

Nov. 25, 1947.

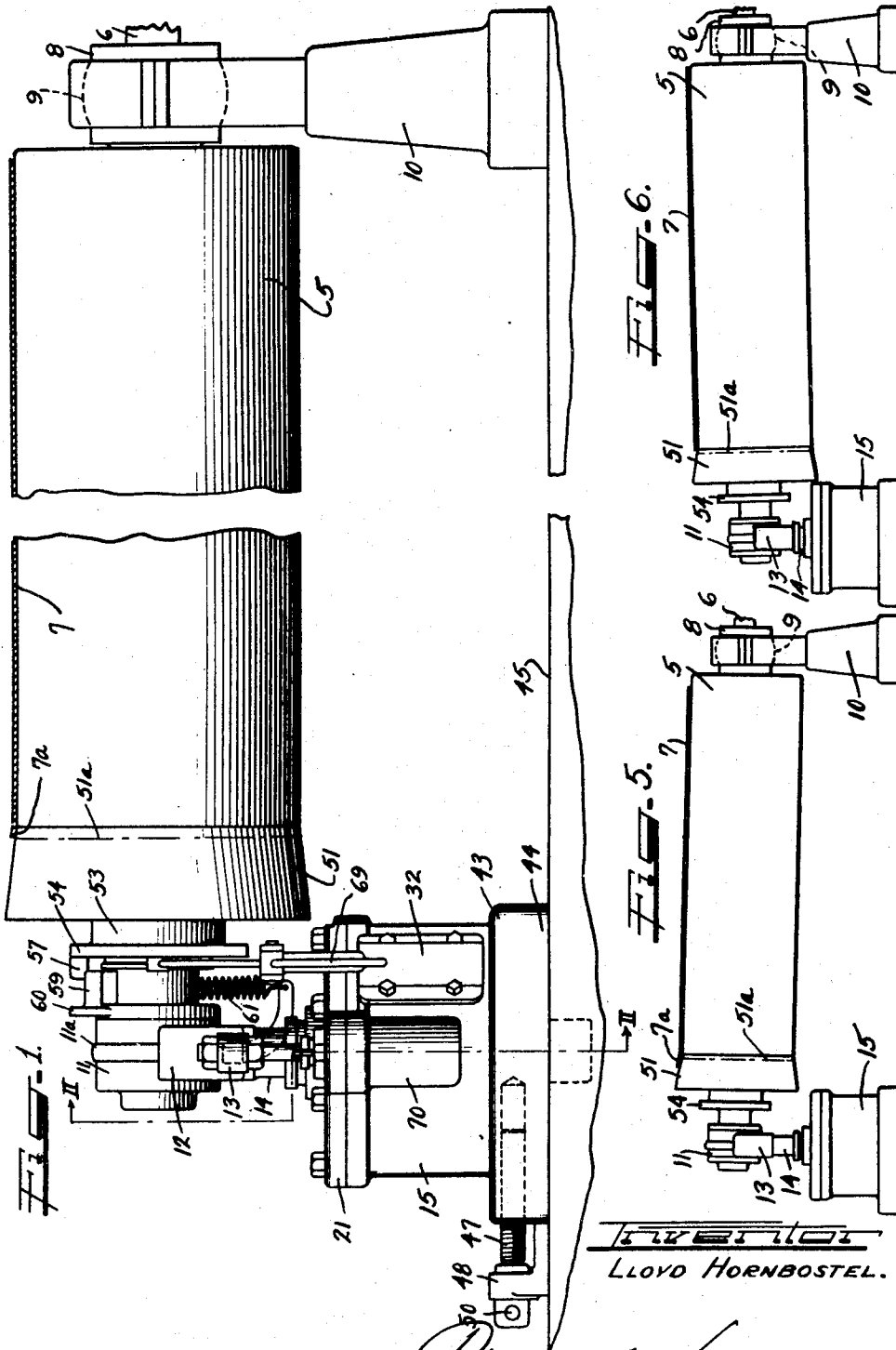
L. HORNBOSTEL

2,431,557

BAND GUIDE

Filed March 23, 1944

5 Sheets-Sheet 1



LLOYD HORNBOSTEL.

Charles H. Hill

Nov. 25, 1947.

