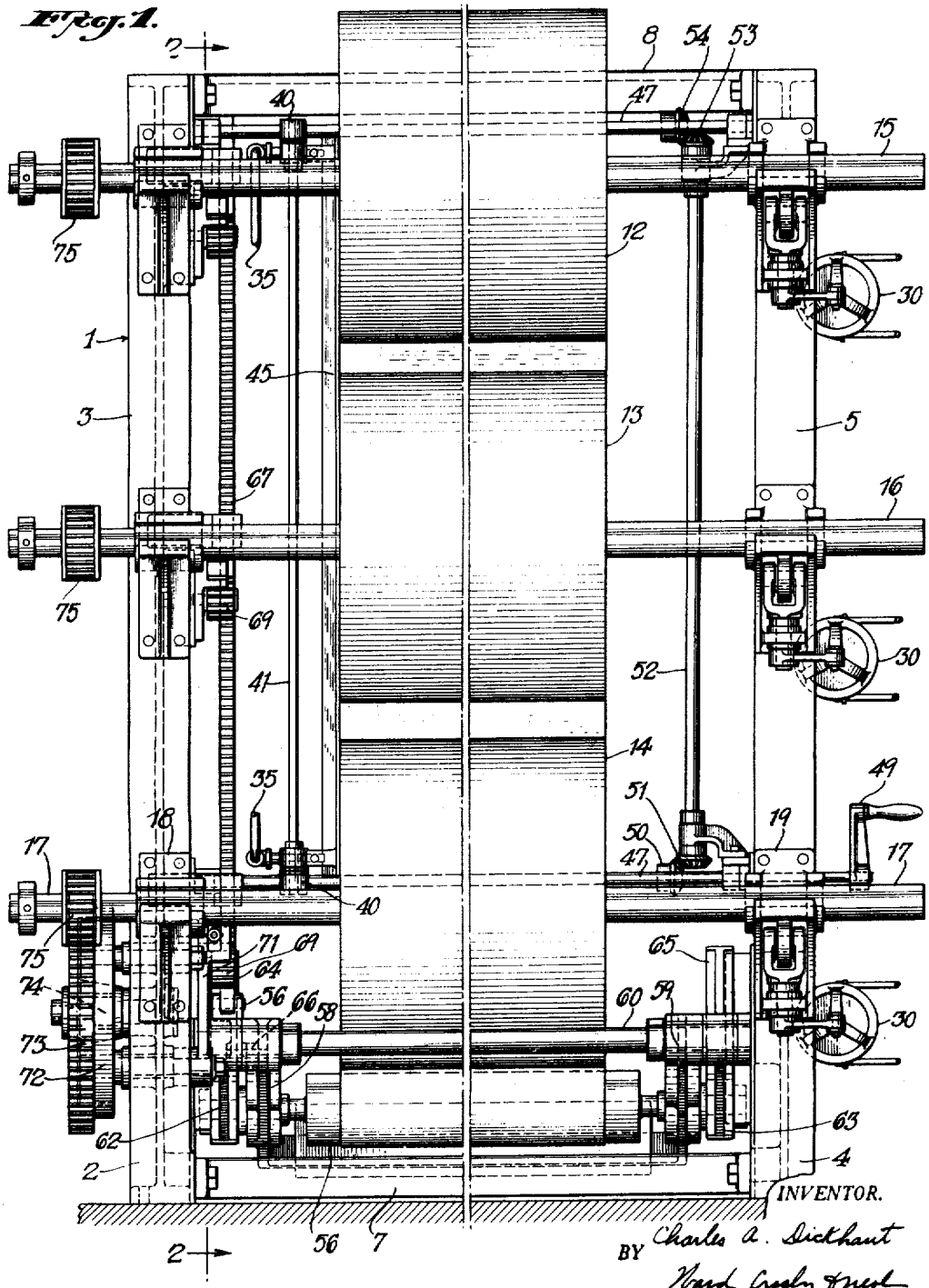
May 2, 1944. C. A. DICKHAUT 2,347,893

APPARATUS FOR WEB ALIGNMENT

Filed Nov. 9, 1942 4 Sheets-Sheet 1

Fig. 1.

