

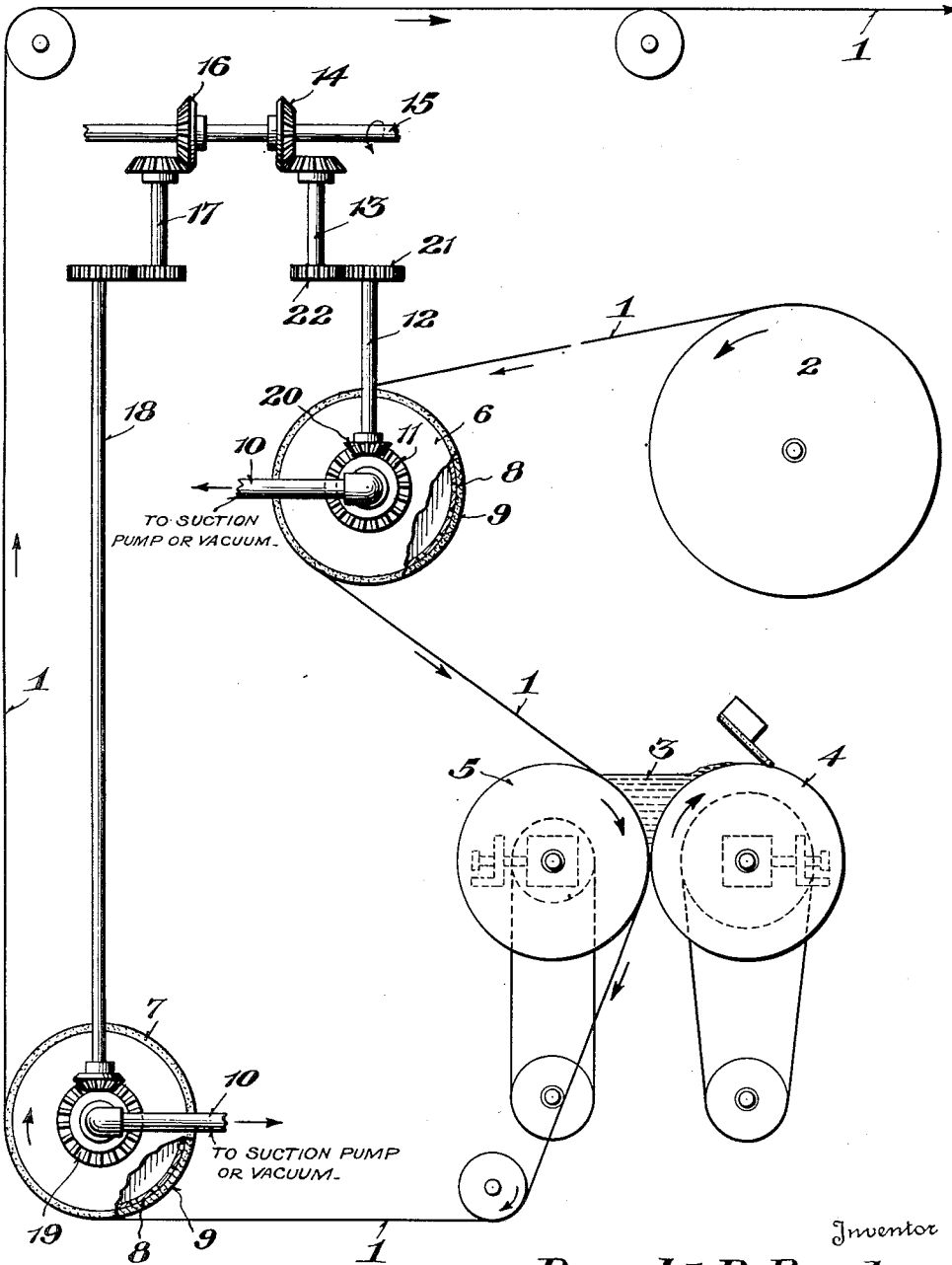
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WEB TENSIONING APPARATUS

