

May 5, 1942.

W. H. WYLIE

2,281,965

RECEIVING ROLL ADJUSTING MEANS FOR WEB WINDING MACHINES

Filed Feb. 28, 1941

2 Sheets-Sheet 1

Fig. 1.

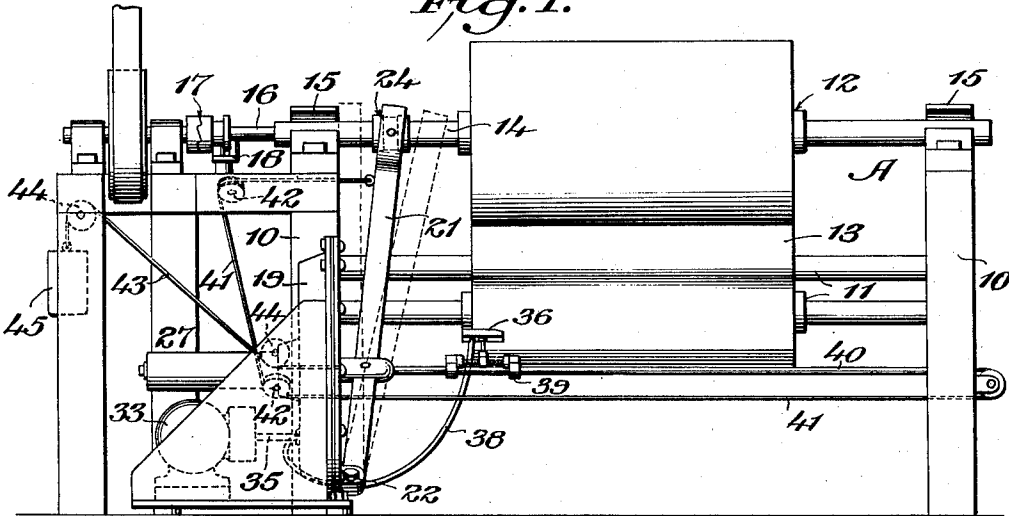


Fig. 8.

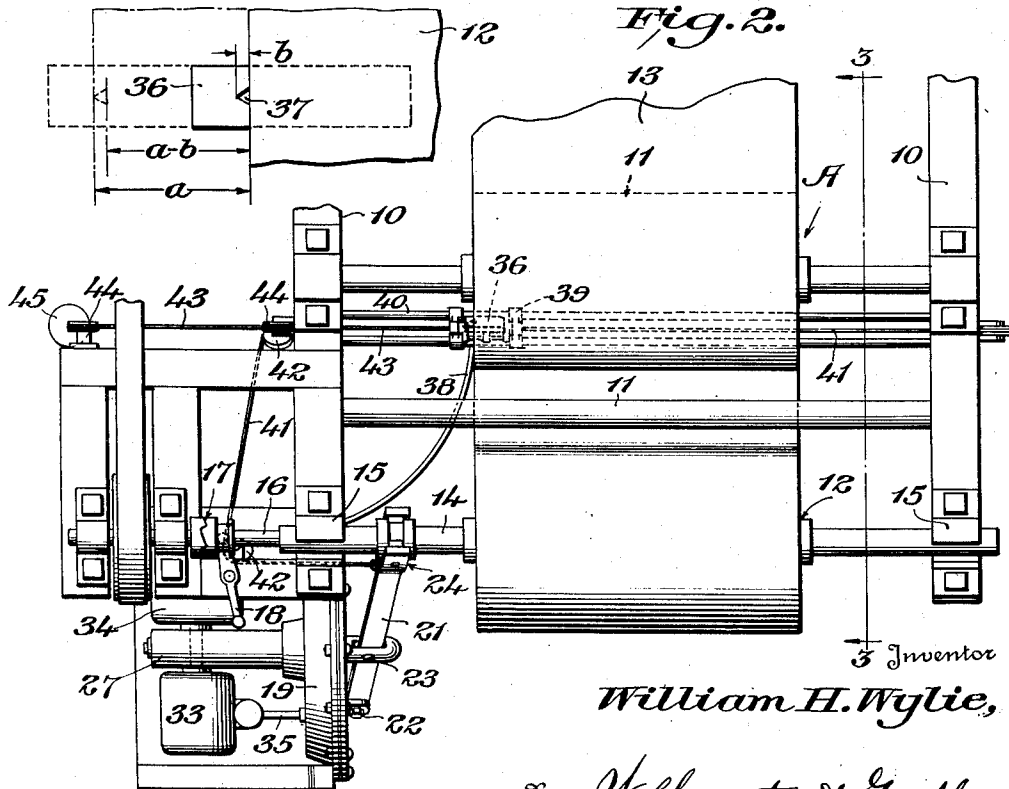
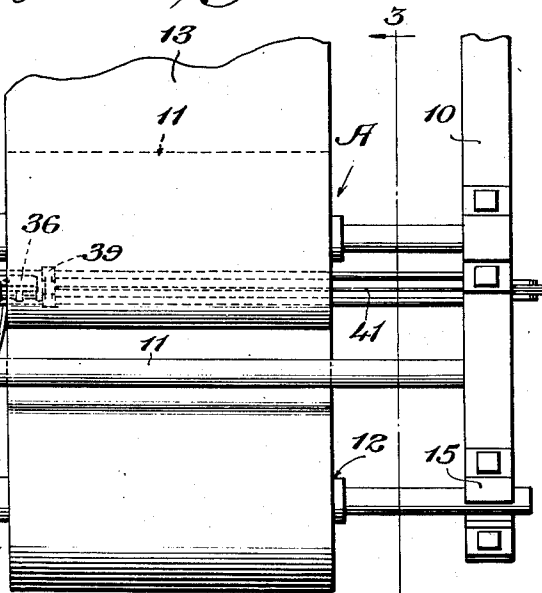


