Nov. 20, 1956 A. H. JOHNSON 2,771,252

WEB CONTROL MECHANISM FOR PAPER-CONVERTING MACHINE

Filed March 12, 1954 3 Sheets-Sheet 1

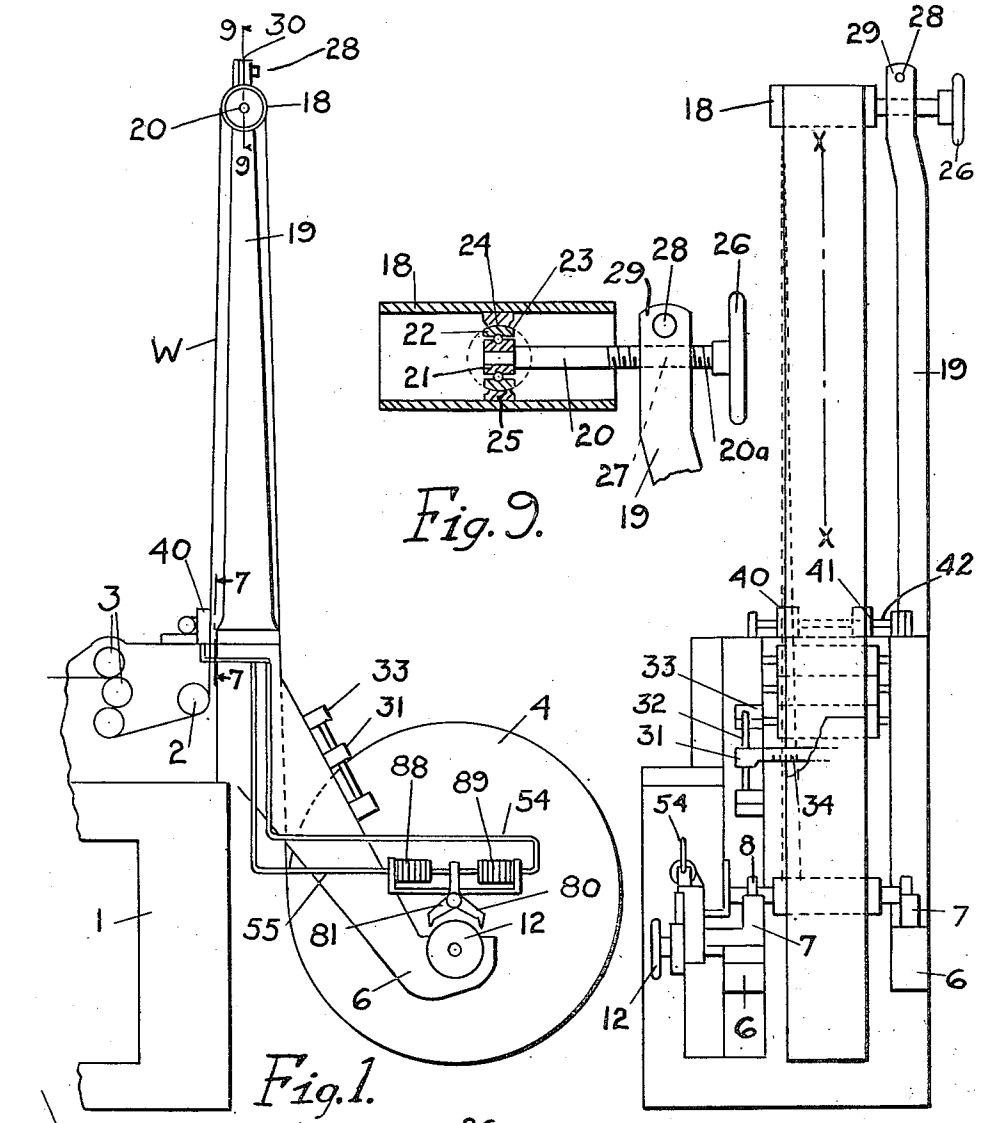


Fig. 1.

Fig. 9.

Fig. 2.

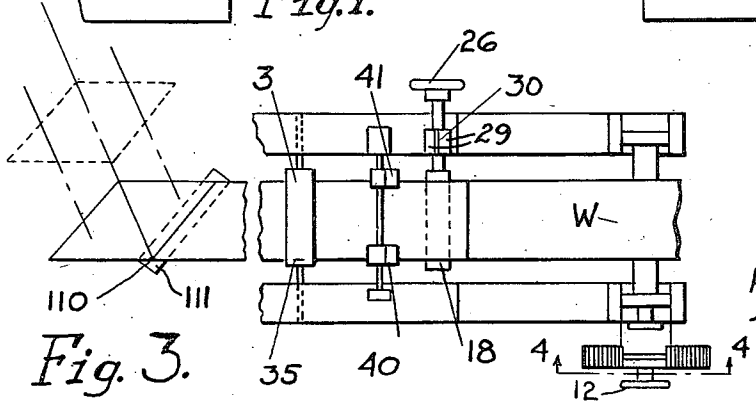


Fig. 3.