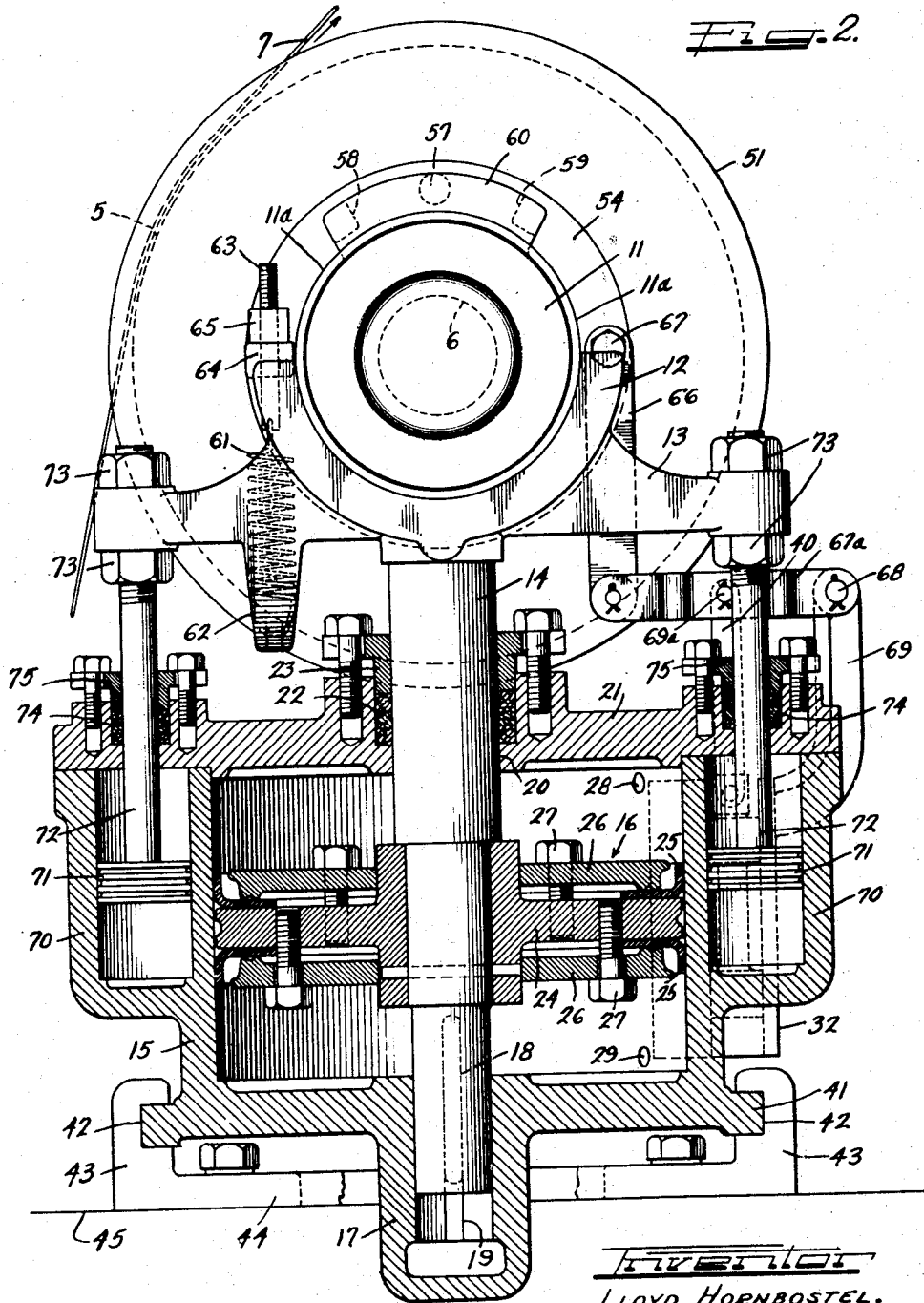
L. HORNOSTEL

2,431,557

BAND GUIDE

Filed March 23, 1944

5 Sheets-Sheet 2



Nov. 25, 1947.

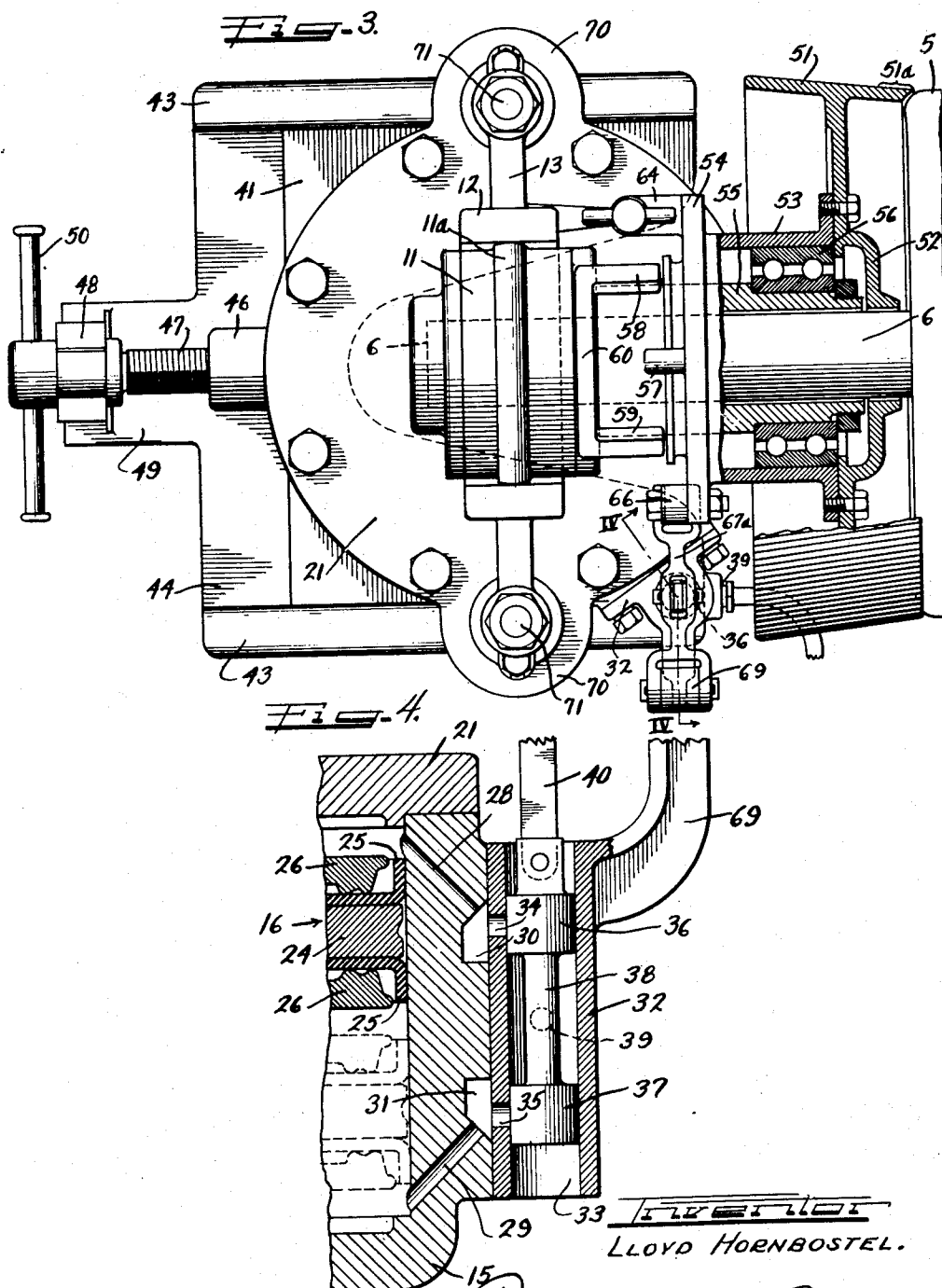
L. HORNOSTEL

2,431,557

BAND GUIDE

Filed March 23, 1944

5 Sheets-Sheet 3



Nov. 25, 1947.

