Oct. 5, 1943. A. T. KING 2,331,030

WEB ALIGNING APPARATUS

Filed March 4, 1941 4 Sheets-Sheet 1

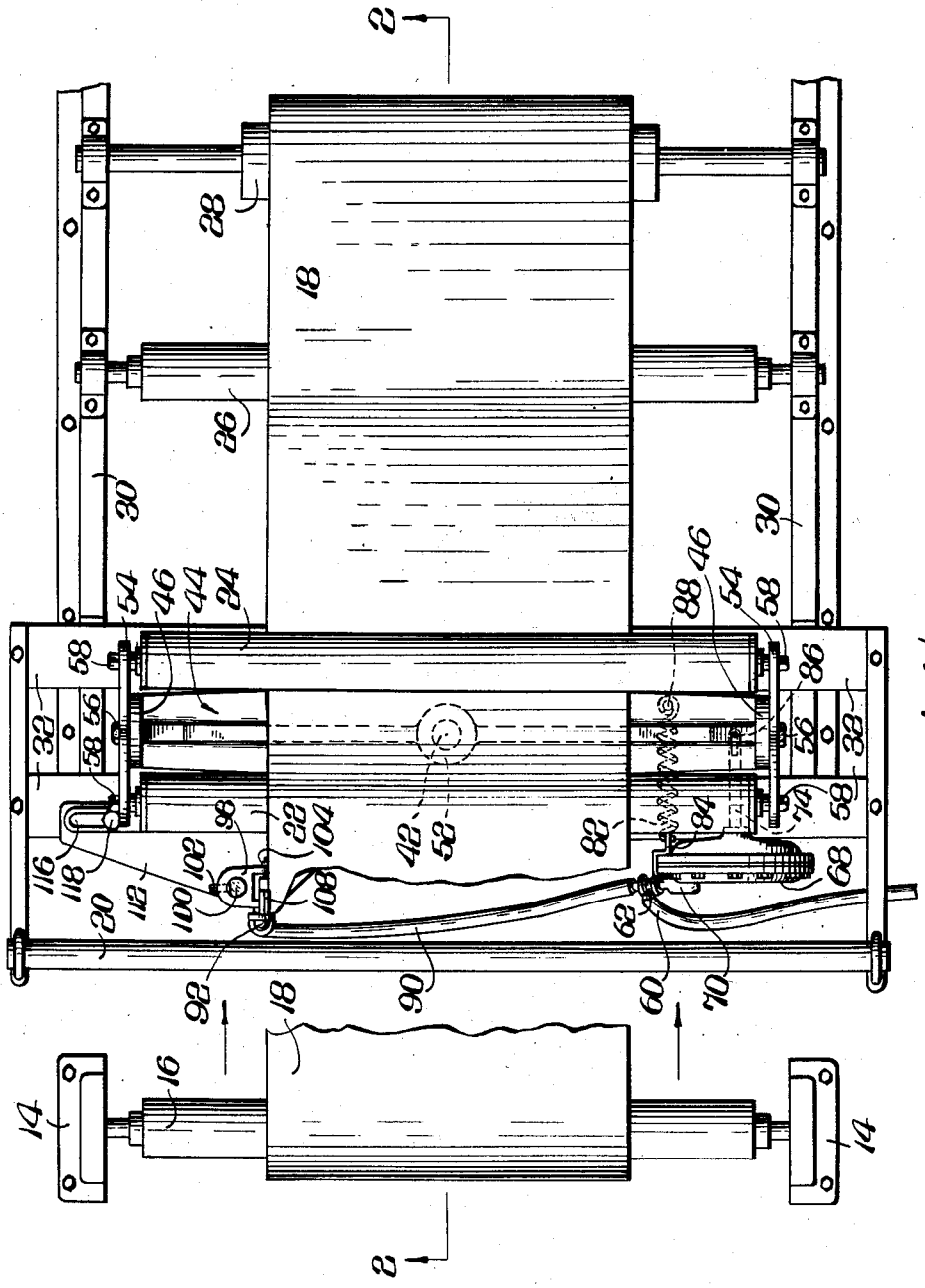


Fig. 1.