INVENTOR
Albert H. Johnson
Geo. H. Kennedy Jr.
ATTORNEY

Nov. 20, 1956 A. H. JOHNSON 2,771,252

WEB CONTROL MECHANISM FOR PAPER-CONVERTING MACHINE

Filed March 12, 1954 3 Sheets-Sheet 2

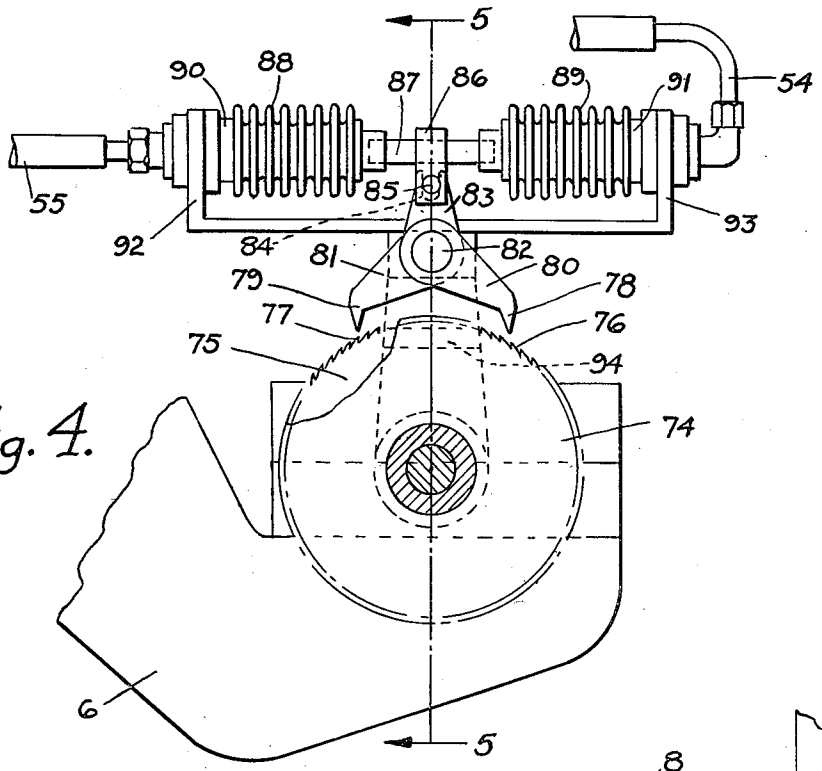


Fig. 4.

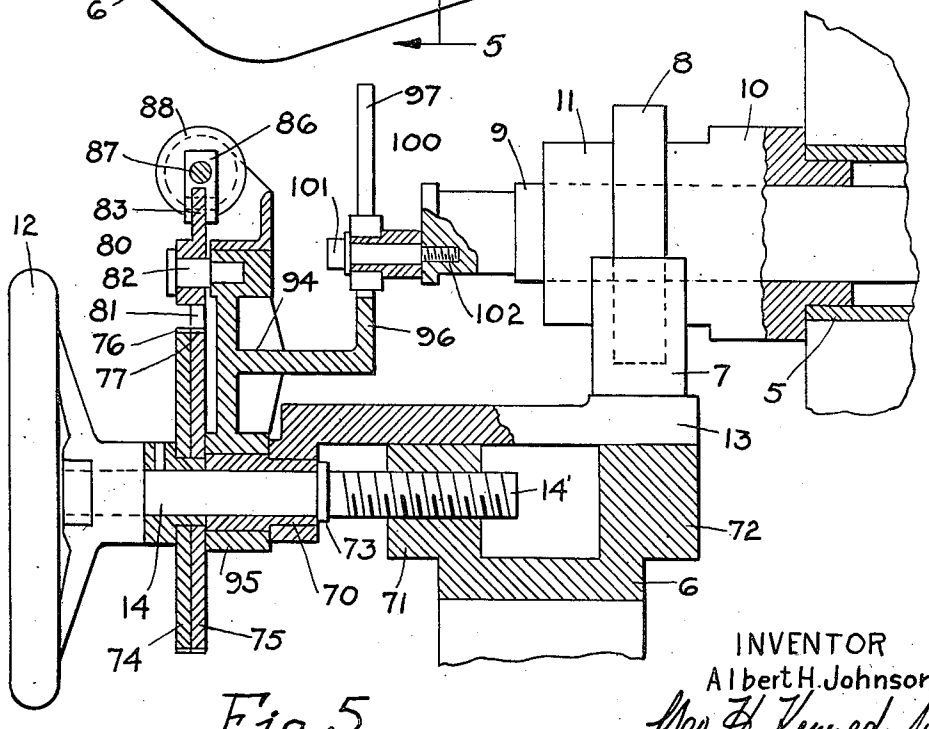


Fig. 5.

INVENTOR
Albert H. Johnson
Geo. H. Kennedy Jr.
ATTORNEY

Nov. 20, 1956 A. H. JOHNSON 2,771,252

WEB CONTROL MECHANISM FOR PAPER-CONVERTING MACHINE

Filed March 12, 1954 3 Sheets-Sheet 3

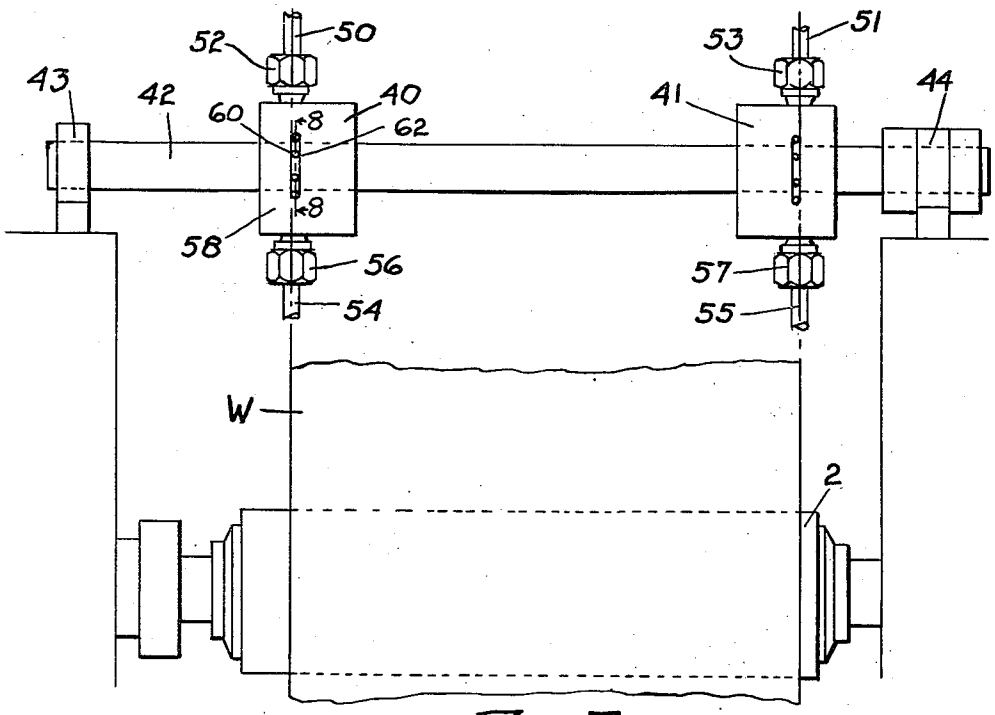


Fig. 7.