Fig. 2.



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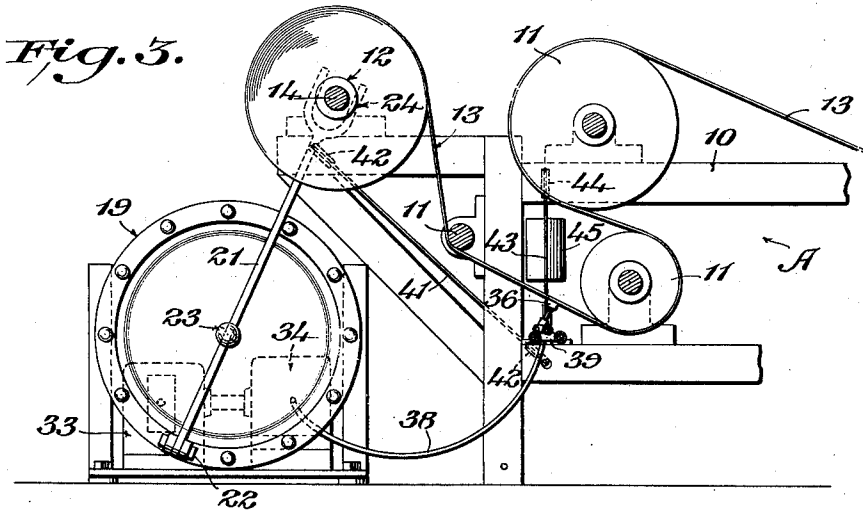
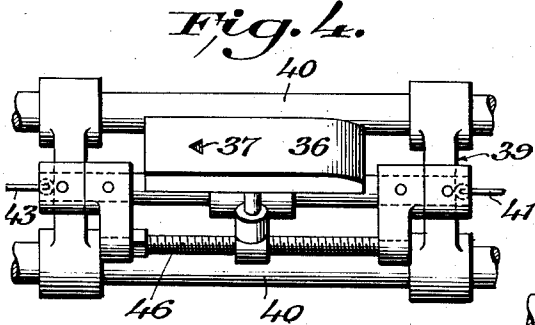
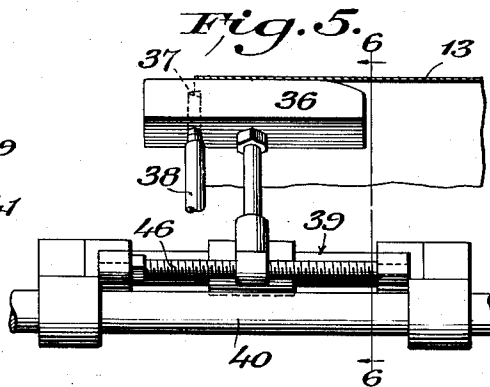
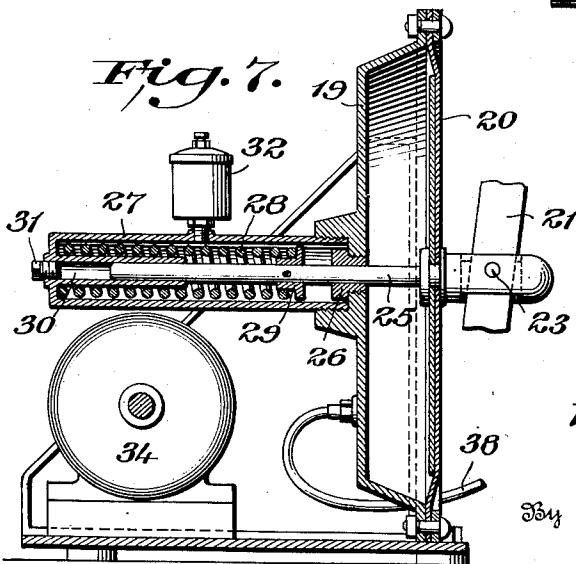
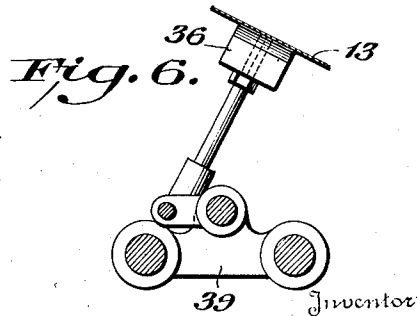
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2 Sheets-Sheet 2