INVENTOR
ALFRED T. KING

BY Louis Necks
ATTORNEY

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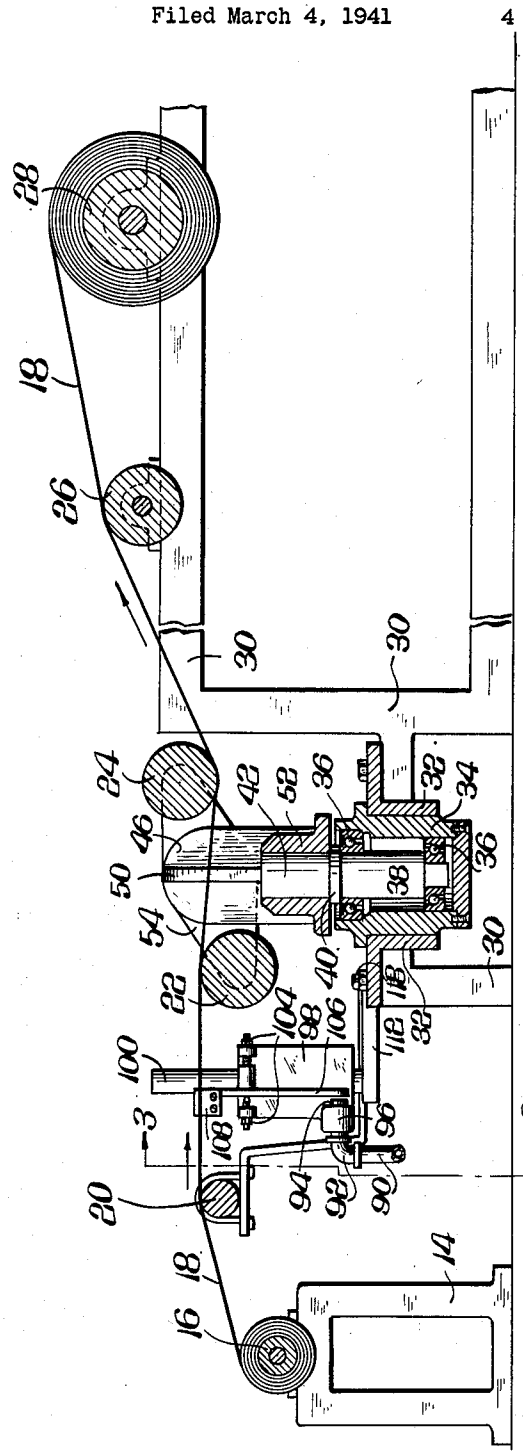


Fig. 2.

INVENTOR
ALFRED T. KING

BY Louis Necho
ATTORNEY

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WEB ALIGNING APPARATUS

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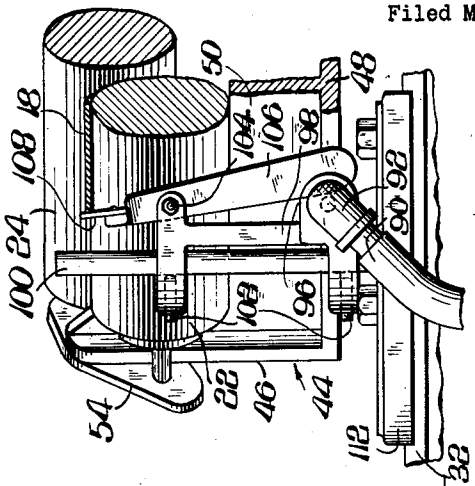


Fig. 5.

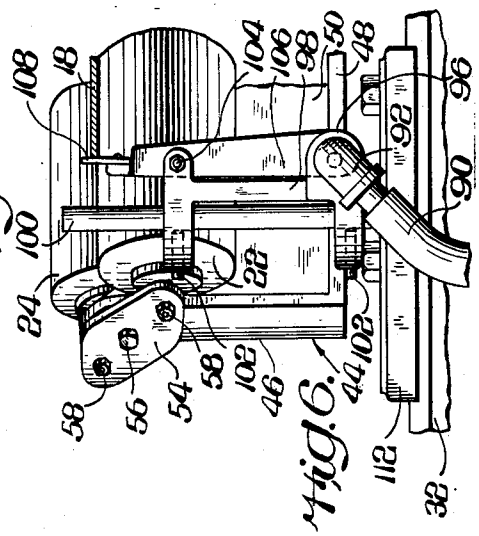


Fig. 6.