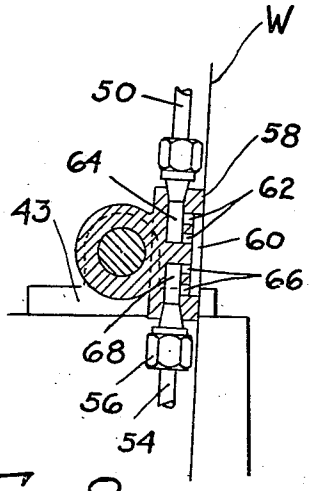


Fig. 8.

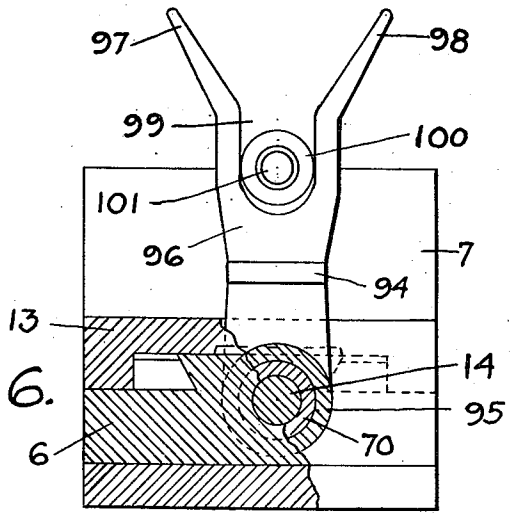


Fig. 6.

INVENTOR
Albert H. Johnson
Geo. H. Kennedy Jr.
ATTORNEY

United States Patent Office 2,771,252 Patented Nov. 20, 1956

2,771,252

WEB CONTROL MECHANISM FOR PAPER-CONVERTING MACHINE

Albert H. Johnson, Worcester, Mass., assignor to United States Envelope Company, Springfield, Mass., a corporation of Maine

Application March 12, 1954, Serial No. 415,723

5 Claims. (Cl. 242—76)

The present invention relates in general to web control mechanism for paper-converting machines. The invention, for purposes of illustration, is here shown as applied to a blank-forming mechanism for envelope-making machines of the type disclosed in United States Patent No. 2,696,255 issued to Vincent E. Heywood on December 7, 1954 and entitled, Blank Forming Method and Mechanism for Envelope Making Machines. It is understood, of course, that the web-control mechanism of the present invention could be used on any type of web-converter.

A primary object of the present invention is to provide an improved mechanism for controlling the delivery of a paper web to a blank-forming mechanism of the type disclosed in the above-mentioned United States patent, so that one edge of the web will always be maintained on a line which passes through a fixed point of the machine, which in this case is the common vertical axis about which the blank cutter and entire feed assembly are adjustable. Since the moving web is subjected to the operation of an obliquely extending blank cutter for severing individual diamond-shaped blanks therefrom, as the web moves away from the feeding rolls, it is of the utmost importance to maintain one edge of the web in exact side register with this vertical axis, in order to produce blanks that will be identical.

In the operation of blank-forming mechanisms of the above-described type, difficulties have been encountered due to the fact that the web supply rolls as received from paper mills exhibit certain variations in form. One cause of this non-uniformity between different mill rolls arises from the difficulty of winding relatively narrow webs of paper upon short cylindrical cores. In some instances, for example, certain of the layers will be out of parallelism with other layers, or, stated in another way, the axes of individual layers will not coincide with each other or with the axis of the core.

Therefore, when such a non-uniform supply roll is mounted for free rotation about a fixed axis in order to deliver the paper web directly to the feed roll of an envelope-making machine, the edges of the moving web will weave back and forth as the supply roll rotates. The net result is a continual shifting of the moving edges of the web with resulting variations in the envelope blanks passing through the machine. Since, as previously pointed out, the blanks are cut obliquely from the web in order to economize stock, with the parallel sides of the web constituting two edges of each blank, it is obvious that side weaving of the web of any supply roll will result in lack of symmetry between successive blanks and the ultimate production of defective envelopes when such blanks are folded by subsequent operations.

In addition to the side weaving effect described above, there is also the undesirable side slipping effect which occurs when the center line of the web as represented by any one given layer on the supply roll is laterally displaced from the center line of an adjacent layer on the

roll. A roll in which side slipping has occurred may appear bowed along the edges such that one edge will be concave and the other convex; such a roll is referred to as "dished." Also a roll so affected may exhibit the familiar "telescope" effect in which the lateral offset between adjacent layers is easily observed. The side slipping effect could be caused from improper winding but is most generally caused from improper handling subsequent to the winding. Just as in the case of the side weaving effect, the side slipping effect will cause the edges of the web to become offset from their predetermined position.

According to the present invention the difficulties encountered due to side weaving and side slipping of a web drawn from any supply roll are entirely eliminated. Briefly stated, the present invention resides in so controlling the travel of the web between a supply roll and the feed rolls of a blank-forming mechanism as to compensate for any side weave or side slipping originating at the roll. Therefore, the web always enters the machine with one edge thereof in proper alignment with the common vertical pivot axis of the blank-forming mechanism described in the above-mentioned United States Patent No. 2,696,255 of Vincent E. Heywood.

The above and other advantageous features of the present invention will hereinafter more fully appear from the following description considered in connection with the accompanying drawings, in which

Fig. 1 is a view in side elevation of a web controlling mechanism embodying the present invention as applied to a blank-forming mechanism, the feeding portion of which is shown here in section.