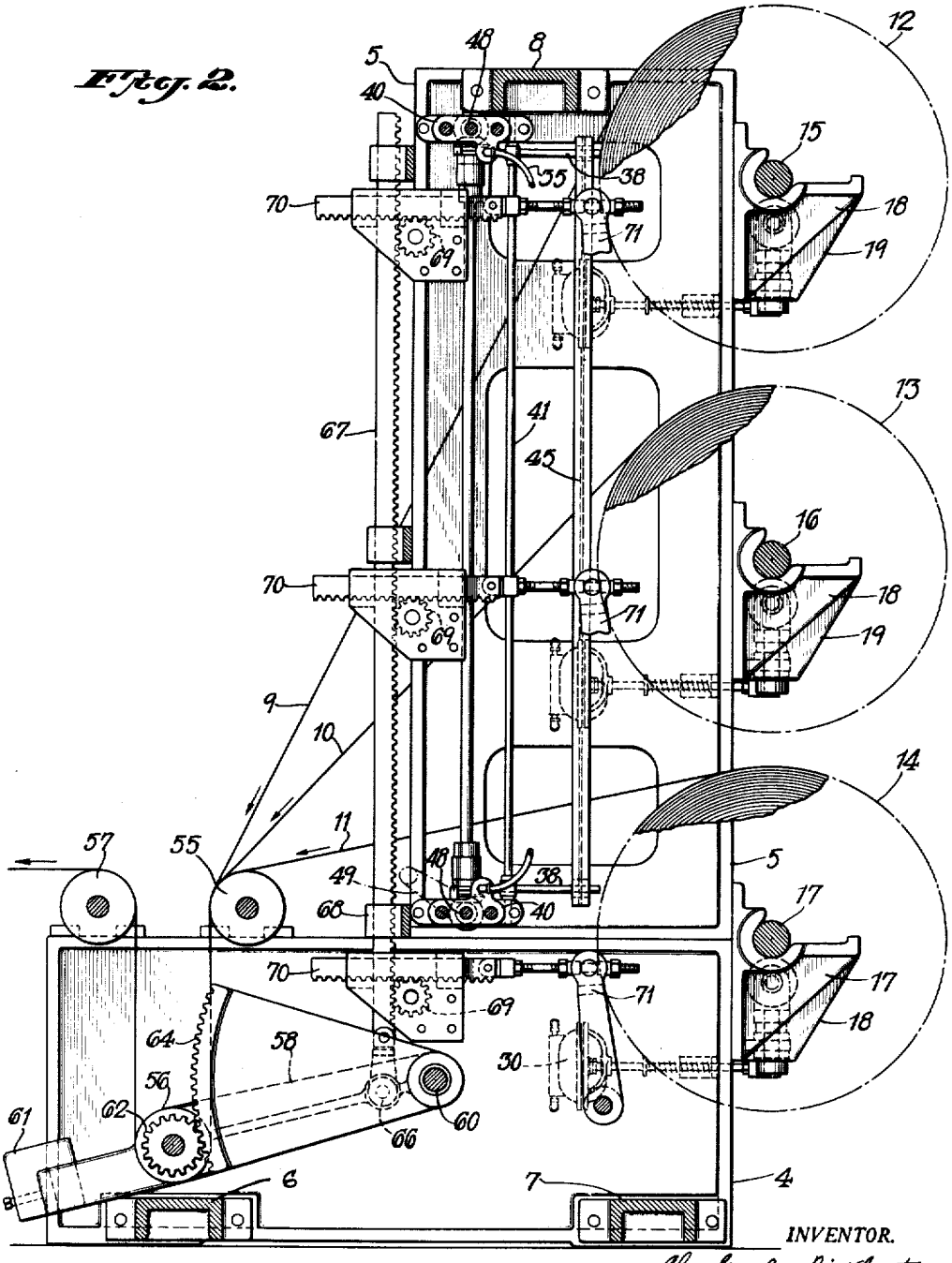


May 2, 1944. C. A. DICKHAUT 2,347,893

APPARATUS FOR WEB ALIGNMENT

Filed Nov. 9, 1942 4 Sheets-Sheet 2

Fig. 2.



INVENTOR.
Charles A. Dickhaut
BY
Ward Canby Mead
his ATTORNEYS

May 2, 1944. C. A. DICKHAUT 2,347,893

APPARATUS FOR WEB ALIGNMENT

Filed Nov. 9, 1942 4 Sheets-Sheet 3

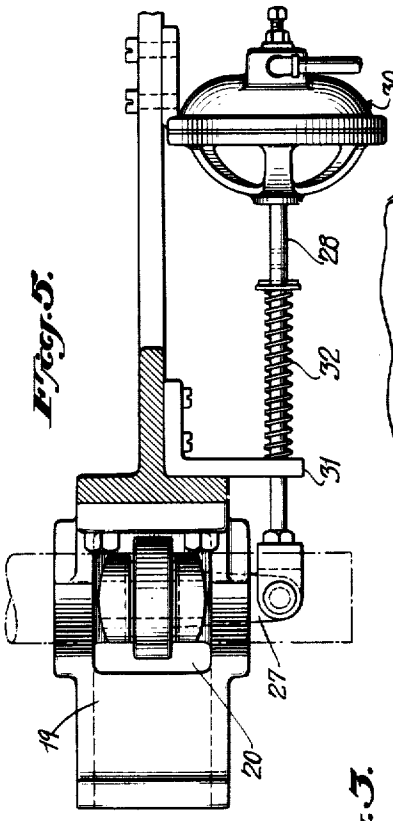


Fig. 5.