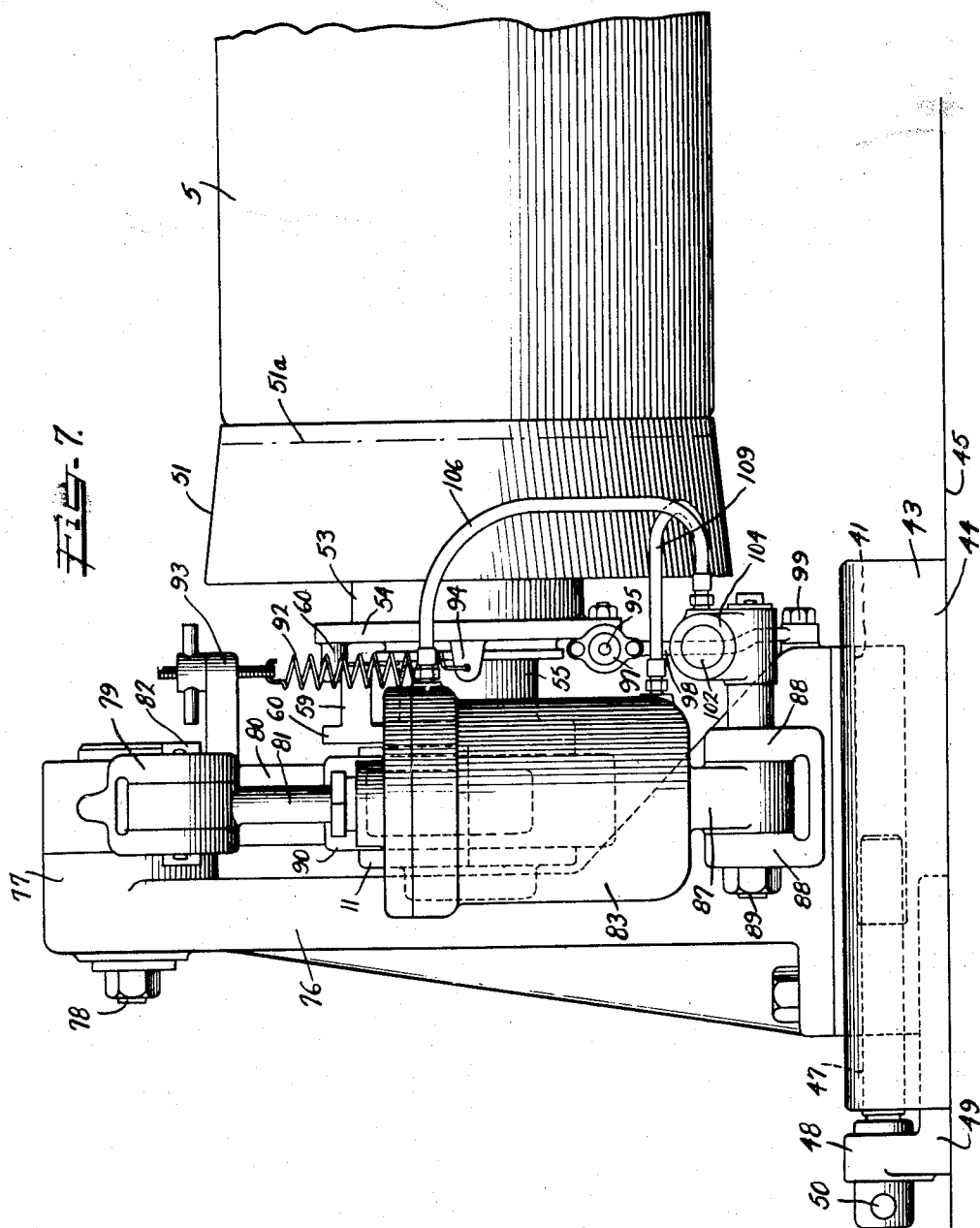
L. HORNBOSTEL

2,431,557

BAND GUIDE

Filed March 23, 1944

5 Sheets-Sheet 4



Went
LLOYD HORNBOSTEL.

Charles Mills

Att.

Nov. 25, 1947.