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WEB TENSIONING APPARATUS

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4 Claims. (Cl. 91—43)

This invention relates to web tensioning apparatus; and it comprises an improvement in continuous paper treating apparatus, such as a roll coating machine, wherein the paper, while passing over a treating roll in such apparatus, is subjected to tension, said improvement comprising a pair of suction rolls, one on the entry side of the treating roll, the other on the exit side thereof, the suction rolls engaging the web and being capable of exerting traction thereon, said rolls running at slightly different peripheral speeds, thereby exerting a tension on the web while passing the treating roll sufficient to stretch the web to the same length across the entire width of the web, and means being provided to regulate the relative speeds of rotation of the rolls; all as more fully hereinafter set forth and as claimed.

The proper control of tension in treating webs of paper (such as, for example, in a coating operation employing coater rolls) to avoid or overcome wrinkles, cockles or other irregularities has always presented difficulties. In coating paper, a thin layer of a liquid aqueous mixture of fine mineral matter such as clay, and an adhesive is applied to one or both sides of paper and is afterwards dried in place. This is sometimes done by rolls coating a continuously passing web of paper. The difficulties are especially pronounced when, as is very frequently the case, the paper web is longer or shorter at the edges than in the middle. Not only are these defects objectionable in themselves, but what is often worse, they frequently make it quite impossible to secure a satisfactory coating job. One common method of regulating tension on a web when the paper is unwound from a stock roll is by means of a brake on the unwinding roll, but this method is open to the objection that the tension continually changes as the roll of paper becomes smaller in diameter. The expedient of passing the paper around a series of fly rolls is also used, but this method in common with others is not very positive and besides is apt to put the paper under tension over too long a span, which is particularly undesirable in case the paper is wet.

In the present invention instead of maintaining much tension on the web for a considerable distance before and after the coater rolls, I employ local tension means close to the coater rolls; a pair of special suction rolls exerting traction, one just ahead of the roll coating device, called the feed roll and the other just behind the device, called the delivery roll. Sufficient suction is maintained on these rolls to prevent any gen-

eral sensible slippage of the paper around either of the rolls during the coating operation, and the relative peripheral speed of the two rolls is positively regulated to stretch the web varying amounts depending upon the uniformity of the length of the paper all across the width of the web. Thus a short edge is stretched out until it has approximately the same length as the rest of the paper. The paper behind the feed roll and beyond the delivery roll is allowed to travel under low tension. In coating operations using paper stock commonly employed for making coated paper of moderate weight, I find that a peripheral speed of the delivery roll about 0.3 per cent greater than the peripheral speed of the feed roll gives about the right amount of tension. For very heavy papers, post cards, etc., it is sometimes desirable to increase this speed ratio and for extremely light weight papers a somewhat lower ratio may be advisable. Operating under these conditions the paper being coated at the time of coating becomes of uniform length, free from buckles and wrinkles and altogether is in a favorable condition for a good coating job. Also, by keeping the web under tension for a short time and span only, swelling of the paper, resulting from absorption of water during various treating processes, occurs for the most part after paper has been relieved of tension. No long stretches of damp paper are under tension.

In order to secure the results desired, I find it best to use atmospheric pressure in gripping the paper by the traction rolls; using rolls exercising suction on one side of the web. A pressure differential between the outer surface of the web and the interior of the suction roll of about 5 inches of mercury generally works well.

Any suitable type of suction roll may be used, but I have found it advantageous to use a roll uniformly perforated or slotted and covered with a layer of fibrous material—paper, cloth, etc., having a sufficiently low resistance to air flow to enable a satisfactory vacuum to be maintained on the paper web being tensioned and yet not so low as to permit excessive leakage through that part of the roll not enveloped by the web. I have found that a paper covering having a Gurley densometer value of 30–120 seconds is a very satisfactory covering. A suction roll of this type is much less expensive than more complicated types for producing localized peripheral suction; rolls equipped with internal or external valves for blanking off from the suction that part of the periphery of the roll that is not in contact with the web. However these can be used for the

present purpose. With the present type of roll however the power requirements and initial cost are low and the apparatus requires very little upkeep.