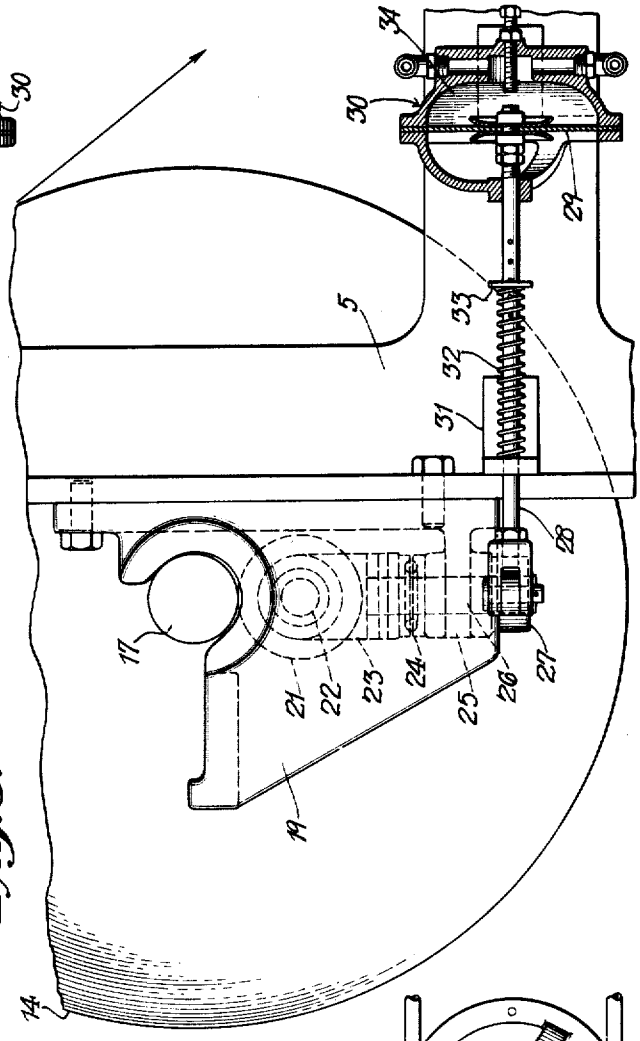


Fig. 3.

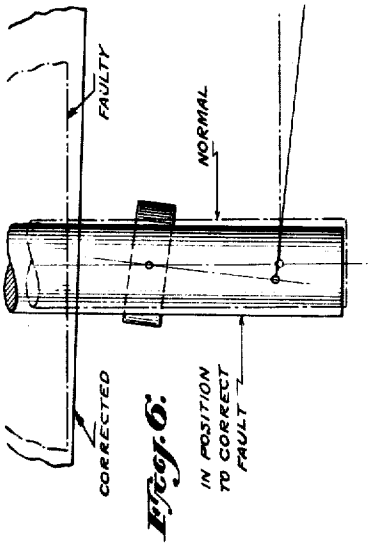


Fig. 6.

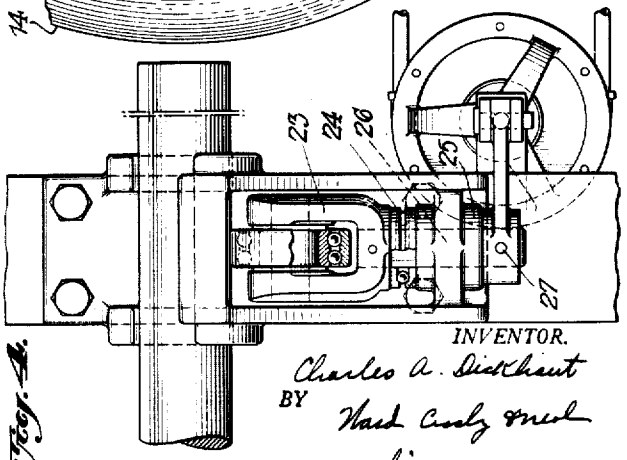


Fig. 4.