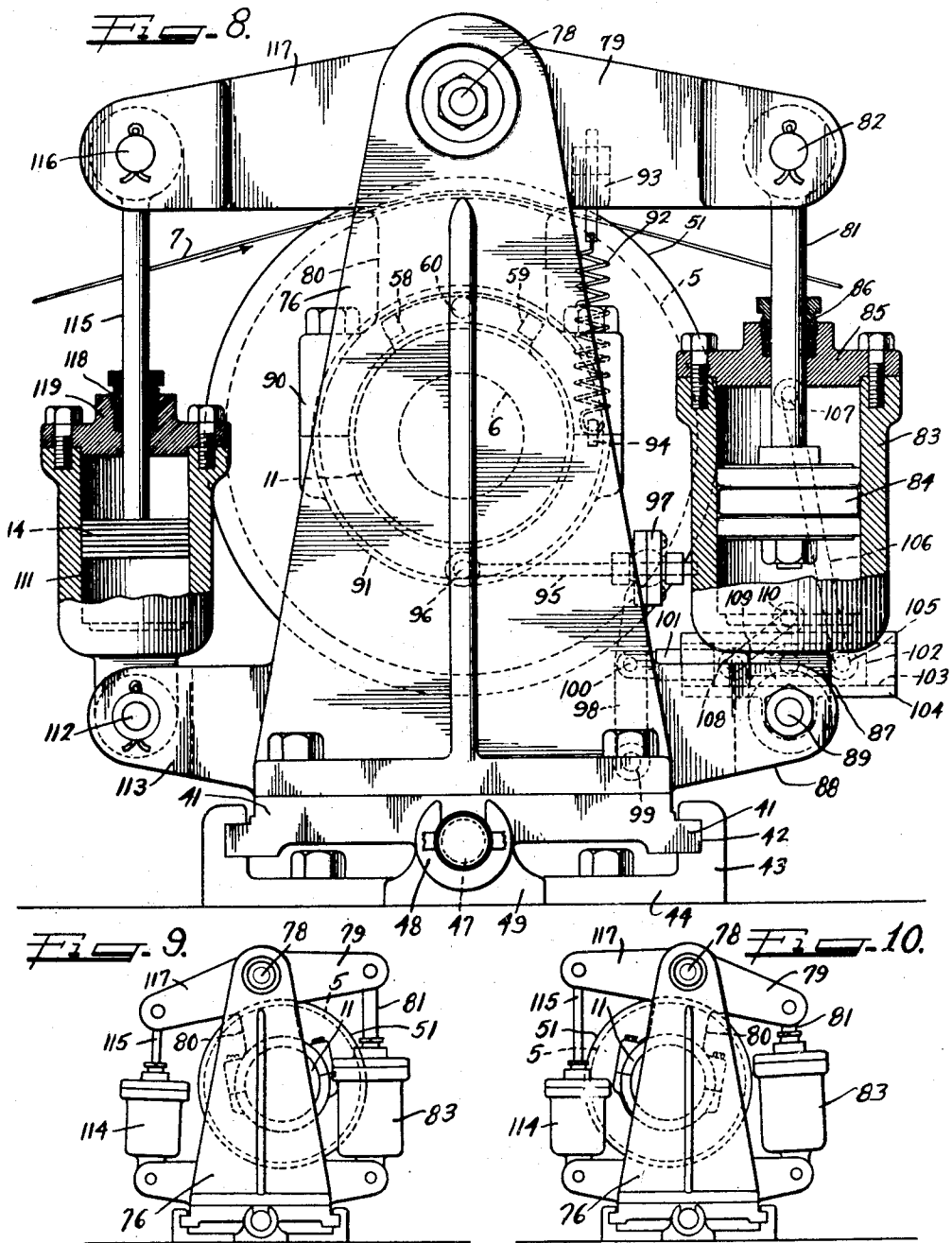
L. HORNOSTEL

2,431,557

BAND GUIDE

Filed March 23, 1944

5 Sheets-Sheet 5



LLOYD HORNOSTEL.

Charles H. Hill

UNITED STATES PATENT OFFICE

2,431,557

BAND GUIDE

Lloyd Hornbostel, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin

Application March 23, 1944, Serial No. 527,784

12 Claims. (Cl. 74—241)

1

This invention relates to a guide for maintaining a band in a predetermined location upon a roller. More particularly the improvements relate to means for guiding the forming wire, felt, or other strip of a paper making machine while such strip is engaged with a roller, whereby the strip is prevented from migrating or laterally creeping too far towards either end of the roller with which it is engaged.

It is one of the principal objects of this invention to simplify the construction of a band guide such as contemplated herein, and to improve the efficiency, operation and dependability of such band guide.

Also it is one of the principal objects of the present improvements to provide a band guide wherein the roller is mounted for transverse displacement in a plurality of directions that are preferably oblique to its normal position to effect the return of the band to its normal or prescribed location upon the roller. This function is performed by the present structure in an automatic manner without attention of an operator.

Another of the principal objects hereof resides in providing control means that are normally engaged with a margin of the band and are adapted to actuate suitable roller displacing means whenever said control means respond to a lateral creep or migration of the band in a direction longitudinally on the roller.

A further object is to provide a band guiding device wherein the margin of the band is normally engaged with a collar or the like that has free rotative movement at one end of a band supporting roller with which it is axially aligned, the roller being journaled for bodily movement out of its normal position, and the said bodily movement of the roller being effected by suitable shifting means that are responsive to the rotative movement of the collar. In this connection, the collar is provided with a work face of varied diameter, preferably a tapered surface that converges toward the cylindrical surface of the roller, and said collar is operative to activate the shifting means in the event the band moves too far upon the surface of the collar, or should the margin of the band become disengaged from the collar, either movement being the result of a creep of the band transverse to its normal path of travel.

Also it is an object hereof to provide damping means having operative connection with a roller displacement assembly whereby to steady to movement of the assembly and to prevent a sudden or too rapid actuation of such assembly.

A still further object is to provide a band-engaged roller that has a pivoted or swivel support at one end and a pressure fluid support at its other end for effecting the lateral displacement

2

ment of the roller bodily in directions that are transverse to its axis. In the present structure the pressure fluid support preferably comprises a cylinder and piston assembly to which the pressure fluid is admitted by means of a valved conduit that is operatively connected to means that respond to the movement of a freely rotatable collar at the adjacent end of the roller.

Additional objects, aims and advantages of the invention contemplated herein will be apparent to persons skilled in the art after the construction and operation of the band guide is understood from the within description. It is preferred to accomplish the objects of this invention and to practice the same in substantially the manner hereinafter described and as more particularly pointed out in the claims. Reference is now made to the accompanying drawings that are a part of this specification.

Figure 1 is a longitudinal elevation of a band-engaged roller, an end of which is mounted by means of the instrumentalities embodying the present invention;

Figure 2 is a vertical end elevation of the structure shown at the left end of Figure 1, drawn on an enlarged scale, with the lower portion of the supporting devices shown in section, the view being on the plane of line II—II on Figure 1;

Figure 3 is a top plan of the structure shown in Figure 2, with a portion in broken away section;

Figure 4 is a vertical fragmentary section taken on the plane of line IV—IV on Figure 3;

Figure 5 is a diagrammatic view of the structure shown in Figure 1, illustrating the tilting or displacement of the roller in an upward direction;

Figure 6 is a view similar to Figure 5 showing the roller tilted in a downward direction;

Figure 7 is a view similar to the left end of Figure 1, but drawn to a larger scale, showing a modification of the invention having instrumentalities whereby the roller may be bodily shifted or displaced in a horizontal direction;

Figure 8 is an end elevation of the structure shown in Figure 7, portions thereof being in broken away or fragmentary section;

Figure 9 is a diagram showing the roller displaced horizontally to the right by means of the structure shown in Figures 7 and 8; and

Figure 10 is a diagram similar to Figure 9 showing the roller displaced to the left by the structure shown in Figures 7 and 8.