Fig. 2 is a front elevation of the mechanism shown in Fig. 1.

Fig. 3 is a plan view of the mechanism shown in Fig. 1.

Fig. 4 is a sectional view along line 4—4 of Fig. 3, on an enlarged scale, looking in the direction of the arrows.

Fig. 5 is a sectional view along line 5—5 of Fig. 4, looking in the direction of the arrows.

Fig. 6 is an enlarged side eelvation, showing the yoke portion of the rocker arm together with a section of the slide assembly of the present invention.

Fig. 7 is an enlarged front elevation taken along line 7—7 of Fig. 1, looking in the direction of the arrows.

Fig. 8 is a side elevation, partly in section, taken along line 8—8 of Fig. 7, looking in the direction of the arrows.

Fig. 9 is an enlarged front elevation, partly in section, taken along line 9—9 of Fig. 1, looking in the direction of the arrows.

Referring first to Figs. 1 and 2, the web control mechanism of the present invention is shown for purposes of illustration in connection with a blank-forming mechanism of the type disclosed in the aforesaid United States Patent No. 2,696,255, wherein a continuously moving web is cut obliquely to produce diamond-shaped blanks which are thereafter operated upon by the various mechanisms of an envelope-making machine to produce completed envelopes. Since the present invention is entirely concerned with the manner of controlling the delivery of the web to the blank-forming mechanism, only the web feeding portion of the machine is shown, although the general progress of the web through the machine is indicated diagrammatically in Fig. 3.

As best shown in Fig. 1, the blank-forming mechanism to which the present invention is applied, comprises a frame 1 for rotatably supporting a guide roll 2 for conducting a continuous web W to a series of rotatably driven feed rolls 3. The operation of the feed rolls 3 serves to draw the web W from a supply roll 4, hereinafter referred to as the mill roll. This roll consists of a central cylindrical core 5 (see Fig. 5) upon which the

web W has been wound as a continuous strip and, as previously pointed out, unless the successive layers of paper on the roll are built up in exact overlying relation on the core, rotation of the roll on a fixed axis, as the web is unwound, will result in sidewise weaving or shifting of the edges of the web.

The mill roll 4 is rotatably supported between spaced brackets 6 extending from the frame 1, with each bracket 6 providing a saddle block 7 for receiving a bearing 8 surrounding a shaft 9 forming part of a mill roll assembly, the details of which are shown in Fig. 5. Generally speaking, the mill roll assembly, only one end of which is shown in Fig. 5, consists of a pair of spaced collars 10 mounted on the shaft 9, which serve to support between them the core 5 on which the web is wound. These collars 10 provide extensions 11 which are surrounded by ball bearing members 8, so that the entire mill roll assembly can be rotatably supported between the brackets 6 by placing the outer races of the bearings 8 within seats provided by the saddle blocks 7. It should be understood that the bearing member 8 (as it appears in Fig. 5) is secured from axial movement with respect to collar 10 by means of an appropriate annular groove (not shown) in extension 11, such that lateral movement of the bearing 8 will cause lateral shifting of the shaft 9.

The entire mill roll assembly can be adjusted laterally between the brackets 6 by means of a hand wheel 12 mounted on a cross slide 13 which carries the left-hand saddle block 7, the right-hand saddle block being similarly mounted upon another cross slide (not shown). The hand wheel 12 carries a shaft 14 which is threaded into a portion of the bracket 6, so that rotation of the hand wheel will cause the mill roll 4 to be moved lengthwise of the axis of the supporting shaft 9.

The ultimate purpose of any web adjustment made in connection with this mechanism is to insure that one edge of the web W, in this case the left-hand edge as seen in Fig. 2, passes through the common vertical axis 110 (see now Fig. 3) about which blank cutter 111 is adjustable together with the whole feed assembly. However, in order to simplify the adjustment, a mark 35 is placed upon the top feed roll 3. Mark 35 is in alignment with axis 110 such that, when one edge of the web passes over mark 35 it will also pass through axis 110. Therefore, in practice, the mill roll is always aligned with respect to mark 35.

Assuming that the mill roll assembly has been adjusted by means of the hand wheel 12 to bring the left-hand edge of the web W into proper alignment with mark 35 on the feed rolls 3, it will be evident from a consideration of Fig. 2 that this condition will not be maintained as the web unwinds from the mill roll, unless each layer of the web is in exact overlying relation with respect to every other layer, or, to explain it in another way, unless the entire roll is symmetrical about a line X—X (see Fig. 2) which represents the center line of a properly aligned web. But, as previously pointed out, mill rolls, as received, will exhibit considerable variation in the extent to which the layers of the web, as wound on the core 5, will project to one side or the other with respect to the center line X—X. For purposes of illustration, the side weaving of the marginal edges of the web is indicated in dotted lines.

Therefore, should the web W pass directly from the mill roll 4 into the feed rolls 3 of the envelope-making machine, the initial adjustment of the edge of the web by the hand wheel 12 would not be maintained, as the web was unwound from the mill roll. That is to say, the edges of the web would tend to shift to such an extent that subsequent cutting obliquely across the web would produce diamond-shaped envelope blanks of non-uniform character, as will be apparent from Fig. 3, which shows diagrammatically the progress of the web through the machine after it leaves the feed rolls 3.

As previously pointed out, the object of the present invention is to provide an improved mechanism for controlling the delivery of a moving web to a blank-forming mechanism, or other machine, so as to compensate automatically for any side weave or side slipping which takes place as the web unwinds from a supply roll. This compensating device is shown in Figs. 1 and 2 as consisting of a roll 18 mounted for free rotation at the end of an arm 19 extending above the frame 1, with the web W extending upwardly from the mill roll 4 to pass around the roll 18 before reversing its direction and passing downwardly to enter the blank-forming mechanism at the guide roll 2. The roll 18, besides being able to rotate freely on its longitudinal axis, is also pivotable about the center point of its axis of rotation.