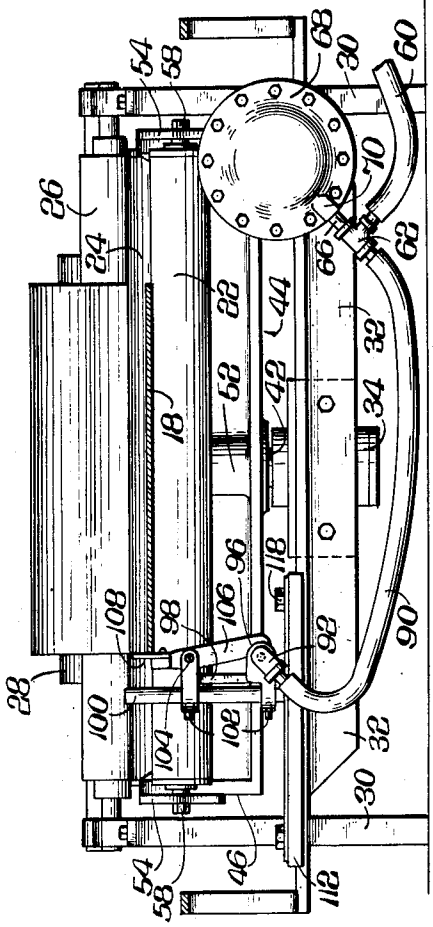


Fig. 3.

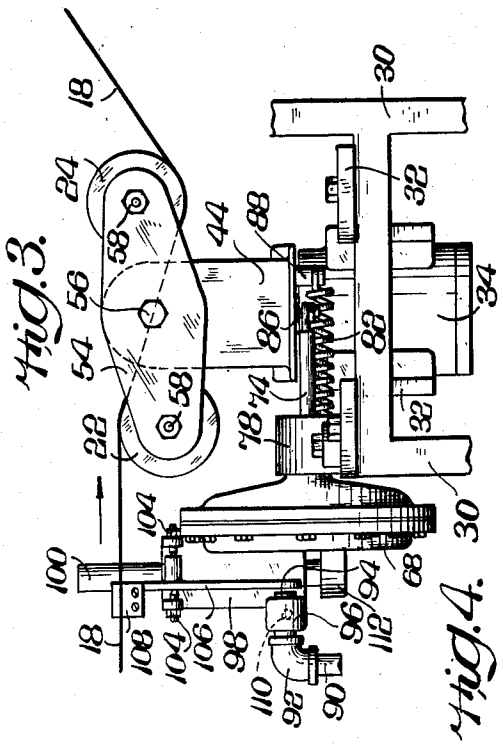


Fig. 4.

INVENTOR

ALFRED T. KING

BY Louis Necho

ATTORNEY

Oct. 5, 1943. A. T. KING 2,331,030

WEB ALIGNING APPARATUS

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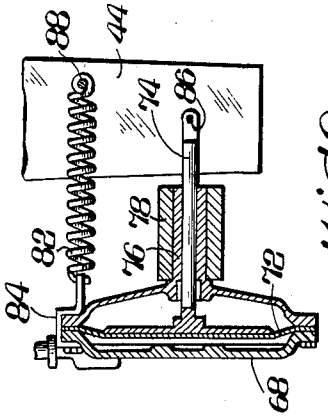


Fig. 9.

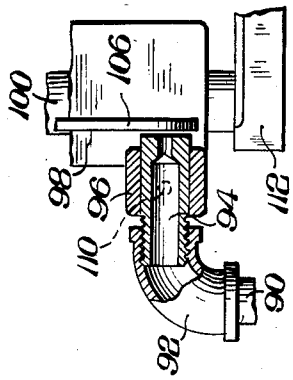


Fig. 10

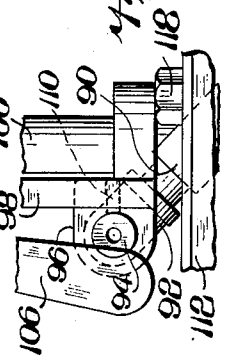


Fig. 11.