For the purpose of displacing the roller vertically or horizontally from its normal position, the roller has one of its ends mounted for pivotal or swivel movement in a plurality of directions. When the shifting means comprise the structure shown in Figures 1 to 4 the shift of the roller is in a vertical plane while in the shifting means

shown in Figures 7 and 8 the displacement of the roller is in a horizontal direction.

The roller 5 is provided with a shaft 6 and is engaged by a band 7 that can be trained there-around as shown. One end of the roller shaft 6 is mounted in a bearing 8 that is preferably a ball and socket type pillow block assembly 9 supported in the upper portion of a standard 10. At its other end the roller shaft 6 is carried in a bearing 11 that is mounted in a semi-circular cradle 12 forming a part of a cross arm 13, and the outer cylindrical surface of the bearing is provided with a bead or rib 11a that permits it to rock in the cradle when the roller is being displaced from its normal position. The cross arm 13 is carried upon the upper end of a vertical piston rod 14 that extends into a cylinder 15 where it passes through a piston head that is identified generally by the numeral 16. The lower end of the piston rod 14 is reciprocally mounted in a boss 17 that guides said piston rod by means of a spline 18 operating in a groove 19 in said boss. The upper portion of the piston rod passes through a guide opening 20 in the center of the removable cover plate 21 of the cylinder, and said guide opening is sealed to prevent escape of pressure fluid by gaskets 22 that are compressed by a gland nut or sleeve 23 of the usual construction. The piston head 16 comprises the disk 24 that is pinned to piston rod 14 and carries cupped pump washers 25 upon its upper and lower faces, that are maintained in position by clamping plates 26 that are pressed against the washers by tightening of bolts 27.

Pressure fluid is admitted to the cylinder 15 above or below piston head 16 through ports 28 and 29 respectively that communicate with recesses 30 and 31 in the outer surface of the cylinder 15. A valve assembly is mounted upon the outer surface of the cylinder 15 at the location of recesses 30 and 31 for admitting the pressure fluid to said recesses from which the fluid may be discharged into the cylinder through either of the ports 28 or 29. This valve assembly comprises a bracket 32 having a longitudinal circular bore 33 extending vertically therethrough and open through the ends of the bracket. This bore 33 communicates with the recess 30 and port 28 through a lateral passage 34, and the lower portion of the bore 33 communicates with recess 31 and port 29 through a lateral passage 35. A dumbbell slide-valve is mounted for longitudinal reciprocal movement in the bore 31 and comprises an upper head 36 adjacent the passage 34 and a lower head 37 adjacent the lower passage 35, said heads being connected by a reduced neck portion 38. The pressure fluid is discharged into the bore 33 between the heads 36 and 37 through an inlet port 39. The upper end of the slide valve is connected by a link 40 to a suitable control mechanism, and when this mechanism moves the slide valve upwardly far enough to clear the passage 34 the fluid pressure in the chamber between the heads 36 and 37 will enter the upper portion of the cylinder 15 through port 28 and force the piston head 16 toward the bottom of the cylinder. At the same time the lower head 37 of the valve will have cleared the passage 35 to vent the lower portion of the cylinder 15 below the piston head 16 by the port 29, passage 35 and through the lower open end of the bore 33. Upon movement of the valve body to the lower portion of the bore 33, the head 37 will uncover passage 35 to admit the fluid to the cylinder below piston head 16 and force it toward the top of said cylinder, and at the same time the valve head 36 will have moved

below passage 34 so that the upper portion of the cylinder has been scavenged through port 28.

The lower end of the cylinder 15 is provided with a rectangular flange 41 that is engaged in grooves 42 facing each other in guide rails 43 on a suitable base 44 that is anchored in any suitable manner on a platform 45. The cylinder assembly is thus adapted for sliding bodily movement on the base 44 that is effected by means of an internally threaded boss 46 that is engaged by a screw 47 having a smooth shank that passes through a fixed boss 48 on a projecting portion 49 of the base 44. The outer end of this shank has an operating handle or rod 50 anchored to it whereby the screw 47 may be rotated in either direction to move the cylinder assembly and the roller shifting toward or from the adjacent end of the roller 5.

A collar 51, having a work face of varied diameter or a gradually tapered surface, has a hub portion 52 on its radial web that surrounds but is not engaged with the adjacent end portion of the roller shaft 6. A cylindrical sleeve 53 is mounted on the radial web of the collar opposite the hub 52 and at its end that is nearest the bearing 11 said sleeve is provided with an annular flange 54. The casing of the bearing 11 has an elongated tubular boss 55 that surrounds the shaft 6 between the latter and the collar sleeve 53 to receive the inner race of an anti-friction bearing 56. The outer race of the anti-friction bearing 56 is secured to the opposing inner surface of the sleeve 53 to support the collar in a definite position, in relation to the roller. By reason of this arrangement the collar is mounted for free rotation with respect to the roller 5, but it is not engaged with nor is it carried directly by the roller shaft 6.

This assembly just described provides a portion of the control devices that comprise a stud 57 projecting laterally from the upper segment of the annular flange 54 at the end of the sleeve 53 carried by the collar, and the said stud is movable in an arcuate path during the free rotative movement of the collar 51. The stud is engageable with lugs 58 or 59 that are a part of the end portion of an upstanding flange 60 on an adjacent portion of the housing for bearing 11 and thus limits the free rotative movement of the collar in both directions.

The collar 51 is normally urged in one direction of rotative movement by means of a spring 61 that has its lower end connected to a depending bracket 62 on the cross arm 13 and the upper end of this spring is connected to a bolt 63 that is passed through a bracket 64 projecting from the flange 54 on the collar sleeve 53. The tension of the spring 64 may be adjusted by rotating a sleeve nut 65 screwed upon the upper portion of the bolt 63 and engaged with the top of bracket 64.

The flange 54 has the upper end of a link 66 pivotally connected to it by a bolt 67 and the lower end of this link is pivotally connected to the adjacent swinging end of a rocker arm 67a that has its fulcrumed end mounted upon a pivot 68 at the upper end of a bracket 69 arising from the slide valve bracket 32. The link 40 that is pivotally connected to the slide valve has its upper end connected to the rocker arm 67a by pivot pin 69a.