Therefore, as the web W is drawn over the roll 18 and passes downwardly to enter the blank-forming mechanism, the roll 18 is free to swing about its pivot point in response to a force exerted on either side of this point by any tendency for the marginal edge of the web W to weave back and forth as it unwinds from the mill roll 4. It has been found that the net result of such pivotal movement of the roll 18, in response to weaving action of the web as it leaves the mill roll, is to substantially eliminate, or cancel out, the weaving action as the web passes downwardly from the roll 18 and enters the blank-forming mechanism at the guide roll 2.

The above-described compensating effect of the roll 18 depends upon a number of factors, such as the mounting of the roll for free rotational and pivotal movement, the downward force exerted by the web on the upper surface of the roll due to the pull on the web developed by the feed rolls 3, and the relatively long distance which the web travels in passing over the roll 18 before entering the web feeding rolls, as compared to the relatively small variations in the effective length of the web due to changes in the diameter of the roll as the web is unwound therefrom.

As best shown in Fig. 9, the roll 18 is supported for free rotation about the axis of a shaft 20 which extends from the arm 19 parallel to the mill roll shaft 9, as well as for pivotal movement about the center point thereof. For this purpose, a ball bearing 21 of the self-aligning type is interposed between the inside of the roll 18 and the shaft 20, with the outer race 22 of the bearing 21 providing a curved surface 23 that is received within a complementary seat 24 provided in a ring 25 located at the middle of the roll 18. The center of the curvature of the surface 23 and seat 24 lies on the axis of rotation of the roll 18 about the shaft 20, with this center of curvature being located exactly at the middle of the roll 18.

Therefore, the roll 18 is freely rotatable about a substantially longitudinal axis and is capable of pivotal movement about the center point of this axis. This action of roll 18 can best be described as a wobble action. Furthermore, the entire roll assembly is adjustable as a unit with respect to its supporting arm 19, by means of a hand wheel 26 whereby a threaded portion 20*a* of the shaft 20 can be turned within a threaded opening 27 extending through the arm 19. (The purpose of this longitudinal adjustment of the shaft 20 will be later described.) After the shaft 20 has been adjusted it can be locked in position by means of a bolt 28 which serves to draw together spaced portions 29 of the upper end of the arm 19 which extend above the shaft 20 on opposite sides of a slot 30, see Fig. 3.

When it is desired to set up the blank-forming mechanism for operation upon a fresh mill roll 4, certain adjustments must be made in order to insure that one edge of the web W will pass through axis 110. Before the web is fed through the various rolls the operator is free to turn the roll about the axis of the shaft 9 in order to determine whether or not the edge of the roll tends to weave. In order to conveniently measure the extent of the weaving effect, a gauge 31 is provided in the form of a bar which can be laid across the upper surface of the

mill roll. This gauge **31** is supported for sliding movement on a rod **32** mounted between fixed lugs **33** provided by the left-hand bracket **6**, so that the gauge can be moved up and down, or swung about the rod **32** to clear the mill roll **4**. The gauge **31** provides a mark **34** which is in alignment with the vertical axis **110** of the blank-forming mechanism and also with mark **35** of feed roll **3**, see Fig. 3. The mark **34** indicates the position which should be occupied by the left-hand edge of the web W for proper alignment. By turning the hand wheel **12** after a mill roll has been placed in position between the saddle blocks **7**, it is possible to so adjust the roll sidewise as to bring the mark **34** on the fixed gauge **31** substantially midway between the extreme positions occupied by the edges of the web during one revolution of the roll **4**, these positions being shown in dotted lines in Fig. 2 to indicate, on an exaggerated scale, the extent of such side weave.

The next step of setting up the machine for operation is to lead the web W upwardly over the roll **18** and then downwardly into the feed rolls **3**. By means of a lever (not shown), the feed rolls are spread apart and the web is fed through them by hand so as to insure that the left-hand edge of the web, as viewed in Fig. 2, is aligned with the mark **35** of the top roll **3**. After this has been done, the feed rolls are moved back together again, and the hand wheel **26** of roll **18** is turned to shift the shaft **20**, if necessary, in order to insure that the center of the bearing seat **24** is exactly in the center of the web W where it passes over the top of the roll **18**. Generally speaking, when once the shaft **20** has been adjusted to obtain this condition, it may be clamped against further movement by the bolt **28**, so that the pivotal center of the roll **18** will always be at the center of the moving web, so long as one or more mill rolls of the same width are handled by the envelope-making machine. However, should the machine subsequently be set up for operation with a web of different width, then it will be necessary to shift the shaft **20** by means of the hand wheel **26** in order to locate the pivot point of the roll **18** exactly at the center of the new web, as represented by the line X—X in Fig. 2.

When the blank-forming mechanism is operated after the above-described adjustments have been carefully made, it is obvious from a consideration of Fig. 1 that the rotation of the feed rolls **3** will exert a draft on the web W which will cause the web to unwind from the mill roll **4** as it passes upwardly over the compensating roll **18** and then downwardly into the machine. Due to the fact that the web undergoes a complete reversal in its direction of movement in passing over the roll **18**, the upper surface of this roll is subjected to a downward pressure by the moving web, and this pressure is evenly distributed on opposite sides of the pivot point of the bearing **21**, as long as both edges of the web engage the surface of the roll **18** at exactly the same distance from the center of the roll as measured along the shaft **20**.