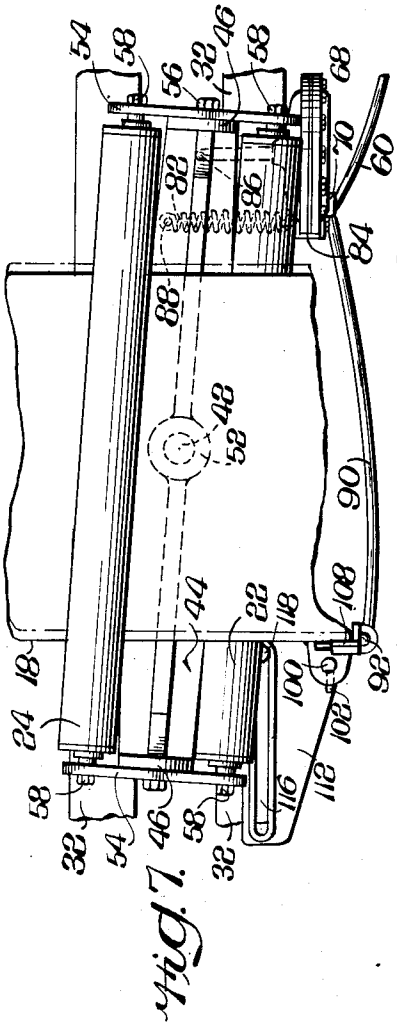


Fig. 7.

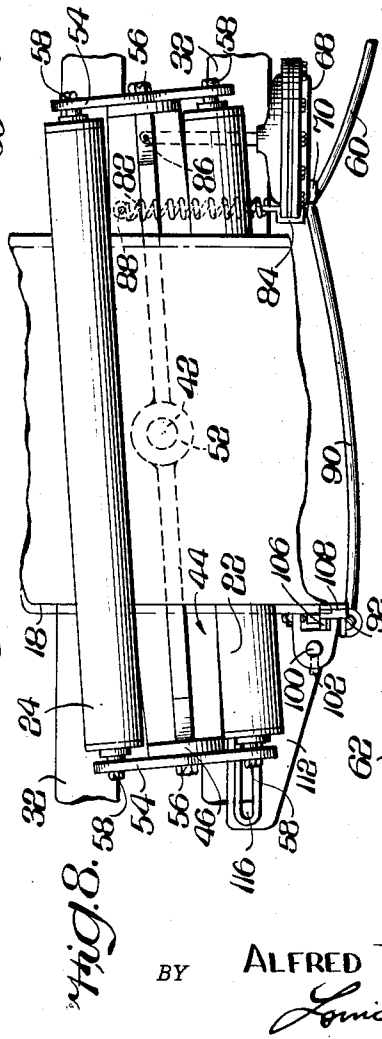


Fig. 8.

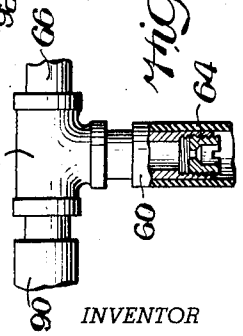


Fig. 12.

INVENTOR

BY ALFRED T. KING

Louis Necko

ATTORNEY

Patented Oct. 5, 1943 2,331,030

UNITED STATES PATENT OFFICE

2,331,030

WEB ALIGNING APPARATUS

Alfred T. King, Upper Darby, Pa., assignor to Hess and Barker, Philadelphia, Pa., a partnership made up of: Wayne Barker, Robert Barker, Effingham Barker, and Margaret Ridgway

Application March 4, 1941, Serial No. 381,639

2 Claims. (Cl. 271—2.6)

My invention relates to a new and useful web aligning apparatus which is adapted to be used in connection with the winding of a web whether it be paper, fabric or the like, the aligning apparatus being such as to be easily adapted and applied to different types of existing machinery, and being also adapted to be incorporated as a unit while such machinery is being built without undue interference with, or alteration of, such standard equipment.

Web balancing or aligning apparatus of this general character has heretofore been known and used but such apparatus has mostly consisted of mechanically actuated and operated apparatus which, unless made with extreme care and precision, will not be sufficiently sensitive or responsive thus either resulting in rather imperfect winding or precluding the use of the apparatus when the web being wound is relatively fragile.

According to my invention the web balancing apparatus is of a continuously self-aligning nature, the aligning action of the apparatus being in turn dependent upon and determined by the maintenance or regulation of combination spring and pneumatic pressure factors which, in addition to being easy to produce and install, can, once they are calibrated to the requirements of the particular operation, be left alone without further adjustment, and which in practice have and will insure perfect alignment.

The full nature and advantage of my novel apparatus will be more clearly understood from the following specification and the accompanying drawings in which:

Fig. 1 represents, diagrammatically, a top plan view of a web winding machine provided with the aligning or balancing device embodying my invention.

Fig. 2 represents a view partly in section and partly in elevation taken on line 2—2 of Fig. 1.