When the collar 51 rotates in one direction it will cause the linkage assembly to raise the slide valve in its bore 33 and when the collar is rotated in the opposite direction the linkage assembly will move the slide valve in a reverse direction. In

this manner fluid pressure may be admitted through the port 28 above the piston head 16 to force the latter in a downward direction in the cylinder 15 thus moving the cross arm 13 and the bearing housing 11 in a downward direction which will bodily displace the roller 5 and its shaft 6 in a non-axial downward direction. The reverse operation of the piston head 16 will be accomplished when pressure fluid is admitted to cylinder 15 through the lower port 29, thereby moving the piston 14 upward which will raise the bearing 11 to displace the roller 5 in an upward direction above normal operating position.

In order to damp the action of the pressure fluid to prevent a too sudden operation of the shifting mechanism, suitable dashpots 70 are provided upon opposite sides of the cylinder 15, said dashpots enclosing suitable sliding heads 71 connected to the lower ends of the rods 72 that pass through the top plate 21 of the cylinder and extend up through the ends of cross arm 13 to which said rods are anchored by nuts 73 screwed thereon to engage opposite sides of said cross arm. Suitable seals 74 surrounding the rods in the top plate 20 are held in place by gland nuts 75 to prevent escape of the fluid in the dashpots between the rod 72 and the cover plate 21.

As shown in Figure 1, the band 7 has a marginal portion 7a engaged with the adjacent band-receiving marginal portion 51a of collar 51. When this band margin 7a is in its normal position, engaged with the band receiving portion 51a of the collar, such engagement will rotate the collar in a direction opposite to the direction in which it is urged by the spring 61 until the spring is stretched for balancing the pull of the band. When thus balanced the band will not then further rotate the collar but will slide upon the band-receiving portion 51a of the collar. In the event the band migrates from its normal path of travel so that it creeps up the tapered surface of collar 51 beyond the band-receiving portion 51a the tension and pressure of the band upon the collar will be increased to such an extent that it overcomes the tension of the spring 61 and the collar will be rotated slightly three or four degrees in the direction of rotation of the roller and the sleeve 53 and its flange 54 will be similarly rotated. The link 66 is thus pushed down to move the slide valve downward and admit the pressure fluid to the cylinder beneath the piston head 16 which starts to move upward. This raises the front end of the roller 5 along with collar 51 and link 66. During this rise of the collar 51 and link 66 the valve is pulled upwardly until it reaches its starting position to close the ports and stop further vertical movement of the front end of the roller 5 which will stay in raised position until the collar 51 again rotates. This tilting of the roller 5 causes the band 7 to shift or run toward the back of the roller 5, and if the amount the roller has been raised at the front end is sufficient to stop the band from moving further toward the front, the control devices will remain inoperative. But if the band should move forward to the front, the collar will turn a little farther in a clockwise direction with the roller and the front end of the roller will raise a little higher. This procedure continues until the roller has raised sufficiently to cause the band to start its travel toward the back end of the roller. As soon as this begins, the collar will swing or rotate counter-clockwise (opposed to the rotation of the roller) and in turn will lower the front end of the roller. The dis-

tance the roller is lowered depends upon how much the collar has rotated in a counter-clockwise direction.

For each degree of band drag on the collar, there is a corresponding position for the collar and corresponding vertical position for the front end of the roller, but the front end of said roller will not move the full stroke of the piston when the collar has turned to a slight angle. Thus it will be seen that it is the rotary motion of the collar that is transmitted, and this rotary motion is not necessarily a power generated motion but is only a slight drag of the band on the collar. The power effect of this motion is amplified or increased by means of compressed air in the cylinder 15 which converts such rotary motion of the collar into a power motion of the piston which in turn vertically moves the end of the roller 5. For each angular degree of rotation of the collar 51, either clockwise or counter-clockwise, there will, of course, be a corresponding place in the vertical movement for raise of the roller 5, at which the roller will discontinue its vertical movement.

Referring to the diagram shown in Figure 5 it will be seen that the migration or creepage of the band margin 7a toward the left has been such that the edge of the band has reached the center of width of the tapered collar 51 and the tension at this margin of the band has been increased to an extent that its pull on the collar has overcome the tension of the balancing spring 61, causing the collar to rotate. The linkage has been actuated by the rotation of the collar to move the slide valve into a position where it has opened the bottom port 29 which admits the pressure fluid to the cylinder beneath the piston head 16 and has forced it upward. This operation has raised the adjacent bearing journal 11 of the roller 5 so that the roller axis is tilted downward toward its swivel or pivot journal 8 and oblique to the normal disposition of the roller. Responding to this upward displacement of the end of the roller from its normal operating position, the margin 7a of the band will thereafter gradually travel back across the face of the collar until only the original narrow margin 7a will be in contact with the band-receiving portion 51a of the collar and the pull which is exerted on this relatively small contacting surface will be insufficient to overcome the tension of the balancing spring 61 and the band will have sliding contact with the collar.

In Figure 6 the migration or creepage of the band has been in an opposite direction or toward the pivoted end of the roller 5 to such an extent that the band is out of contact with the collar 51. This has released the collar so that the spring 61 has effected a rotation of the collar in a reverse direction (opposed to the direction of rotation of the roller) and the linkage is thereby actuated to move the slide valve in its other direction to open the top port 28 through which the pressure fluid has entered the cylinder and has forced the piston downward which has lowered the movable bearing 11 of the roller. As a result of this displacement of the roller from its normal position, the band will be caused to gradually move away from the pivoted end of the roller until the predetermined margin 7a of the band has again engaged the band-receiving surface of the collar 51.