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RECEIVING ROLL ADJUSTING MEANS FOR
WEB WINDING MACHINES

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Application February 28, 1941, Serial No. 381,141

7 Claims. (Cl. 242—76)

This invention relates to the art of winding paper or other sheet material in web form onto a receiving roll, and has for its general object to provide a simple, practical, reliable and efficient mechanism to adjust the receiving roll longitudinally in response to any occurring lateral deviation of the web as it approaches the roll to compensate for lateral deviation of the web, thus to insure edge alinement of the successive convolutions of the web at the ends of the wound roll.

A special object of the invention is to provide a mechanism for the purpose stated embodying a construction and mode of operation such that longitudinal adjustment of the receiving roll is effected quickly in response to lateral deviation of the web and in amount substantially equal to lateral deviation of the web at the receiving roll, thus to insure most exact edge alinement of the successive convolutions of the web at the ends of the wound roll.

With the foregoing and other objects in view, which will become more fully apparent as the nature of the invention is better understood, the same consists in a mechanism for the purpose stated embodying the novel combination and arrangement of features and parts as will be hereinafter more fully described, illustrated in the accompanying drawings and defined in the appended claims.

In the accompanying drawings, wherein like characters of reference denote corresponding parts in the different views:

Figure 1 is an end elevation of a web winding machine having operatively associated therewith a mechanism for the purpose stated constructed in accordance with one practical embodiment of the invention.

Figure 2 is a top plan view of the machine and mechanism shown in Fig. 1.

Figure 3 is a section on the line 3—3 of Fig. 1.

Figure 4 is an enlarged top plan view of the orifice block and the shiftable supporting carriage therefor comprising part of the receiving roll adjusting mechanism.

Figure 5 is a front elevation of the orifice block and its supporting carriage.

Figure 6 is a transverse section on the line 6—6 of Fig. 5.

Figure 7 is a central vertical section through the vacuum chamber and its related parts comprising part of the receiving roll adjusting mechanism; and

Figure 8 is a diagrammatic view illustrating

the differential movement of the orifice block with respect to the web.

Referring to the drawings in detail, A designates, generally, a portion of a web winding machine, illustrated in the present instance conventionally and by way of example as comprising a pair of side frames 10, 10, web guide rolls 11 supported by and between said side frames, and a web receiving roll 12, also supported by and between said side frames, to have wound thereon a web 13 of paper or other material which, in its travel to said receiving roll, is guided and tensioned by said guide rolls.

During travel of a web to a receiving roll the web usually deviates for one reason or another from a straight path, sometimes shifting laterally in one direction and sometimes in the opposite direction, and unless means is provided to compensate for such shifting the edges of different convolutions of the web on the roll will be undesirably disalined from one another.