INVENTOR.
Charles A. Dickhaut
BY Hood Cooley Hood
his ATTORNEYS

May 2, 1944. C. A. DICKHAUT 2,347,893

APPARATUS FOR WEB ALIGNMENT

Filed Nov. 9, 1942 4 Sheets-Sheet 4

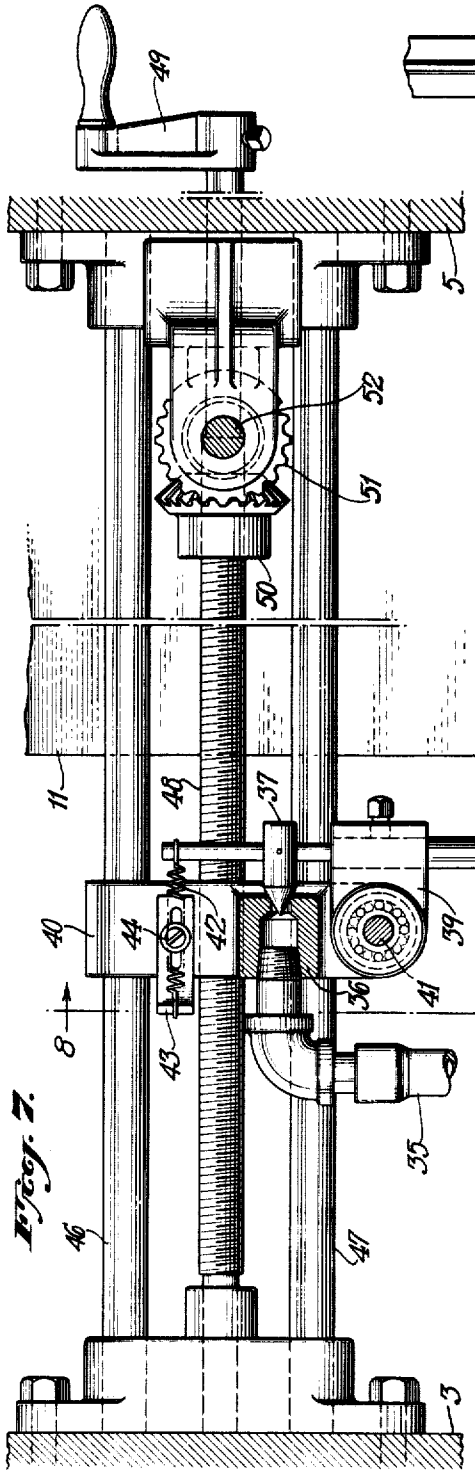


Fig. 7.

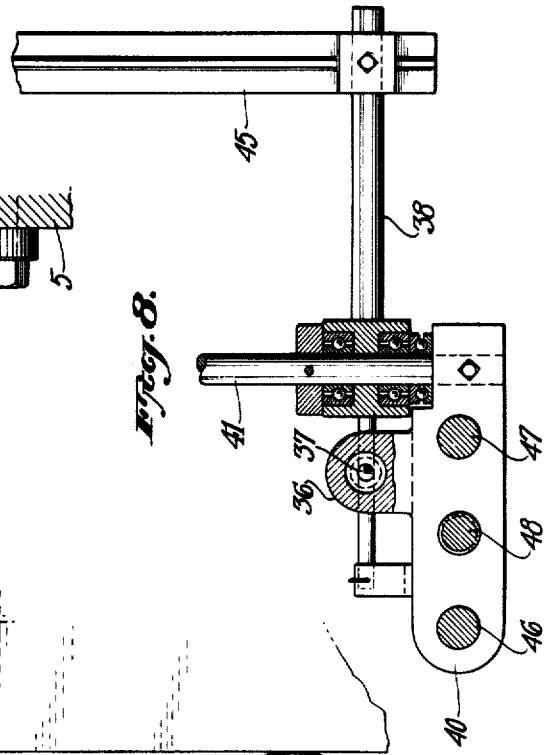


Fig. 8.

INVENTOR.
Charles A. Dickhaut
BY
Ward Cady & Reed
his ATTORNEYS

Patented May 2, 1944 2,347,893

UNITED STATES PATENT OFFICE

2,347,893

APPARATUS FOR WEB ALIGNMENT

Charles A. Dickhaut, New Brunswick, N. J., assignor to John Waldron Corporation, New Brunswick, N. J., a corporation of New Jersey

Application November 9, 1942, Serial No. 465,004

12 Claims. (Cl. 242—76)

The invention relates to apparatus for controlling the alignment of a travelling web of sheet material, such as from or to a bundle roll of said material.

In machines for handling or operating upon such webs it is desirable to guide the web in a predetermined path of travel, such as in a direction normal to the axis of rotation of the roll or bundle of web material. As is well known in the art, such travelling webs have a tendency to "hunt" or oscillate from side to side during their travel, and this is objectionable—especially where the web is desired to be brought into a predetermined position or register at a point removed from its roll.

In my prior Patent No. 1,858,436, issued May 17, 1932, for "Automatic side control for rolls," I disclosed mechanism for adjusting the path of travel of web material by axially sliding the axle of said roll relative to its supporting bearings. As to certain of its features the present invention is an improvement over that of my said prior patent.

An object of the present invention is to provide a greatly improved mechanism for effecting web alignment in a simple and dependable manner.

Another object is to provide mechanism which may be employed readily in conjunction with various machines for operating upon, or handling, such web material.

The invention consists in the novel features of construction, arrangement, and combination of parts embodied, by way of example, in the apparatus hereinafter described as illustrating a present preferred form of the invention, and the invention will be more particularly pointed out in the appended claims.

Further and more specific objects, features and advantages of the invention will more fully appear from the detailed description given below taken in connection with the accompanying drawings which form a part of this specification, and in which

Fig. 1 is a front elevational view of an embodiment of the invention, with certain parts omitted for purposes of clarity;

Fig. 2 is a vertical section in end elevation taken at 2—2 of Fig. 1;

Fig. 3 is an end view of certain parts of the device illustrated in Figs. 1 and 2, showing further details of construction;

Fig. 4 is a front view of the mechanism shown in Fig. 3;

Fig. 5 is a plan view of the mechanism shown in Figs. 3 and 4;

Fig. 6 is a diagrammatic plan view illustrating the principal in accordance with which the alignment of the travelling web is effected;

Fig. 7 is a plan view of certain details of the structure pertaining to the control mechanism; and

Fig. 8 is a cross-sectional view in elevation taken at 8—8 of Fig. 7.