The structure shown in Figures 7 and 8 is adapted to shift the bodily movable end of the roller 5 in a horizontal direction to either side of its normal operating position. This structure

comprises a standard 76 the base of which is bolted to the base flange 41 that is guided and adjusted in the same manner as the corresponding portions of the structures shown in Figures 1 to 3. At its upper end the standard 76 is provided with a boss 77 in which a fulcrum stud 78 is mounted to pivot a bell-crank that consists of a horizontal arm 79 and an arm 80 that is vertically disposed at an angle thereto. At its outer end the bell crank arm 79 is connected to a reciprocable piston rod 81 by a pivot pin 82, the said piston rod being extended downward into a cylinder 83 where it is provided with a piston head 84. The cover plate 85 of this cylinder is adapted to guide the piston rod 81 in its reciprocal movement and a stuffing box device 86 provides a seal against leakage of pressure fluid between the piston rod and the cover plate. The lower end of the cylinder has a lug 87 that projects down between supporting ears 88 on the side of the standard 76 to pivotally mount the cylinder upon a pin 89 that passes through the ears and lug.

At the lower end of the vertical arm 80 of the bell crank there is a split yoke comprising two semi-circular members 90 and 91 that surround and carry the shiftable bearing 11 for the adjacent end of the roller shaft 6. When the piston rod 81 is reciprocated in a vertical direction this movement of the rod is adapted to swing the bell-crank arm 80 in a horizontal direction and correspondingly displace the roller 5 out of its normal operating position.

A spring 92 has its upper end adjustably connected to a bracket 93 projecting from the bell-crank arm 79 and has its lower end connected to lug 94 on the flange 54 that is a part of the collar assembly. The flange 54 has a link 95 connected to it by a pivot pin 96, the other end portion of the link having a ball and socket connection 97 with a vertically disposed lever 98 that is fulcrumed at its lower end on a pivot 99 projecting from an adjacent portion of the standard 76. Intermediate its ends the lever 98 carries a pin 100 that pivotally connects the same with a link 101 carried by the adjacent outer end of a slide valve body 102, of the dumbbell type such as shown in Figure 4, that is reciprocated in the bore 103 of a bracket 104. This valve bracket 104 is below and at the side of the cylinder 83 and has one of its ports 105 communicating, by a pipe 106, with the upper port 107 in the cylinder 83. The other port 108 of the valve bracket communicates by a pipe 109 with the lower port 110 of the cylinder 83. The structure disclosed in Figures 7 and 8 operates in the same manner as the hydraulic or pressure fluid assembly that is shown in Figures 1 to 3 to admit fluid pressure to one side of the piston head 84 to move the piston rod 81 in either an upward or downward direction thereby rocking the crank arm 79 to swing the other arm 80 of the bell-crank in a horizontal direction to correspondingly displace the roller in a horizontal direction.

Damping means comprising a dashpot 111 is pivotally mounted at its lower end on a pin 112 extending between ears 113 projecting from the side of the standard opposite the ears 88. The plunger 114 that operates in the dashpot 111 has a rod 115 connected to it and the upper end of this rod is pivotally connected by a pin 116 to the adjacent end of an actuating arm 117 that extends from the bell-crank opposite the arm 79 thereof. A gland nut assembly 118 surrounding

the rod 115 in the cover 119 of the dashpot prevents seepage of fluid around the rod.

The diagrams shown in Figures 9 and 10 illustrate the horizontal displacement of the roller by means of the mechanism disclosed in Figures 7 and 8. In Figure 9 the margin 7a has migrated from its normal path of travel and has crept up the face of the collar 51 beyond the band-receiving portion of said collar. This migration has resulted in a larger area of the band being engaged with a correspondingly increased area of the collar and has caused the band to rotate the collar which in turn has activated the shifting devices that have displaced the roller 5 horizontally toward the right and oblique to its normally operating position. Figure 10 shows the displacement of the roller horizontally to the left, such displacement being the result of a migration of the band in a direction away from the collar so that the band margin 7a has disengaged the collar whereupon the spring 92 has rotated the collar in a direction opposed to the path of travel of the band and the rotation of the roller 5.

From the above descriptions it should be understood that the invention provides a band operated governor for controlling the position of a band by shifting a roller on which the band is trained. Band drag on an actuator varies as the position of the band varies and the degree of drag on the actuator determines the position of the roller.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. A band guide comprising a roller upon which a band is engaged; means rotatably supporting an end of said roller for pivotal bodily movement thereon; a tapered head at the other end of said roller normally engaged by a margin of the band and having free rotation with respect to said roller; a standard adjacent said collar; a bell-crank fulcrumed on said standard; a reciprocable piston for operating said bell-crank; a bearing carried by an arm of said bell-crank for supporting the adjacent end of said roller for reciprocating bodily movement in generally horizontal directions; means for actuating said piston in response to the rotative movement of said head; and damping means yieldably opposing the action of said piston.

2. A band guide comprising a roller upon which a band is engaged; means rotatably supporting an end of said roller for pivotal bodily movement thereon; a tapered head at the other end of said roller normally engaged by a margin of the band and having free rotation with respect to said roller; means yieldably urging said head in one direction of rotation; a standard adjacent said head; a bell-crank fulcrumed on said standard; a reciprocable piston for operating said bell-crank; a bearing carried by an arm of said bell-crank for supporting the adjacent end of said roller for reciprocal bodily movement in generally horizontal directions; fluid pressure means for actuating said piston; and a valve controlling said pressure means, said valve operatively connected to said head and movable in response to rotative movement thereof.

3. A band guide comprising a roller upon which a band is engaged; means rotatably mounting an

end of said roller for pivotal bodily movement thereon; a tapered head at the other end of said roller normally engaged by a margin of the band and having free rotation with respect to said roller; means yieldably urging said head in one direction of movement; a standard adjacent the head; a cross-arm fulcrumed intermediate its ends on said standard; a piston engaged with said cross-arm at one side of its fulcrum for operating said arm; damping means engaged with said cross-arm at the other side of its fulcrum; a hanger depending from said cross-arm; a bearing carried by said hanger for supporting the adjacent end of said roller for bodily movement in generally horizontal directions; pressure actuated means for actuating said piston; and a valve controlling said pressure means, said valve being operatively connected to said head and movable in response to rotational movement thereof to rock said cross-arm.