According to the present invention the web receiving roll is, as aforesaid, shifted longitudinally to compensate for lateral shifting of the web in its travel to said roll, thus to insure edge alinement of the successive convolutions of the web at the ends of the wound roll, and in this connection the receiving roll may be mounted in any suitable manner for rotation and also for longitudinal shifting movement or adjustment. For example, the present receiving roll 12 is illustrated as being carried by a shaft 14 which is mounted for rotation and longitudinal sliding movement in bearings 15 carried by the side frames 10, 10.

The shaft 14 may be driven in any suitable manner to drive the receiving roll 12, and in this connection any suitable provision may be made to permit said shaft and the receiving roll carried thereby to be shifted or adjusted longitudinally while being driven. For example, and as illustrated in the present instance, the shaft 14 may be splined to a drive shaft 16 to be driven thereby and to be longitudinally adjusted relative thereto. In the drive shaft 16 may be interposed a clutch 17 operable by a lever 18 to connect and disconnect the receiving roll at will with and from the power source.

The present mechanism for adjusting the receiving roll 12 longitudinally in response to lateral deviation of the web 13 is of the vacuum type and includes a vacuum chamber 19 constituted in part by a diaphragm 20 which flexes in response to pressure variations in said chamber and which is operatively connected by a lever 21

with the shaft 14 whereby flexure thereof serves to longitudinally adjust said shaft.

The vacuum chamber 19 is mounted in any suitable manner in a fixed position in suitable proximity to the shaft 14 and the lever 21 is pivoted at one end, as indicated at 22, to any suitable fixed support, such as the vacuum chamber 19, and is operatively connected in any suitable manner intermediate its ends to the diaphragm 20, as indicated at 23, so that it swings in response to flexure of said diaphragm. At or near its other end said lever 21 is operatively connected to the shaft 14 in any suitable manner, as indicated at 24, whereby swinging movement thereof effects longitudinal movement of said shaft.

The diaphragm 20 constitutes one side of the vacuum chamber 19 and is flexible inwardly by atmospheric pressure when said chamber is subjected to a predetermined sub-atmospheric pressure and is flexible outwardly by suitable constantly acting spring means upon a predetermined rise in the sub-atmospheric pressure which constantly exists in said chamber during normal operation of the mechanism.

While any suitable spring means may be provided to tend constantly to urge the diaphragm 20 outwardly and to be effective to do so upon a predetermined rise in the sub-atmospheric pressure existing in the chamber 19, one practical spring means for this purpose may consist, as shown, of a stem 25 fastened to said diaphragm and extending through a guide 26 in the rear wall of the chamber 19 into a tube 27 fixed to said rear wall and having therein an expansion coil spring 28 one end of which bears against the outer end of said tube and the other end of which bears against a shoulder 29 on said stem 25.

The outer end portion of the stem 25 may be guided in a small tube 30 carried by the outer end of the tube 27 and said small tube 30 may be closed at its outer end by a removable plug or a suitable fitting 31 whereby it may be utilized for the supply of lubricant such as grease to the stem 25. In addition, the tube 27 may be provided, if desired, with an oil cup 32 for the supply of lubricating oil to the stem 25 and the spring 28.

Any suitable means may be provided to subject the vacuum chamber 19 to a sub-atmospheric pressure. However, a suitable and preferred means for this purpose may consist, as illustrated in the present instance, of an air pump 33 driven by an electric motor 34, said air pump having a connection with the chamber 19 as indicated at 35. The pump 33 is driven by the motor 34 at constant speed and therefore tends to exhaust air at a uniform rate from the chamber 19.

At some suitable location in the path of travel of the web 13 as it approaches the roll 12 is located a block 36 over which said web travels and which has therein an orifice 37 underlying a side edge of said web and connected with the vacuum chamber 19 by a flexible tube 38.