Fig. 3 represents a view partly in section and partly in elevation taken along the line 3—3 of Fig. 2.

Fig. 4 represents a fragmentary and diagrammatic view of the right hand end elevation of Fig. 3.

Figs. 5 and 6 represent fragmentary, perspective views showing the aligning apparatus in its opposite, extreme positions.

Figs. 7 and 8 represent fragmentary top plan views corresponding to Figs. 5 and 6.

Figs. 9, 10, 11 and 12 are in the nature of fragmentary and diagrammatic enlargements showing various details of construction.

Referring to the drawings in which like reference characters indicate like parts, and more particularly to Figs. 1 and 2, 14 designates any suitable framework which carries the feed roll 16 from which the web 18 is fed in the direction of the arrow over the guide bars 20 and 22 and under the guide roll 24, over the guide roll 26 and onto the take-up roll 28. The parts 20, 22, 24, 26, and 28 are carried by any suitable framework which is conventional and need not be described in detail. Also, the number of guide rolls 22 to 26 and their location as well as their relation to the fabric is conventional and optional, the essential point being that the fabric is traveling in the direction of the arrow from the feed roll 16 to the take-up roll 28, and the object of the invention being to insure that the web 18 will be uniformly wound on the take-up roll 28 and will be in perfect alignment when wound on the take-up roll 28.

Referring to Fig. 2 it will be seen that to the framework 30 are secured the brackets or angles 32 which in turn support the housing 34. In the housing 34 are accommodated the ball bearings 36 which support the shaft 38. The shaft 38 is provided with the collar 40 and the upper extension 42. By this construction the shaft 38 is freely rotatable and with a minimum of friction.

Referring now to Figs. 2, 3, 5 and 6, 44 designates a supporting beam having the vertical end walls 46 and the horizontal wall 48, this beam being also provided with a reinforcing rib or web 50. The supporting beam 44 is provided with a centrally located hollow hub 52 which is adapted to fit over the upper extension 42 of the shaft 38 and to seat or rest upon the collar 40 as best shown in Fig. 2. To the vertical end walls 46 of the beam 44 are secured the plates 54 by the bolts or the like 56. In the opposite ends of the plates 54 are journalled the rotary shafts 22 and 24 as at 58. When it is desired to tilt the rollers 22 and 24 in one direction or the other in order to adjust the position of the rollers with respect to the plane of the web, the central bolts 56 at the opposite ends of the machine are loosened, the proper adjustment is made and the assembly is again tightened in position. It will be seen, particularly from Figs. 3 and 5, that the freely rotating rollers 22 and 24 are adjustable as to their relative heights or levels so that the rollers 22 and 24 may be on the same level if so desired, or the roller 22 can be lower than the roller 24 of vice versa. Also, it will be seen that the rollers 22 and 24, being carried by the supporting beam 44, are also rotatable with the beam

44, as a unit, about the vertical axis of the shaft 38 on the ball bearings 36 so that a minimum of pressure or tension is needed to cause such rotation.

In Figs. 7 and 8 the rollers 22 and 24 are shown tilted in opposite directions with respect to the vertical axis of the shaft 38. Due to unavoidable conditions, the web 18 while traveling at high speed will tend to get out of alignment while being wound on the take-up roll 28 and it therefore becomes necessary to provide means for continuously, automatically and accurately maintaining the proper alignment and such means must necessarily be extremely sensitive since in many cases the web 18 is extremely fragile. In order to accomplish this result I provide an air compressor (not shown) which is operatively connected to the hose 60 which in turn is connected to the T 62.