5 By the use of suction rolls to obtain tension on the web of paper, the traction on the paper is, so to speak, elastic. This allows the traction to accommodate itself at all points across the width of the paper; thereby diminishing danger of tearing.

10 In the accompanying drawing I have shown, more or less diagrammatically, web tensioning apparatus under the present invention applied to a particular roll coater; this coater being of the type described in my Patent No. 1,838,358. Its
15 application to this particular treating apparatus is merely exemplificatory; it being applicable to any other type of roller apparatus treating a web of paper where an imposed definite tension differential between the two sides of the apparatus
20 is desirable.

In this showing the view is in vertical section, certain parts being shown in elevation.

In this showing the paper treating apparatus proper to which the invention is applied is the
25 same as in the prior acknowledged patent. As illustrated a traveling web of paper 1 coming from a stock roll 2 passes down through a pool 3 of coating composition contained between the upper quadrants of two revolving rolls 4 and 5 being
30 therein coated with a layer of liquid coating material, such as for example, a mixture of clay and aqueous casein solution.

Tension is maintained on the web of paper passing through the roll coating apparatus just
35 mentioned by means of suction roll 6 and suction roll 7, respectively located before and after the coating apparatus. These two rolls as shown are alike in structure and consist of a perforated drum 8 covered by a layer of paper or fabric 9.
40 Each roll is provided with suction line 10 leading to a vacuum or suction pump, not shown. The two suction rolls are connected by intermediate gearing. As shown, the first (feed) suction roll 6 is provided with the bevel gear 11, meshing with
45 the pinion 20 on gear shaft 12. Mounted on the other end of shaft 12 is gear 21 which meshes with gear 22 on shaft 13. Gears 21 and 22 are advantageously replaceable, so as to allow a selected variety of speed ratios between suction
50 rolls 6 and 7. The other (delivery) suction roll 7 is also driven from the drive shaft 12 through the gear train 16, 17, 18, 19.

The train of gearing shown is so constructed, in the embodiment shown, as to produce a peripheral speed of traction roll 7 about 0.3 per cent greater than that of traction roll 6. In this particular embodiment of my invention the tension
80 on the web of paper just beyond roll 7 is very low and the paper is delivered to roll 6, also under very low tension.

While I have shown and described the tensioning means of the present invention as applied to a particular paper coating device (Bradner, 1,838,358), yet it is applicable in any other device where a web of paper or the like is passed over
90 treating means for any purpose and where it is desirable to stretch it out so as to have the same length across the entire width of the web.

What I claim is:

1. The combination with a web treating apparatus of two suction rolls adapted to engage the web, one being located on the entry side and one
95 being located on the exit side of said web treating apparatus, a source of suction connected to the rolls and means for driving the exit side suction roll at a greater peripheral speed than the other
100 suction roll.

2. Apparatus for tensioning a web of paper on a roll coating machine applying coating to said web comprising a leading suction roll to contact with said web prior to its contact with said coating
105 applying means, a delivery suction roll to contact with said web after its contact with said coating applying means, a suction pump connected to said rolls and means for positively driving said suction rolls the delivery roll being driven
110 at a peripheral speed greater than said leading suction roll.

3. As a means of tensioning a web of paper passing to, through and away from a roll coating device, a pair of traction rolls, one adapted to engage the incoming web and the other the outgoing web, each traction roll consisting of a perforated metal cylinder covered with a jacket of fibrous material and connected to a source of suction and means for driving the roll carrying
115 the outgoing web at a slightly but definitely greater peripheral speed than the roll carrying the incoming web.
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4. The apparatus of claim 3 in which the two suction rolls are connected by gear trains from a common driving means.
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