Referring more particularly to Figs. 1 and 2; a suitable supporting frame, designated in its entirety as 1, comprises a pedestal portion 2 carrying rigidly secured thereto an upper portion 3 forming therewith one side frame which is rigidly secured in spaced relationship with a correspondingly opposite side frame comprising a pedestal portion 4 and an upper portion 5, by means of suitable lower spreader members 6 and 7 and an upper spreader member 8. In the present embodiment the machine is adapted to handle a plurality of webs of sheet material designated respectively (Fig. 2) 9, 10 and 11 supplied or fed from the respectively corresponding bundle rolls 12, 13 and 14. The rolls 12, 13 and 14 are rotatably supported on the respective axles 15, 16 and 17, and each of these axles is in turn supported in a manner to be particularly described following with reference to axle 17, it being understood that the support of the remaining axles 15 and 16 is provided for in the same manner.

The oppositely disposed journal portions of the axle 17 (Fig. 1) are received in respective bearings 18 and 19 rigidly secured to the respective side frame members 3 and 5. As will be seen from Fig. 2, the bearings 18 and 19 are of the open type and are provided with a platform portion upon which the axle may be placed and from which it may be rolled into the open bearing seat. These bearings do not have a snug running fit with the journal portions of the axle but provide a relatively loose fit permitting a slight angular movement of the axle to each side of its neutral axis, which extends in a direction normal to the desired path of travel of the web. The bearing 19 (Figs. 3, 4 and 5) is provided with an opening or cut-out portion 20 through which extends the periphery of a cylindrical roller 21, which in the present embodiment is the outer race of a double row ball bearing, through the inner race of which passes an axle pin 22 whose opposite ends are carried in the U-shaped supporting member 23 which rests upon a thrust bearing 24 supported on a bracket portion 25 provided as an integral part of the bearing member 19. The member 23 is secured to a vertically disposed pintle 26 which passes through the thrust bearing 24 and is jour-

nalled in the bracket 25 to thereby hold the parts in proper position during the rotational movement provided between the member 23 and bracket 25. The roller 21 is positioned so that the upper portion of its periphery is disposed somewhat above the lower concavity of the bearing 19 so as to bring said surface into tangential supporting contact with the corresponding journal portion of the axle 17. The axis of rotation of the roller 21 lies in a substantially vertical plane passing through this point of contact and through the axis of rotation of the axle 17 which is shown in its neutral position in Figs. 3, 4 and 5. In this position the axis of the pintle 26 passes through the axis of the pin 22 intermediate the length of the roller 21, and for purposes of description this will be referred to as the axis of oscillation of the roller 21.

The lower end of the pintle 26 carries secured thereto a crank arm 27 whose outer end is pivotally attached to the outer end of the rod 28. The rod 28 has its other end secured to a diaphragm 29 forming a movable part of the pneumatic unit, designated in its entirely as 30, and which is rigidly supported on a portion of the side frame member 5. The rod 28 passes through a bracket 31, also rigidly secured to the frame member 5, and a suitable compression spring 32 surrounds the rod 28 and is disposed between the bracket 31 and a washer 33 adjustably secured to the rod 28 for purposes to be hereinafter referred to. The pneumatic device 30 is adapted to be actuated by the difference in pressure between the side of the diaphragm 29 exposed to the closed chamber 34 and its opposite side which is exposed to the atmosphere; and accordingly the device may be actuated by reducing the pressure in chamber 34 below atmospheric (suction) or increasing it above atmospheric (pressure). The present device employs suction.

Suction to the pneumatic device 30 is controlled by regulating the admission of atmospheric pressure to the chamber 34 through a control valve (Figs. 7 and 8) interconnected to the chamber 34 as by a rubber tube designated 35 connected to a valve comprising a head 36 provided with an orifice whose opening is varied by means of a needle 37. The needle 37 is secured to an arm 38 provided intermediate its ends with a fulcrum hub 39 supported on a screw block 40 for pivotal movement about an axle 41; the block 40 being integral with the valve head 36. The outer end of the arm 38 is attached to one end of a tension spring 42 whose other end is fastened to an anchor plate 43 adjustably secured to the block 40 as by a slot and screw connection designated 4. The other end of the arm 38 is secured to a feeler bar 45 which is vertically disposed and in the present embodiment is shown common to the three webs; in Figs. 7 and 8 the particular valve illustrated being associated with the lower axle 17, and the lever arm 38 being attached adjacent the lower end of the feeler bar 45.

The block 40 is slidably supported on the parallel cross bars 46—47 whose opposite ends are suitably secured to the respective side frame members 3 and 5. A screw shaft 48 is positioned intermediate the bars 46—47 and parallel thereto, and is in threaded engagement with a correspondingly threaded bore provided in the block 40; the shaft 48 being suitably journalled at its opposite ends for rotative movement by means of a crank handle 49 secured to the outwardly extending end of the screw shaft 48. It will therefore be seen that the rotation of the crank 49, will cause a transverse movement to be imparted to the block 40 which carries with it the valve mechanism and feeler bar 45. The upper end of the feeler bar 45 in the present embodiment is associated with a similar valve mechanism whose corresponding block is mounted on corresponding guide bars; and the axle 41 is likewise common to both valves. In order to assure transverse parallel movement of the feeler bar 45 the lower jack screw shaft 48 is provided with a miter pinion 50 (Figs. 7 and 1) in driving engagement with a corresponding pinion 51 carried on the lower end of a torque shaft 52 supported in suitable journals and having secured at its upper end a miter pinion 53 in driving engagement with a cooperating pinion 54 carried by the upper jack screw shaft such as 48; to thereby cause simultaneous and like movement of the screw blocks and associated mechanisms. This lateral adjustment of the feeler bar 45 permits adjustment of the bar in accordance with various widths of web material which it is desired to use, so that the bar may be placed in the zone of lateral travel of a contiguous edge of the web.

