shaft 12. Rotatable about the shaft 12 are a pair of diametric arms 13 (one being shown in the drawing) between the ends of which are journalled a

pair of reeling spindles 14. Also journalled about the shaft 12 is a second pair of diametric arms 15 (one being shown in the drawing) between the ends of which are journalled a pair of guide rolls 16.

Juxtaposed adjacent to the arc of movement of the spindles 14 about the shaft 12 are a pair of trunnions 17 which can be rocked about a shaft 18 by a piston and cylinder unit 19. A bump roll 20 is journalled for rotation between the trunnions 17. Immediately above the bump roll 20, an arm 21 carrying a knife 22 is journalled for rotation about a shaft 23 by a piston and cylinder unit 24.

The construction and operation of the winder shown in Figure 2 is well known and its operation will therefore only be briefly described. A spindle 14 is first mounted for rotation between the ends of the arms 13 and a strip of self-adhesive tape (not shown) applied thereto along its length. Assuming that a similar spindle extending between the other extremities of the arms has already had reeled thereon a reel 26 of the desired diameter, the arms 13 and 15 are simultaneously rotated in the direction of the arrows 25. This causes the completed reel 26 to move to the position shown in Figure 2 and to draw the tail of paper 27 round one of the guide rolls 16 after passage around fixed guide rolls 28 and 29 from a paper coating machine (not shown). In doing so, the sheet 27 passes close to but not in contact with the empty spindle 14 carrying the adhesive tape. The piston and cylinder units 19 and 24 are then operated substantially simultaneously so as to cause the bump roll 20 to force the sheet 27 into contact with the empty spindle 14 whilst the knife 22 cuts the sheet at the point 29. The new leading end of the sheet adheres to the adhesive strip and winding of a new reel then commences on the new spindle 14. The completed reel 26 is removed and a new, empty spindle mounted between the ends of the arms 13.

In the conventional operation of the apparatus shown in Figure 2, the pistons 19 and 24 are then retracted so as to cause simultaneous retraction of the bump roll 20 and knife 22. However when using a bump roll 20 constructed according to the invention and as described below with reference to Figure 3, the bump roll is left in contact with the sheet 27 as it is wound onto the spindle 14. It then acts as a lay-on roll so as to expel air from between the turns of the reel.

Turning now to Figure 3, this shows the construction of a roll which may be used either as the lay-on roll 7 of Figure 1 or the bump roll 20 of Figure 2. The roll consists of a cylindrical steel support shell 30 carrying a resilient base layer 31 and a resilient surfacing layer 32. The base layer is preferably about 16 to 18 mm thick and comprises a synthetic resin material having a hardness of about 35° Shore. The resin material may comprise chlorosulphonated polyethylene (including suitable additives to achieve the desired hardness) sold by Du Pont (UK) Limited under the Registered Trade Mark "HYPALON".

The surfacing layer 32 has a hardness of about 55° Shore and a thickness of about 2 mm. It may be formed from a vinylidene fluoride-hexafluoro propylene copolymer sold by Du Pont (UK) Limited under the Registered Trade Mark "VITON". The surfacing layer affords good release properties, high wear and high resistance to degradation by solvent residues which may be present on the paper.

It has been found that by using a lay-on roll or bump roll according to the invention, substantial increases in the winding speed of carbonless copying paper may be achieved so as to form a tightly wound and uniform reel without degradation of the roll or damage to the paper. Thus for example and depending on the grade of paper being reeled, both winding and splicing may be achieved at speeds of in excess of 1,000 metres/min.

Claims

1. A lay-on roll for co-operative engagement with a reel of pressure-sensitive sheet material carrying chemical residues during the reeling of said material, so as substantially to prevent the entrainment of air between the turns of said sheet material as they form on the reel, comprising a cylindrical support shell, a resilient base layer of material carried by said support shell and having a compressibility within a range to prevent said air entrainment at the reeling speed without damage to the sheet material, and a surface layer substantially thinner than said base layer, of flexible material inert to said chemical residues.

2. A lay-on roll as claimed in Claim 1, in which said base layer is of chlorosulphonated polyethylene 16 to 18 mm thick.

3. A lay-on roll as claimed in Claim 1 or Claim 2, in which said base layer is within the range 30 - 40° Shore hardness.

4. A lay-on roll as claimed in Claim 3, in which said base layer is of 35° Shore hardness.

5. A lay-on roll as claimed in Claims 1 to 4, in which said surface layer is 2 mm thick.

6. A lay-on roll as claimed in Claim 5, in which said surface layer is formed from a vinylidene fluoride-hexafluoro propylene copolymer.

7. A lay-on roll as claimed in Claims 1 to 6, in which the surface layer has a 50 - 60° Shore hardness.

8. A lay-on roll as claimed in Claim 7, in which the

surface layer has a 55° Shore hardness.