However, should the web W exhibit a tendency to side weaving as it unwinds from the roll **4**, then the edges of the web will shift back and forth between the dotted line positions shown in Fig. 2 during each complete revolution of the roll. As a result of this weaving action, edges of the web W will engage the surface of the roll **18** with slightly different tensions therein, and the roll **18**, because of its pivotal mounting, will tend to oscillate about its middle. While this weaving action is shown on an exaggerated scale in Fig. 2, it is obvious that any shifting of one edge of the web in one direction will result in turning the opposite side of the roll **18** downwardly about its pivot point. As the same edge of the web tends to shift in the opposite direction, upon continued rotation of the roll **4**, the roll **18** will swing about its pivot point in the reverse direction. The net result is that as the web unwinds from the roll **4** with a weaving action, the roll **18** will oscillate, or wobble, about its pivot point, with the amplitude of such oscillation being dependent upon the amount of side weave exhibited by the edge of the web as it unwinds from the roll **4**. In practice, it has been found that such oscillation of the roll **18** serves to substantially eliminate the side weave from the web as it passes downwardly from the roll **18** into the web feeding rolls **3**.

From the foregoing it is apparent that wobble-roll **18** will eliminate most of the undesirable effects due to side weaving. However, this roll is unable to compensate completely for side weaving due to attendant side slipping components present therein, such that the operator will occasionally be required to adjust the position of mill roll **4** by means of hand wheel **12**. It should be further pointed out that roll **18** is unable to compensate for variations in the mill roll due to the side slipping effect alone. In the case of side weaving, as explained above, the roll **18** is caused to pivot about its pivot point due to the difference in tension between the opposite edges of the web. In the case of pure side slipping (that is without attendant side weaving) the edges of the web will be under substantially the same tension and the roll **18** will not oscillate as in the case of side weaving. Therefore, it is apparent that roll **18** will compensate for a majority of the side weave and almost not at all for the side slipping.

In order to compensate fully for adverse side weave effects not corrected by roll **18** and for adverse side slipping effects there is provided, as shown in Figs. 1, 2, 3, 7 and 8, a pair of web detectors **40** and **41** mounted on rod **42** which is connected at its opposite ends to the blank-forming mechanism by means of supports **43** and **44**.

The web detectors **40** and **41** are connected to a source of vacuum (not shown) by means of hollow conduits **50** and **51**, respectively, which are fastened to the top portions of the detectors by means of nuts **52** and **53**, respectively. Hollow conduits **54** and **55** are connected to the bottom portions of detectors **40** and **41** by means of nuts **56** and **57**, respectively. Conduits **54** and **55** are connected at their other ends to bellows **89** and **88**, respectively, as will be described later.

Detectors **40** and **41** are separated from one another at a distance approximately equal to the width of the web. Detector **40** is adjusted to line up with mark **35** on top feed roll **3**. These detectors provide a means for sensing the location of the edges of the web, as shown in detail in Fig. 8. The face portion **58** of detector **40** is positioned to bear against the surface of the web passing from roll **18** to roll **2** so that the substantially vertical groove **60** is proximate the left-hand edge of the web. The upper portion of groove **60** communicates with holes **62** which in turn connect into channel **64** located within the upper portion of detector **40**. Channel **64** connects with conduit **50** through nut **52**. The lower portion of groove **60** communicates with lower channel **68** through holes **66**. Channel **68** connects with conduit **54** through nut **56**. The exact manner in which detectors **40** and **41** sense the edges of web W will appear more fully after the description of the automatic positioning device for the mill roll.

As has been explained above the mill roll may be shifted laterally along its axis **9** by turning of the hand wheel **12**. This action will be more fully explained in order to show how this turning action may be made automatic. The hand wheel **12** is firmly connected to shaft **14** which rotates within fixed bushing **70**. Bushing **70** is immovably attached to slide member **13** which is slidable over portions **71** and **72** of support member **6**. Support portion **71** is internally threaded so as to receive the threaded end **14'** of shaft **14**. Collar **73** is attached to shaft **14** so as to bear against bushing **70**, thus preventing axial movement of shaft **14** with respect to slide **13**. Saddle block **7** is integral with slide **13**, and bearing **8** which fits into the saddle block **7** is axially immovable with respect to shaft **9**. Therefore, when handle **12** is rotated all of the above described parts except **6**, **71** and **72** move with the shaft **14**; that is, shaft **14** moves slide **13**; saddle block **7** which is integral with slide **13** forces

against bearing 8; and bearing 8 will move the shaft 9 of mill roll 4 along its axis.

In order to make the turning motion automatic, there are provided ratchet wheels 74 and 75 which are keyed to the hand wheel 12 about the shaft 14. Wheel 74 has teeth 76 projecting from its periphery in a counterclockwise direction, whereas wheel 75 has its teeth 77 projecting in a clockwise direction, as can be seen from Fig. 4.

Teeth 76 and 77 correspond with the pointed ends 78 and 79 of pawls 80 and 81 respectively. These pawls are pivotable about pin 82 in either a clockwise or counterclockwise direction so that pawls 80 and 81 may engage ratchet wheels 74 and 75, respectively. Pawls 80 and 81 are welded or otherwise fastened together so as to move as a unit. Pawl 81 has an upper vertical extension 83 which includes vertical slot 84. Slot 84 is adapted to engage horizontal pin 85 inside of actuator member 86 which is attached to rod 87 connecting bellows 88 and 89. Bellows 88 and 89 are attached at their remote ends 90 and 91 to supports 92 and 93 which are secured to rocker arm 94. Pin 82 is also fastened to rocker arm 94. Rocker arm 94 has a lower cylindrical bearing surface 95 adapted to rotate about bushing 70.

Attached to the upper right-hand end of rocker arm 94 is vertical yoke member 96 which has prongs 97 and 98 projecting upwardly on either side of a slot 99. Slot 99 engages the surface of cylindrical bearing member 100 which is rotatable on pin 101. Pin 101 at its right-hand end (see now Fig. 5) is screwed into threaded hole 102 which has been drilled into the left-hand end of shaft 9 parallel to the axis thereof and offset therefrom. Pin 101 will behave in much the same manner as an eccentric cam with respect to shaft 9. For each complete revolution of shaft 9 there will be one complete oscillation of rocker arm 94.