Referring to Fig. 12, it will be seen that in the end of the hose 60, which is connected to the T 62, I provide a restricted orifice 64 the purpose of which is to regulate the air pressure without the necessity of adjusting the air compressor itself and without the necessity of limiting me to the use of an air compressor of predetermined or limited capacity. From the T 62 a coupling 66 leads into the casing 68 through the inlet 70. In the casing 68 is positioned a flexible diaphragm 72 to which is connected the rod 74. The rod 74 moves through the bushing or bearing 76 which is integral with or secured to the adjacent side of the diaphragm casing 68. 78 designates a clamp for rigidly securing the diaphragm casing 68 to the adjacent portion 32 of the frame of the machine. 82 designates a spring which is secured by the bracket 84 to the diaphragm casing 68 as best shown in Fig. 9. The rod 74 is suitably secured to the supporting beam 44 by means of the pivot pin or the like 86 and the spring 82 is also anchored to the supporting beam 44 at 88. From the other end of the T 62 a hose 90 extends to the opposite end of the machine and terminates in a coupling 92 into which is threaded the jet or nozzle 94 which in turn is slidable in the neck or bearing 96 which is secured to or constitutes an extension of the vertical supporting yoke 98. The supporting yoke 98 is mounted for vertical adjustment on the rod 100 by means of set screws or the like 102. Near the upper end of the yoke 98 is freely pivoted, as at 104, the swinging shutter 106, the lower end of which is adapted to register wholly or partly, or to be entirely out of registration with the discharge end of the jet 94 as best illustrated in Figs. 5, 6, 10 and 11. The swinging shutter 106 is provided with an upper extension 108 against which the web 18 is adapted to abut as best seen in Figs. 5 and 6.

The operation is as follows:

The compressed air supplied by the compressor (not shown) is discharged through the orifice 64 into the T 62 and from the T 62 some of the air passes through the inlet 70 into the diaphragm casing and some of the air will pass through the hose 90 and escape through the jet 94. The air pressure is determined by the restriction of the orifice 64 which can be changed to suit various requirements but which remains fixed and obviates the necessity for manual adjustment of one or more parts once the capacity has been determined. The air entering the diaphragm casing 68 presses against the diaphragm 72 to actuate the rod 74 to the right as viewed in Fig. 9 and since the rod 74 is pivoted at 86 to the supporting beam 44 which in turn carries the rollers 22 and 24, the action of the air against the diaphragm would tend to pivot the supporting beam 44 about the vertical axis of the shaft 38. Since the beam 44 is also connected to the spring 82 at 88, and since the other end of the spring is connected rigidly at 84, it follows that the action of the rod 74, when it moves to the right, would be against the tension of the spring 82 and that the spring 82 constantly tends to pull on the supporting beam 44 in the reverse or left hand direction as viewed in Fig. 9. Therefore the tendency of the spring 82 is to pivot the supporting beam 44 about the vertical axis of the shaft 38 in the reverse direction from the action of the rod 74 and therefore, if the action of the rod 74 is to rotate the hub 52 and hence the supporting beam 44 in a counter-clockwise direction, the tendency of the spring 82 would be to rotate the same in a clockwise direction. Since the supporting beam 44 is mounted on anti-friction bearings 36, it will be seen that the construction is very sensitive and that the slightest variation in the pressure against the diaphragm relative to the action of the spring would result in the rotation in one direction or the other of the beam 44 with respect to the vertical axis of the shaft 38. Since the jet 94 is at all times open so that a certain amount of compressed air is released at all times, it follows that if the flow of air through the jet 94 is retarded the pressure is increased on the diaphragm 72 and vice versa. In order to accomplish this result I have suspended the swinging shutter 106, which has a point pivotal suspension at 104 so that it may be freely swingable and very sensitive, directly in front of the jet 94. Thus, when the shutter 106 is in the position shown in Fig. 6 in which it is in complete registration with the opening of the jet 94, there is maximum obstruction of the flow of air through the jet and therefore there is maximum pressure against the diaphragm 72. Conversely, if the swinging shutter 106 is completely out of registration with the opening of the jet 94 as shown in Figs. 5 and 11, it follows that the flow of air through the jet 94 is at maximum and therefore the pressure against the diaphragm 72 is at the minimum, all of this being due to the fact that the air pressure delivered to the main feed pipe 60 by the air compressor (not shown) is constant both due to the capacity of the compressor as well as due to the particular size of the orifice 64 that is employed. The yoke 98 carrying the swinging shutter 106 is adjustable on the rod 100 as hereinabove explained. From Figs. 3, 5 and 6, for instance, it is clear that the edge of the web 18 abuts against the upper extension 108 of the swinging shutter 106. Therefore, if the web 18 should move unduly to the left, as viewed in Fig. 5, the pressure of the web against the extension 108 will tilt the swinging shutter 106 with respect to the vertical so that it is entirely out of registration with the opening of the jet 94 as more clearly seen in Fig. 11. This causes more of the air to flow through the jet 94 and it therefore decreases the pressure on the diaphragm and hence the rod 74 with the result that the spring 82 will tend to pull the supporting beam 44 to the left of Fig. 9 which in turn will tilt the rollers 22 and 24 as shown in Figs. 5 and 7. This will result in correcting the position of the web. If the resulting correction is excessive so that the web moves too far over to the right as viewed in Figs. 5 and 6, then, due to the position of the center of gravity of the freely