The block 36 is suitably supported for movement transversely with respect to the web 13 and is suitably connected with the lever 21 so as to be moved transversely with respect to said web in response to swinging movement of said lever to effect longitudinal adjustment of the shaft 14 and of the receiving roll carried thereby. In this connection and as illustrated by way of example in the present instance, the block 36

may be mounted upon a carriage 39 which may, in turn, be slidably mounted upon guide rods 40 extending transversely of the machine and supported by the side frames 10, 10 thereof, while a flexible element 41 may be connected at one end to said carriage and be led over suitable sheaves 42 to the lever 21 and be connected at its other end to said lever, and a second flexible element 43 may be connected at one end to said carriage and may be led over suitable sheaves 44 to any suitable point where it may have attached to its other end a weight 45. Thus, the weight 45 acts counter to the lever 21 and as a consequence the block 36 is shifted transversely of the machine in response to swinging movement of said lever to adjust the receiving roll 12 transversely of the machine. In this connection it will be noted that the arrangement is such that the block 36 moves in the same direction as the receiving roll 12 and that the flexible element 41 is connected with the lever 21 at a point nearer the fulcrum point 22 of said lever than the point of connection 24 of said lever with the shaft 14. It is apparent, therefore, that although the block 36 is shifted transversely of the machine simultaneously with shifting of the receiving roll transversely of the machine, i. e., longitudinally, the amount of shifting movement of the receiving roll 12 is slightly greater than the amount of shifting of said block 36. In other words, the receiving roll 12 and the block 36 partake of differential movement. The arrangement in this respect is such that the full range of movement of the block 36 transversely of the machine is only slightly less than the full range of longitudinal adjustment of the receiving roll 12 as, for example, by an amount approximately equal to the small width of the orifice 37, as is diagrammatically illustrated in Fig. 8 of the drawings wherein the distance *a* represents the range of longitudinal movement of the receiving roll, *b* represents the width of the orifice 37 and the distance *a-b* represents the range of movement of the block 36. The amount of lateral deviation of the web progressively increases toward the receiving roll 12, and since the block 36 is spaced, as shown, from the receiving roll toward the roll or other source of supply of the web, it follows that the amount of lateral deviation of the web at the receiving roll is slightly greater than the amount of lateral deviation of the web at the location of the block 36. The differential movement between the block 36 and the receiving roll 12 is made as nearly as possible equal to the difference between lateral deviation of the web at said block and said receiving roll. Accordingly, since the block 36 shifts the same amount as the web deviates laterally at the location of said block, the receiving roll is responsively shifted a slightly greater amount than said block to compensate for the slightly greater lateral deviation of the web at the receiving roll.

Under normal conditions of operation of the machine and mechanism the edge of the web 13 is aligned with the orifice 37 approximately midway between the sides of said orifice and the rate of exhaust of air from the vacuum chamber 19 is such in relation to the effective area of said orifice, that is, the area of said orifice that is open for flow of air therethrough to the vacuum chamber 19, that the diaphragm 20 will be maintained in equilibrium by the spring 28 and the sub-atmospheric pressure in said vacuum chamber. Maintenance of the diaphragm 20

in equilibrium will hold the lever 21 and, consequently, the shaft 14 and the receiving roll 12 against movement and thus the web 13 will be wound onto the roll 12 with the edges of its convolutions in alinement with each other at the ends of the roll as long as the web does not deviate laterally in its travel to the receiving roll.

Should the web 13 in its travel to the receiving roll 12 deviate laterally in either direction it will act either to reduce or to increase the effective area of the orifice 37, as the case may be. If the deviation is in a direction to reduce the effective area of the orifice and thus reduce flow of air to the vacuum chamber 19, the sub-atmospheric pressure in said vacuum will become lower and as a result the diaphragm 20 will be flexed inwardly and will swing the lever 21 to adjust the receiving roll 12 longitudinally an amount to compensate for the lateral deviation of the web at said roll, thereby maintaining edge alinement of the convolutions on the receiving roll. If, on the other hand, the deviation of the web is in a direction to increase the effective area of the orifice 37 and thus permit an increased flow of air to the vacuum chamber 19, the sub-atmospheric pressure in said vacuum chamber will rise and as a result the spring 28 will act to flex the diaphragm 20 outwardly, thereby swinging the lever 21 and adjusting the receiving roll 12 longitudinally an amount to compensate for the lateral deviation of the web at said roll. In short, the mechanism acts on the block 36 to cause same constantly to seek a position in which its orifice 37 is disposed in normal relationship to the edge of the web 13 and in doing so to adjust the receiving roll 12 longitudinally to compensate for any lateral deviation of the web at said roll in either direction. The range of adjustment of the receiving roll and of the block 36 is, of course, sufficiently great to compensate for the greatest expected lateral deviation of the web.