Conduits 55 and 54 are attached to the ends 90 and 91 of bellows 88 and 89, respectively. As has been described above conduits 54 and 55 are also connected to detectors 40 and 41, respectively. Bellows 88 and 89 are so balanced that any change in pressure between lines 54 and 55 will cause one bellows to expand and the other to contract. This expansion and contraction will cause a lateral shifting of rod 87 and actuator member 86 which in turn will cause the pawls 80 and 81 to pivot about pin 82 so as to engage one or the other of ratchet wheels 74 or 75.

In order to more fully understand the operation of the automatic turning of the hand wheel, the operation of the mechanism will be described first under a condition of balance, that is, when the web is in proper alignment; secondly, the operation of the mechanism will be described as the web tends to go out of alignment.

First of all, mill roll 4 will be described as rotating about shaft 9 and rocker arm 94 including the bellows and pawls will be oscillating continuously back and forth above the toothed edges of the ratchet wheels. Since in this instance, the web is now properly aligned, the edges of the web will be covering completely the grooves 60 in the face portions 58 of the detectors 40 and 41. The pull from the source of vacuum will be transmitted, in the case of detector 40, from conduit 50 through channel 64, holes 62, holes 66, channel 68 and conduit 54 to bellows 89. By virtue of the fact that groove 60 is covered by the web, there is no loss of vacuum between holes 62 and holes 66 so that the pressure in bellows 89 will be substantially the same as that in conduit 50 (or full-line vacuum). Since the web also covers the corresponding groove in detector 41, the pressure in bellows 88 likewise will be substantially the same as that in conduit 51 (or full-line vacuum). Bellows 88 and 89 are therefore balanced under these conditions and actuator member 86 will stay at its mid-point position. Pawls 80 and 81 will not pivot about pin 82 and therefore will not contact the ratchet wheels 74 and 75 as the rocker arm 94 oscillates about bushing 70. The hand wheel will not turn under this set of conditions.

Secondly, for the conditions of misalignment assume that the center line of the web has shifted to the right so that groove 60 of detector 40 is now exposed. The corresponding groove of detector 41 is still covered by the web, so that bellows member 88 will be under full-line vacuum. In the case of detector 40, holes 66 will be exposed to the atmosphere, and holes 62 will be drawing air into conduit 50. Conduit 54 will be under atmospheric pressure as will also bellows 89. Bellows 89 will therefore expand under the increased pressure pushing actuator member 86 to the left (as in Fig. 4). The tip 79 of pawl 81 will be lowered so as to engage ratchet wheel 75 on the counterclockwise stroke of rocker arm 94. Ratchet wheel 75 will be moved in a counterclockwise direction together with the hand wheel 12. This movement of the hand wheel will cause the mill roll to be pulled to the left (as in Fig. 5). When the web is moved to the left sufficiently, the edge of the web will cover again the groove 60 of detector 40, the motion of the hand wheel will cease, and the center line of the web will have been returned to its proper position.

Likewise, if the web shifts to the left, the automatic turning mechanism will return it to the right.

Sensing devices 40 and 41 are adjustable to different sizes of webs; by sliding these devices on rod 42 the distance between them may be increased or diminished so as to correspond with the width of the particular web being used. Sensing device 40 will be kept more or less stationary so as to be always in alignment with mark 35 on top feed roll 3, such that the web will always have its left-hand edge passing over the same spot on feed roll 3. Sensing device 41 will generally be the one that is moved to accommodate for the varying widths. However, sensing device 40 may be moved slightly in either direction to increase or decrease the sensitivity of the correction.

The automatic web-control of the instant invention has many important advantages. With this system no external source of power is needed; the vacuum lines to the detectors are connected into the main vacuum line of the envelope-making machine. (All modern envelope-making machines require a source of suction for their operation.) The rocker arm which carries the bellows and pawls operates from the shaft of the mill roll.

In the operation of the instant invention, as the diameter of the mill roll decreases the speed of shaft 9 will increase, since the web speed is constant. As the speed of shaft 9 increases, the rate at which rocker arm 94 oscillates will increase, and therefore the rate at which the hand wheel is "corrected" will be increased. The error due to side slipping (and side weaving as well) generally increases as the diameter of the mill roll decreases. Therefore, it is an important feature of this invention that the mechanism will correct the errors in the winding at a rate commensurate with the errors themselves.

It is also significant that the mechanism will use little or no power when the web is tracking properly; that is, when the web is covering both detectors, the loss of suction through the web is minimal. Also when the web is tracking properly, the automatic turning mechanism is inoperative and therefore there is no "hunting."

In accordance with my invention I have provided an improved means for controlling the delivery of a continuous web to the feeding mechanism of a machine of the type in which a moving web is operated upon by cutting or folding instrumentalities. By employing my web-control mechanism with a machine of this type, it is possible to use web supply rolls as they come from the paper mill with the assurance that the operation of the machine will be unaffected by any irregularities in the roll due to the winding or handling thereof.

While the web-control mechanism of my invention has been described in connection with a blank-forming mechanism for an envelope-making machine of the type operating on a continuous web of moving paper material, it is obvious that my web-control mechanism could be used on any type of web converter, that is, in combination with any machine operating on a continuous web of material, be it paper, cellophane or sheet metal, which is taken from a supply roll of that material. Also, the web-control mechanism could be used on the type of printing press which operates upon a continuous roll of paper material.

I claim:

1. A web control mechanism for an envelope-making machine of the type adapted to operate on a continuous web of material comprising a supply roll of said material in the form of a web of constant width, said supply roll being mounted on a shaft for free rotation about a fixed horizontal axis, a bearing mounted in an annular groove on said shaft, a horizontal slide member engaging said bearing, a horizontal threaded rod engaging said slide member and a fixed support so that rotation of said rod causes a horizontal movement of said slide and said shaft, a pair of ratchet wheels keyed to said rod, a horizontal pin eccentrically mounted on said shaft, a rocker arm pivotable about said rod and having an elongated slot for engaging said pin, a pair of pawls pivotally mounted on said rocker arm above said wheels, a pair of bellows supported on said rocker arm, means responsive to a pressure differential between said bellows for pivoting one of said pawls into engagement with one of said wheels, a feed roll mounted at one end of said machine for guiding said web from said supply roll to said machine, a pair of sensing devices spaced apart from one another at a distance approximately equal to the width of said web, said sensing devices being adapted to engage a surface of said web at a position between said supply roll and said feed roll, means for connecting said sensing devices to a source of low-pressure, and a pair of conduits connecting said sensing devices to said bellows.