9. A paper reeling apparatus incorporating a lay--on roll as claimed in any one of the preceding Claims.

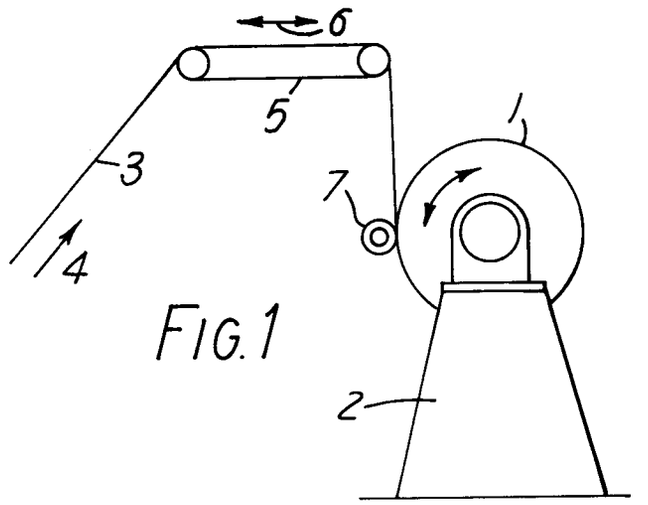

FIG.1

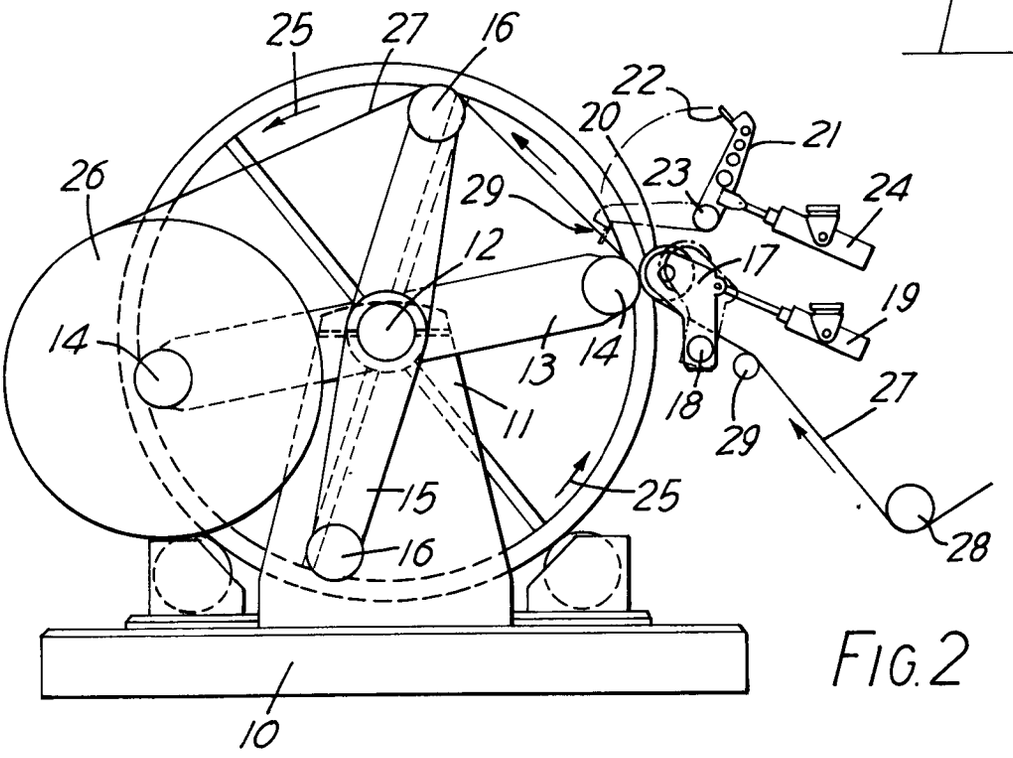

FIG.2

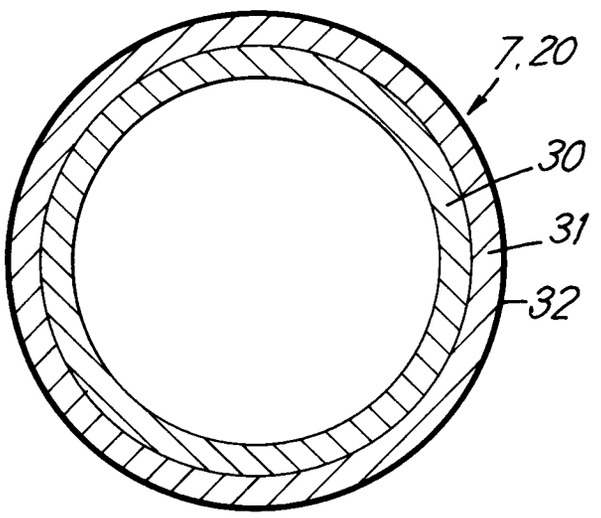

FIG.3

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EUROPEAN SEARCH REPORT

Application Number
EP 92 30 5971

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	EP-A-0 393 519 (HOECHST AKTIENGESELLSCHAFT) * the whole document *	1,9	B65H27/00 B65H18/26
A		2-8	

Y	DE-A-3 437 553 (ROGERS CORP.) * abstract; figures 1,2 *	1,9	
A		2-8	

A	US-A-4 841 613 (BEERY; BROOKSTEIN) * the whole document *	1-9	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06 OCTOBER 1992	MADSEN P.

CATEGORY OF CITED DOCUMENTS

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