pivoted swinging shutter 106, it will swing in the reverse direction and assume the position shown in Fig. 6 in which it is in complete registration with the opening of the jet 94 thus greatly obstructing the flow of the air therethrough and correspondingly increasing the pressure against the diaphragm 72. This results in the rod 74 pushing the beam 44 to the right as viewed in Fig. 9 and this in turn results in tilting the rollers 22 and 24 in the reverse direction as shown in Fig. 8. This will result in another correction of the position of the web 18. In order clearly to illustrate the point I have shown only the extreme positions of the rollers 22 and 24 and how they are brought about by the extreme positions of the shutter 106 with respect to the jet 94, but it will be understood that as the web travels in the direction of the arrow in Fig. 2 it gradually finds its true center course at which the shutter 106 will probably be only in partial alignment with the jet 94. This is the balanced position of my apparatus and this position will be maintained as long as the web is running true and in the desired alignment. Since this balance is a very delicate one and is maintained between the pressure of the air on the diaphragm, the free or partly obstructed flow of air through the jet 94 and the tension of the spring 82, it follows that the slightest tendency of the web to deviate from its true course will act on the swinging shutter 106 in the manner set forth to vary the air pressure and thus tilt the rollers 22 and 24 as much as may be necessary and in the proper direction until the balanced condition is again regained and the web travels its true course. Further, in order to avoid the necessity of any manual adjustments by the operator, I have provided the jet 94 with the sliding fit in the bearing or clamp 96 so that it may be moved to the right or to the left of Fig. 10 to vary the distance between the outermost edge of the jet 94 and the swinging shutter 106, the jet 94 being fixed in the desired position by the set screw or the like 110. It will be understood that the closer the end of the jet 94 is to the shutter 106 the greater the obstructing power of the shutter and vice versa.

In order to adjust the aligning device to webs of different widths, the rod 100, which carries the yoke 98 which in turn carries the swinging shutter 106 and the jet 94, is mounted on the plate 112 which in turn is adjustably secured to the support 32 by means of the slot 116 and the pin 118 which are best seen in Fig. 1. By this construction the rod 100 and the yoke 98 and their adjuncts can be moved to the right or to the left as viewed in Fig. 3 according to the width of the fabric.

Having thus described my inventoin, what I claim as new and desire to secure by Letters Patent is:

1. In a web aligning apparatus, a support, a bracket mounted for free rotation about a vertical axis on said support, a guide roll journalled in said bracket and over which said web is adapted to travel, a rod operatively connected to said bracket, means for constantly exerting positive pneumatic pressure on said rod for urging said bracket to turn in one direction about said vertical axis, a spring operatively connected to said bracket and constantly urging the same to rotate about said vertical axis in the opposite direction, a by-pass leading from said pneumatic means and terminating in a relief nozzle, a vertically adjustable, pivotally mounted shutter having its lower end disposed in proximity to the discharge end of said relief nozzle, and having its upper end in contact with an edge of said web whereby said shutter is adapted to be swung into a position partly or wholly to open or obstruct said relief nozzle by the deviation of the web from a predetermined course, thereby to vary the pressure of said pneumatic means on said rod relative to the action of said spring, and means for vertically adjusting said shutter.

2. In a web aligning apparatus, a support, a bracket mounted for free rotation about a vertical axis on said support, a guide roll journalled in said bracket and over which said web is adapted to travel, a rod operatively connected to said bracket, means for constantly exerting positive pneumatic pressure on said rod for urging said bracket to turn in one direction about said vertical axis, a spring operatively connected to said bracket and constantly urging the same to rotate about said vertical axis in the opposite direction, a by-pass leading from said pneumatic means and terminating in a relief nozzle, a vertically adjustable, pivotally mounted shutter having its lower end disposed in proximity to the discharge end of said relief nozzle, and having its upper end in contact with an edge of said web whereby said shutter is adapted to be swung into a position partly or wholly to open or obstruct said relief nozzle by the deviation of the web from a predetermined course, thereby to vary the pressure of said pneumatic means on said rod relative to the action of said spring, and means for slidably mounting said relief nozzle with respect to said shutter whereby the distance between said relief nozzle and said shutter may be varied.

ALFRED T. KING.