The orifice 37 may be of any desired shape, but in order to promote rapidity of shifting of the block 36 and, consequently, of the receiving roll 12 in response to any lateral deviation of the web, said orifice 37 preferably is of triangular shape. With an orifice of triangular shape the effective area thereof will be reduced or increased, as the case may be, at a progressively increasing rate as the edge of the web moves toward the apex or base end of said orifice and as a result the block and receiving roll shifting mechanism will respond quickly to any lateral deviation of the web so that by the time any deviation of the web occurs at the receiving roll said roll will have been adjusted to compensate for the deviation.

Obviously a piston may be employed in lieu of the diaphragm 20 and any suitable means other than the lever 21 may be employed to transmit movement of the diaphragm or piston, as the case may be, to the receiving roll and the orifice element. As shown, the orifice element 36 preferably is mounted for longitudinal adjustment with respect to the carriage 39 and is adjustable therealong by a screw 46 for the purpose of properly locating the orifice 39 relative to the edge of the web 13.

Without further description it is thought that the features and advantages of the invention will be readily apparent to those skilled in the art, and it will of course be understood that changes in the form, proportion and minor details of construction may be resorted to, without departing

from the spirit of the invention and scope of the appended claims.

I claim:

1. In combination with a web winding machine including a rotatable, longitudinally adjustable web receiving roll, a vacuum chamber including a member to be moved in one direction by sub-atmospheric pressure in said chamber, means for moving said member in the opposite direction, a connection between said member and said receiving roll whereby the latter is adjusted longitudinally in response to movement of said member, means for uniformly exhausting air from said vacuum chamber at a rate to subject said chamber to a sub-atmospheric pressure, an orifice element mounted to be traversed by the web as the latter travels to the receiving roll, said orifice element being spaced from said receiving roll toward the source of supply of the web and having an air inlet orifice connected with said vacuum chamber and related to an edge of the web to have its effective area varied by lateral deviation of said web, thereby to vary the sub-atmospheric pressure in said vacuum chamber and cause said member to be moved to adjust the receiving roll longitudinally to compensate for lateral deviation of the web the amount of lateral deviation of which progressively increases from its source of supply toward the receiving roll, and means for causing said orifice element to move laterally in the same direction as the receiving roll and web and in amount slightly less than the receiving roll as the web deviates laterally to compensate for the difference between the amount of lateral deviation of said web at the location of said orifice element and the amount of lateral deviation of said web at the location of said receiving roll.

2. The combination as set forth in claim 1 in which the air inlet orifice in the orifice element is of triangular shape for the purpose set forth.

3. In combination with a web winding machine including a rotatable, longitudinally adjustable web receiving roll, a vacuum chamber including a member to be moved in one direction by sub-atmospheric pressure in said chamber, means for moving said member in the opposite direction, a pivoted lever connected to said member to be swung thereby and having an operative connection with said receiving roll so that swinging thereof effects longitudinal movement of said roll, means for uniformly exhausting air from said vacuum chamber at a rate to subject said chamber to a sub-atmospheric pressure, an orifice element mounted to be traversed by the web as the latter travels to the receiving roll, said orifice element being spaced from said receiving roll toward the source of supply of the web and having an air inlet opening connected with said vacuum chamber and related to an edge of the web to have its effective area varied by lateral deviation of the web, thereby to vary the sub-atmospheric pressure in said vacuum chamber and cause said member to swing said lever to adjust the receiving roll longitudinally to compensate for lateral deviation of the web the amount of lateral deviation of which progressively increases from its source of supply toward the receiving roll, and an operative connection between said lever and said orifice element whereby said orifice element is moved in the same direction as the receiving roll and in amount

slightly less than the receiving roll when the latter is adjusted longitudinally, thereby to compensate for the difference between the amount of lateral deviation of said web at the location of said orifice element and the amount of lateral deviation of said web at the location of said receiving roll.