In the present embodiment since the bar 45 is common to the three webs 9, 10 and 11 the tubes, such as 35, of the upper and lower valves are connected to a common vent line which serves as a common vent for the pneumatic devices, such as 30, provided one each for the respective bundle rolls 12, 13 and 14. It will be understood by those skilled in the art that where desired individual valves may be actuated by individual webs to control respective pneumatic means.

With the feeler bar so placed, lateral movement or "hunting" of the web will cause inward and outward movement of the respective valve needles 37 about their pivotal axle 41 to thereby relatively open and close the respectively associated valve or valves, which in turn control the degree and direction of operation of their respectively associated pneumatic devices such as 30. The devices 30 are suitably connected to the vent line 35 and suction source (not shown); e. g., as in said Pat. No. 1,858,436.

Web tension control

Referring particularly to Figure 2; the webs 9, 10 and 11 pass in their forward travel over a common idle or guide roller 55 suitably journalled to the lower side frame members 3 and 4 where they are brought into face-to-face contact and pass downwardly around a dancer roller 56 and then upwardly over another freely rotatable guide roller 57 suitably journalled in the side frame members 2 and 4. From the guide roller 57 the multiply web passes outwardly to the next operation, which in the present embodiment happens to be a tube rolling machine (not shown) and which provides the tractive force causing the web travel. The dancer roller 56 is provided with oppositely extending axle ends which are freely journalled in oppositely disposed arms (see also Fig. 1) 58—59 whose inner ends are pivotally mounted on a shaft 60 suitably journalled at its ends where it is supported from the side frame members 2 and 4. The outer ends of the arms 58—59 are provided with weights such as 61 (Fig. 2) adjustably carried thereon. The oppositely extending axle ends of the roller 56 pass outwardly through their respective supporting arms 58—59 and carry fixed thereto pinion gears 62—63 in mesh with respective gear segments 64—65 rigidly secured to the respective inner faces of the side frame members 2 and 4; thus providing for equalization of

and assuring parallel alignment of the dancer roller 56 in its up and down movement about the supporting shaft 60.

The supporting arm 58 is pivotally connected as at 66 to the lower end of the vertically extending gear rack 67 which is slidably supported for vertical movement in suitable guideways such as 68 rigidly secured to the frame member 3. The gear rack 67 is in driving engagement with pinion gears such as 69, one being provided for each of the roll units, and these pinions are mounted on suitable journals rigidly carried by the side frame member 3. Each pinion is in engagement with a respectively cooperating horizontally extending gear rack such as 70 (Fig. 2) which is adapted to be moved back and forth in accordance with its pinion 69. The right-hand end of each gear rack 70 is pivotally connected by suitable means to a brake arm such as 71 (Fig. 1) which serves to actuate an internal brake drum such as 72 formed integrally with a cooperating gear 73 suitably journalled on the side frame 3 for rotation about an axle such as 74. Each of the gears 73 is in driven engagement with a pinion 75 connected to the corresponding bundle roll shaft such as 17 and preferably floating in roller bearings to permit limited angular movement of the shaft while maintaining driving relationship between the pinion 75 and gear 73. From this it will be understood that as the travelling webs 9, 10 and 11 are fed forward at such speed that the loop of multi-ply web between the idle rollers 55 and 57 lengthens, the roller 56 moves downwardly under the influence of the weight 61; causing the arm 58 to move the gear rack 67 downwardly, thereby rotating the pinions 69 anti-clockwise and causing the gear racks 70 to move to the left, which in turn moves the brake arms 71 anti-clockwise to thereby apply friction to the brakes with the resultant braking of the rotation of each of the bundle roll axles such as 17. Conversely, as the multi-ply loop passing around the roller 56 shortens, the brakes are released.

Operation

After the bundle rolls have been placed on the machine and threaded through in the manner previously indicated (Figs. 2 and 1) the feeler bar 45 is set against the edges of the webs 9, 10 and 11 with the webs positioned in the desired path of travel. At this setting of the feeler bar 45 (Fig. 7) the needle 37 is positioned so that the valve orifice is half open; so that as the feeler bar 45 moves to the left the valve is further opened and as the feeler bar moves to the right the valve is further closed. With this adjustment of the valve the pneumatic motor (Figs. 3, 4 and 5) is so adjusted, as by spring 32 and rod 28, that the bearing roller 21 is disposed with its axis of rotation in alignment with the axis of rotation of the bundle roll shaft such as 17.