2. A web control mechanism for a web-converting machine of the type adapted to operate on a continuous web of material, comprising a supply roll of said material in the form of a web of constant width, said supply roll being mounted for free rotation about a fixed axis, a feed means associated with said machine and adapted to guide said web from said supply roll to said machine, a wobble roll mounted for free rotation about a movable axis, said movable axis being pivotable about a fixed point located at the midpoint of said axis, said wobble roll being adapted to engage and support said web between said supply roll and said feed means, a pair of sensing devices adapted to engage the surface of said web near the opposite edges thereof and at a position along said web between said wobble roll and said feed means, shifting means for shifting said supply roll along said fixed axis, means for applying a source of low pressure to said sensing devices, a suction opening in each sensing device in communication with said surface, a pair of bellows supported at their opposite ends and mounted and joined in end-to-end relationship, the juncture of said bellows being adapted to move laterally when one of said bellows expands and the other of said bellows contracts in response to a loss of suction through one of said openings, a pair of hollow conduits for connecting said bellows to said sensing devices, a threaded rod engaging said shifting means and a fixed support such that rotation of said rod will cause a movement of said shifting means in the direction of said fixed axis, a lever attached at its free end to the juncture of said bellows, means responsive to the swinging movement of said lever in one direction only for imparting a rotary movement to said rod, and means responsive to the swinging movement of said lever in the other direction only for imparting an opposite rotary motion to said rod, whereby said supply roll is moved axially in the direction of the one of said openings through which said suction loss occurs.

3. A web control mechanism for an envelope-making machine of the type adapted to operate on a continuous web of material comprising a supply roll of said material in the form of a web of constant width, said supply roll being mounted on a shaft for free rotation about a fixed horizontal axis, a bearing mounted in an annular groove on said shaft, a horizontal slide member engaging said bearing and slidably engaging a fixed support, a horizontal threaded rod engaging said slide member and said fixed support so that rotation of said rod will cause a horizontal movement of said slide and said shaft, a pair of ratchet wheels keyed to said rod, a first set of ratchet teeth on one ratchet wheel, a second set of ratchet teeth on the other wheel oriented in the opposite direction from said first set, a horizontal pin eccentrically mounted on one end of said shaft, a rocker arm pivotable about said rod and having an elongated slot for engaging said pin, a pair of oppositely-pointed pawls pivotably mounted on said rocker arm above said wheels, a pair of bellows supported on said rocker arm, means responsive to a pressure differential between said bellows for pivoting one of said pawls into engagement with one of said ratchet wheels, a feed roll mounted at one end of said machine for guiding said web from said supply roll to said machine, a wobble roll mounted for free rotation about a movable axis, said movable axis being pivotable about a fixed point which is located at the midpoint of said axis, said wobble roll being adapted to engage and support said web between said supply roll and said feed roll, a pair of sensing devices spaced apart from one another at a distance approximately equal to the width of said web, said sensing devices being adapted to engage a surface of said web at a position between said wobble roll and said feed roll, means for applying a source of low-pressure to said sensing devices, and a pair of conduits connecting said sensing devices to said bellows.

4. A web control mechanism for a web-converting machine of the type adapted to operate on a continuous web of material comprising a supply roll of said material in the form of a wound web of substantially constant width, said supply roll being mounted for free rotation about a horizontal axis, means for laterally shifting said supply roll along said axis, a rotatably driven feed roll for feeding said material from said supply roll to said machine, a pair of pneumatic sensing devices spaced apart from one another at a distance approximately equal to the width of said web, said sensing devices being adapted to engage the surface of said web near the edges thereof and at a position between said supply roll and said feed roll, a port in each sensing device communicating with the surface of said web, a pair of bellows mounted and joined in end-to-end relationship, a pivotable lever attached at its free end to the juncture of said bellows, means responsive to the pivotal movement of said lever in one direction only for moving said shifting means in a given direction along said fixed axis, means responsive to the pivotal movement of said lever in the other direction only for moving said shifting means in the opposite direction along said fixed axis, and means for connecting said bellows through said sensing devices in parallel circuits to a source of suction.

5. A web control mechanism for a continuous web-converting machine comprising a supply roll of web material mounted for free rotation upon a horizontal shaft, a slide member engaging and supporting said shaft on opposite sides of said supply roll for sliding movement of said supply roll along its axis of rotation, a threaded rod engaging said slide member and a fixed support on said machine, said rod being adapted upon its rotation to provide relative lateral movement between said slide member and said support, a pair of ratchet wheels keyed to said rod, a horizontal pin eccentrically mounted on said shaft, a rocker arm pivotable about said rod and having an

elongated slot for engaging said pin, a pair of pawls pivotally mounted on said rocker arm above said wheels, a pair of bellows supported on said rocker arm, means responsive to a pressure differential between said bellows for pivoting one of said pawls into engagement with one of said wheels, a feed roll mounted at one end of said machine for guiding said web from said supply roll to said machine, a pair of sensing devices spaced apart from one another at a distance approximately equal to the width of said web, said sensing devices being adapted to engage a surface of said web at a position between said supply roll and said feed roll, means for connecting said

sensing devices to a source of low-pressure, and a pair of conduits connecting said sensing devices to said bellows.

References Cited in the file of this patent

UNITED STATES PATENTS

1,189,611	Morse	July 4, 1916
1,858,436	Dickhaut	May 17, 1932
2,239,472	Stanford	Apr. 22, 1941
2,562,026	Fife	July 24, 1951

FOREIGN PATENTS

273,016	Great Britain	June 27, 1927