4. In combination with a web winding machine including a rotatable, longitudinally adjustable web receiving roll, a vacuum chamber including a member to be moved in one direction by sub-atmospheric pressure in said chamber, means for moving said member in the opposite direction, a pivoted lever connected to said member to be swung thereby and having an operative connection with said receiving roll so that swinging thereof effects longitudinal movement of said roll, means for uniformly exhausting air from said vacuum chamber at a rate to subject said chamber to a sub-atmospheric pressure, an orifice element mounted to be traversed by the web as the latter travels to the receiving roll, said orifice element being spaced from said receiving roll toward the source of supply of the web and having an air inlet opening connected with said vacuum chamber and related to an edge of the web to have its effective area varied by lateral deviation of the web, thereby to vary the sub-atmospheric pressure in said vacuum chamber and cause said member to swing said lever to adjust the receiving roll longitudinally to compensate for lateral deviation of the web the amount of lateral deviation of which progressively increases from its source of supply toward the receiving roll, and a connection between said orifice element and said lever at a point on said lever nearer the pivot thereof than its operative connection with the receiving roll whereby said orifice element is moved in the same direction as the receiving roll when the latter is adjusted longitudinally and in amount slightly less than the receiving roll, thereby to compensate for the difference between the amount of lateral deviation of said web at the location of said orifice element and the amount of lateral deviation of said web at the location of said receiving roll.

5. In combination with a web winding machine including a rotatable, longitudinally adjustable web receiving roll, a vacuum chamber including a member to be moved in one direction by sub-atmospheric pressure in said chamber, means for moving said member in the opposite direction, a pivoted lever connected to said member to be swung thereby and having an operative connection with said receiving roll so that swinging thereof effects longitudinal movement of said roll, means for uniformly exhausting air from said vacuum chamber at a rate to subject said chamber to a sub-atmospheric pressure, an orifice element mounted to be traversed by the web as the latter travels to the receiving roll, said orifice element being spaced from said receiving roll toward the source of supply of the web and having an air inlet opening connected with said vacuum chamber and related to an edge of the web to have its effective area varied by lateral deviation of the web, thereby to vary the sub-atmospheric pressure in said vacuum chamber and cause said member to swing said lever to adjust the receiving roll longitudinally to compensate for lateral deviation of the web the amount of lateral deviation of which progressively increases from its

source of supply toward the receiving roll, means mounting said orifice element for adjustment transversely with respect to the direction of travel of the web, means tending constantly to move said orifice element in one direction, and a flexible element connected with said orifice element and with said lever at a point on said lever nearer the pivot thereof than its operative connection with said receiving roll whereby said orifice element is moved in the same direction as the receiving roll when the latter is adjusted longitudinally and in amount slightly less than the receiving roll, thereby to compensate for the difference between the amount of lateral deviation of said web at the location of said orifice element and the amount of lateral deviation of said web at the location of said receiving roll.

6. In a web winding machine, a rotatable, longitudinally adjustable web receiving roll to have wound thereon from a source of supply a web which may deviate laterally and lateral deviation of which progressively increases from its source of supply toward said receiving roll, and means for adjusting said receiving roll longitudinally to compensate for lateral deviation of the web, said means including a control element spaced from the receiving roll toward the source of supply of the web, said means also including means whereby said control element is shifted laterally in response to lateral deviation of the web and also including means whereby the receiving roll is adjusted longitudinally in response to lateral shifting of said control element and in amount slightly greater than the amount of lateral shifting of said control element to compensate for the greater amount of lateral deviation of the web at the location of the receiving roll than at the location of the control element.

7. In a web winding machine, a rotatable longitudinally adjustable web receiving roll, a vacuum chamber including a member to be moved in one direction by sub-atmospheric pressure in said chamber, means tending constantly to move said member in the opposite direction, a connection between said member and said receiving roll whereby the latter is adjusted longitudinally in response to movement of said member, means for uniformly exhausting air from said chamber at a rate to subject said chamber to a sub-atmospheric pressure, and an orifice element mounted to be traversed by the web as the latter travels toward the receiving roll, said orifice element having an air inlet orifice connected with said vacuum chamber and related to an edge of the web to have its effective area varied by lateral deviation of the web, thereby to vary the sub-atmospheric pressure in said vacuum chamber and to cause said member to be moved to adjust the receiving roll longitudinally to compensate for lateral deviation of the web, the orifice in said orifice element being of triangular shape to have its effective area increased or decreased at a progressively increasing rate by lateral deviation of the web, thereby to quickly vary the sub-atmospheric pressure in said vacuum chamber and render said member quickly effective in response to lateral deviation of the web to quickly adjust the receiving roll to compensate for lateral deviation of the web.

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