If the web should move to the left of the desired path of travel the control valve is opened to thereby increase the vent to the chamber 34, causing the suction in the chamber to drop and allowing the actuating rod 28 to move to the left (Figs. 3 and 5) thereby moving the bearing roller 21 about its axis of oscillation and causing its axis of rotation to be moved out of alignment with the axis of rotation of the supporting shaft such as 17; for example as diagrammatically illustrated in Fig. 6. The bundle roll shaft will thereupon assume a position of parallelism with the position of adjustment of the center of rotation of its supporting journal roller 21 and this will necessarily cause the web to move from its bundle roll in a direction normal to the new position of adjustment of its supporting axle, which will carry the web laterally to the right. Conversely, if the web should travel to the right beyond the desired path, the mechanism will operate in the reverse manner to angularly adjust the position of the bundle roll shaft so as to move the web to the left. From this it will be seen that the web is kept in desired alignment by means of giving small increments of angular adjustment to the bundle roll shaft in the direction desired to effect such alignment.

In the angular adjustment of the bundle roll shaft it will be understood that the shaft is in effect pivoted about the bearing such as 18 (Fig. 1) oppositely disposed to the bearing such as 19 with which the bearing roller 21 is associated. Accordingly the movement of the outwardly extending end of the shaft such as 17 with respect to its pinion such as 75 is very slight and is readily accommodated by suitable means such as the roller bearing floating support of the pinion above referred to. Accordingly the actuation of the braking mechanism, in accordance with the tension control previously described, is readily achieved. It will also be appreciated from the foregoing description of operation that the increments of angular adjustment of the shaft are relatively small and since they are effected by utilizing the natural tendency of a rotating body to assume parallelism with another rotating body in tangential contact therewith, the effort necessary to effect the angular adjustment is relatively small as compared with that heretofore required. Furthermore, the delicacy of adjustment possible in accordance with this invention results in a much smoother operating machine and therefore provides for economy in operation and service upkeep.

It is to be understood that while I have found it desirable in the present embodiment to utilize only one bearing roller such as 21 in association with the bearing means on one end of the supported shaft or axle; nevertheless it is contemplated that in certain embodiments it may be found desirable to utilize a roller bearing such as 21 in association with the bearing means at both ends of the supported shaft; such dual means providing for increased speed of angular displacement of the shaft and serving to effect this angular displacement about the median length of the shaft instead of about one of its journalled ends as in the present embodiment.

Having thus described my invention with particularity, with reference to the preferred embodiment of the same, and having referred to certain modifications thereof, it will be obvious to those skilled in the art, after understanding my invention, that other changes and modifications may be made therein without departing from the spirit or scope of my invention and I aim in the appended claims to cover such changes and modifications as are within the scope of the invention.

What I claim is:

1. In an apparatus for controlling the alignment of a travelling web associated with a roll of said web material provided with journal portions, the combination of two bearing means spaced apart along a bearing axis substantially normal to the desired path of travel of said web, said bearing means being adapted to receive said journal portions and support said roll for rotation about said axis, one of said bearing means being provided

with a bearing surface portion angularly movable relative to the remainder of said bearing means into and out of parallelism with said normal bearing axis to thereby angularly adjust the axis of rotation of said roll, means for actuating said bearing portion to effect said angular adjustment, and means for controlling said actuating means responsive to lateral movement of said web.

2. In an apparatus for controlling the alignment of a travelling web associated with a roll of said web material, the combination of axle means for rotatably supporting said roll, two bearing means spaced apart along a bearing axis substantially normal to the desired path of travel of said web, said axle being journalled in said bearing means for rotation about said axis, one of said bearing means being provided with a bearing surface portion angularly movable relative to the remainder of said bearing means into and out of parallelism with said normal bearing axis to thereby angularly adjust the said axle means, and means for actuating said bearing portion to effect said angular adjustment.

3. In apparatus for controlling the alignment of a travelling web associated with a roll of said web material provided with journal portions, the combination of two bearing means spaced apart along a bearing axis substantially normal to the desired path of travel of said web, said bearing means being adapted to receive said journal portions and support said roll for rotation about said axis, one of said bearing means being provided with a convex bearing surface portion having tangential contact with a respectively corresponding journal portion, said convex portion being mounted for rotation about a substantially horizontal axis and for oscillation about a substantially vertical axis passing through a point of contact between said convex portion and journal portion, means for oscillating said convex portion about its vertical axis to angularly adjust its said horizontal axis relative to said bearing axis.

4. In apparatus for controlling the alignment of a travelling web associated with a roll of said web material, the combination of spaced apart supporting frame members, two bearing means secured to respective of said members, an axle for carrying said roll and rotatably journalled in said bearing means with its axis substantially normal to the desired path of travel of said web, one of said bearing means comprising a cylindrical body journalled for rotation about a substantially horizontal axis extending in a direction transverse said path of travel and mounted for movement about a substantially vertical axis, said cylindrical body being in tangential supporting contact with said axle, and means for angularly adjusting the horizontal axis of said body relative to said normal axis.

5. In apparatus for controlling the alignment of a travelling web associated with a roll of said web material, the combination of spaced apart supporting frame members, two bearing means secured to respective of said members, an axle for carrying said roll and rotatably journalled in said bearing means with its axis substantially normal to the desired path of travel of said web, one of said bearing means comprising a cylindrical body journalled for rotation about a substantially horizontal axis extending in a direction transverse said path of travel and mounted for movement about a substantially vertical axis, said cylindrical body being in tangential supporting contact with said axle, means for angularly adjusting the horizontal axis of said body relative to said normal axis to thereby cause said axle to be angularly moved about said other bearing means, and brake means connected to said axle through a pinion drivingly secured to said axle adjacent said last mentioned bearing means.

6. In apparatus for controlling the alignment of a travelling web associated with a roll of said web material rotatably supported by oppositely disposed journal portions, the combination of two bearings spaced apart for receiving said journal portions with a loose fit providing sufficient play for angular movement of the axis of rotation of said roll, a rotatable circular roller having a convex surface disposed adjacent one of said bearings for tangential supporting contact with one of said journal portions along a line of tangency lying in a common plane passing through the axes of rotation of said roll and roller, said roller being mounted for angular movement relative to said adjacent bearing and out of said common plane, and means for moving said roller whereby said journal portions are moved relative to said bearings and the axis of rotation of said roll is angularly displaced.

7. In apparatus of the character described the combination of two relatively fixed bearings for supporting respectively opposite ends of a bundle roll axle during the longitudinal travel of a web of said bundle material, said bearings providing for slight angular movement of said axle to either side of an axis of rotation normal to the desired direction of web travel, one of said bearings having an opening provided therethrough, a cylindrical roller mounted for rotation about an axis extending in the general direction of said bundle roll axis and having a portion of its periphery extending upwardly through said opening for supporting engagement with said axle, said roller being supported for angular movement of its axis of rotation relative to the axis of rotation of said bundle roll axle, actuating means for effecting said movement, and control means for said actuating means provided with a part movably supported adjacent the path of travel of an edge of said web.

8. In apparatus of the character described the combination of two relatively fixed bearings for supporting respectively opposite ends of a bundle roll axle during the longitudinal travel of a web of said bundle material, said bearings providing for slight angular movement of said axle to either side of an axis of rotation normal to the desired direction of web travel, one of said bearings having an opening provided therethrough, a cylindrical roller rotatably supported on an axis substantially parallel to said bundle roll axis and having a portion of its periphery extending upwardly through said opening for supporting engagement with said axle, means for moving said roller axis out of parallelism with said bundle roll axis, and control means for said last means actuated in accordance with the transverse movement of said web.

9. In web feeding apparatus having means for rotatably supporting an axle carrying a roll of web material to be fed relative thereto in a direction normal to the axis of rotation of said axle, the combination of a bearing roller disposed beneath said axle adjacent a journal portion thereof in supporting engagement therewith and freely supported for rotation by driving contact of said axle, means for holding said bearing roller in neutral position of substantial axial alignment with said normally disposed axis of rotation, and means for angularly adjusting

the axis of said bearing roller selectively to one side or the other of said neutral position in accordance with variations in the position of said web transverse its path of travel.

10. In web feeding apparatus having means for rotatably supporting a plurality of superimposed axles carrying respective rolls of sheet material relative to which respective webs are to be fed in superimposed engagement over a common roller in a direction normal to the axes of rotation of said axles, the combination of bearing rollers disposed beneath respective of said axles adjacent journal portions thereof in supporting engagement therewith and freely supported for rotation by driving contact of said axles, means for holding said bearing rollers in neutral positions of substantial axial alignment with said normally disposed axes of rotation, and means for angularly adjusting the axes of said bearing rollers selectively to one side or the other of said neutral positions in accordance with variations in the position of said webs transverse the desired path of travel, said last mentioned means comprising a vertically extending feeler bar disposed adjacent corresponding superimposed edges of said webs in the zone of lateral movement thereof, said bar being movably supported at its respectively opposite ends for parallel adjustment into said zone of lateral web movement.

11. In apparatus for controlling the alignment of a travelling web associated with a roll of said web material rotatably supported by oppositely disposed journal portions, the combination of two bearings spaced apart for receiving said journal portions and providing for angular movement of the axis of rotation of said roll, a rotatable circular roller having a convex surface disposed adjacent one of said bearings for tangential supporting contact with one of said journal portions along a line of tangency, said roller being mounted for angular movement of its axis of rotation relative to said line of tangency, and operative means for moving said roller to thereby angularly displace the axis of rotation of said roll of web material.

12. In apparatus for controlling the alignment of a travelling web associated with a roll of said web material rotatably supported by oppositely disposed journal portions, the combination of two bearings spaced apart for receiving said journal portions and providing for angular movement of the axis of rotation of said roll, a rotatable circular roller having a convex surface disposed adjacent one of said bearings for tangential supporting contact with one of said journal portions along a line of tangency, said roller being mounted for angular movement of its axis of rotation relative to said line of tangency, operative means for moving said roller to thereby angularly displace the axis of rotation of said roll of web material, and control means for said operative means constructed and arranged so as to be actuated by and in accordance with the lateral movement of said web.

CHARLES A. DICKHAUT.