4. A band guide comprising a rotatable roller with which a movable band is adapted to be engaged, supporting means for both ends of the roller constructed and arranged whereby at least one end of the roller may be displaced non-axially relatively to the other end, a control member at one end of said roller mounted for oscillatable movement relatively thereto, a surface portion of said member being normally engaged with a marginal surface portion of the band extending laterally beyond the adjoining end of said roller whereby the band exerts a frictional drag on said member, yieldable means connected with said member for opposing the drag of the band, the increasing and decreasing migration of the band from the roller upon the control member being adapted to vary the frictional drag upon said member, and means controlled by movement of said member caused by variations in said drag for displacing one end of said roller relatively to the other.

5. A band guide comprising an elongated support with which a movable band is adapted to be engaged, a pivotal bearing for one end of the support and a shiftable bearing for the other end of the support, a movable control member adjacent the shiftable end of the support and shiftable therewith, controllable means for actuating said shiftable bearing, said control member being positioned to maintain a substantial frictional engagement with a marginal portion of the surface of the band which normally extends laterally of one end of said support, said frictional engagement producing normally a drag tending to move said control member in the direction of the travel of the band, means normally urging said control member yieldably in a direction opposed to the travel of said band, and an operative connection between said control member and said controllable means to produce movement of the shiftable end of said support in a plurality of directions and for distances proportionate to the existing band drag on said control member, said movement of said support being effective to shift said operative connection for limiting the extent of movement to eliminate overguiding and hunting movements of the support.

6. In a mechanism for correcting lateral migration of a band running over a tiltable guide roller, a shiftable friction member tiltable with the roller and positioned to contact the marginal surface portion of the band extending normally laterally from one end of the guide roller, the frictional drag of the band normally tending to

shift said member in a direction parallel to the movement of the band, means for restraining shifting of said member in response to said drag to hold it substantially stationary whenever the frictional drag force is being maintained at a predetermined value, a control unit operated by said member in one direction when the drag exceeds said value and in an opposed direction when the drag decreases below said value, and a power unit for tilting the guide roller and member relatively to the travelling band and having substantially greater motive power than is exerted by said member on said control unit and controlled in its operation by said unit.

7. In a band guide assembly for guiding a band and correcting lateral migrations of the band relatively to a guide roller, a guide roller mounted for movement to exert a corrective influence upon the lateral migrations of the band, power means for tilting said roller, means for accurately measuring for control purposes the extent of migration of the band including a shiftable contact member tiltable with the roller and arranged to frictionally contact a marginal surface portion of the band abutting one end of the guide roller, yieldable means acting on said contact member to hold it normally at rest when the amount of drag by the band on said member is being maintained at a predetermined force value, said member being free to shift in the direction of the drag whenever it increases beyond said value and to shift in a direction opposed to the drag when it decreases below said value, a control unit for actuating said power means operated by said shifting of said contact member and by comovement of the contact member and roller.

8. A band guide comprising a band guiding roller, a shiftable support for one end of said roller, a control contactor at said end of said roller movable with said support, a predetermined marginal surface portion of said band being normally engaged with a predetermined area on said contactor to exert a predetermined drag thereon and tending to shift the contactor in the direction of the drag, adjustable means opposing said drag for holding said contactor at rest during the existence of said predetermined drag, a control unit operated by said shifting of said contactor and support, means under the control of said unit for applying a substantially greater force than is exerted directly by the contactor for shifting the shiftable support of the roller, and means for damping the movement of said roller shifting means.

9. A band guide comprising a rotatable roller with which a movable band is adapted to be engaged, supporting means for both ends of the roller, power means for non-axially shifting one end of the roller relative to the other end, a control member at said one end of the roller mounted for non-axial shifting movement with the roller and for oscillatable movement relative to the roller, said control member having a surface portion arranged to be normally engaged with a marginal surface portion of the band extending laterally beyond said end of the roller whereby the band exerts a frictional drag on said control member, yieldable means connected with said control member for opposing the drag on said band, the increasing and decreasing migration of the band from the roller upon the control member being effective to vary the frictional drag upon said control member, and means controlled by both non-axial shifting and oscillating movement of said control member caused by the non-

11

axial shifting of the roller and by variations in said drag for controlling said power means to shift the roller.

10. A band guide comprising a tiltable guide roll, a control head rockably mounted adjacent an end of said guide roll and arranged to receive thereon a marginal portion of a band trained on said guide roll, means tending to effect rocking movement of said head in one direction, said marginal portion of the band being effective to resist said means and urge said head to rock in the opposite direction, a fluid pressure motor for tilting said guide roll to direct the band thereon, and a valve movable with said guide roll controlling said motor and actuated by rocking movement of the head as well as tilting movement of the roll.

11. A band guide comprising a tiltably mounted roll, a control head coaxial with said roll at one end of the roll and mounted for tilting movement with the roll and rocking movement relative to said roll, spring means arranged for rocking said control head in one direction, said control head adapted to receive a marginal portion of a band on said guide roll and said marginal portion tending to rock said control head in the opposite direction for resisting said spring means, a pneumatic motor arranged for tilting said roll to carry the control head therewith, a valve for said motor adapted to reverse the direction of movement of the motor to tilt the roll in opposite directions, and link means connecting said valve with said control head whereby rocking of the control head will shift the valve to drive the motor and tilt the roll until tilting movements of the roll and control head shift the valve in the opposite direction to limit the extent of tilting movement.

12

12. A band guide comprising a shiftable rotatable roller upon which a band is engaged, means pivotally supporting an end of said roller, a head at the other end of said roller shiftable with the pivotal movement of said roller and rotatable independently of said roller, said head being arranged to be normally engaged by a margin of the band and to be rotated relative to said roller by transverse creep of the band in either direction on said head, a movable bearing journaling the end of said roller adjacent said head, power means for bodily moving said bearing to pivot said roller about the pivotally supported end thereof, and a control member for said power means operatively connected with said head and being responsive to rotational movement of the head caused by a transverse creep of the band in either direction on said head for actuating the power means to pivot said head and roller about said pivotally supported end thereof, said control member being also responsive to said shifting movement of said head to terminate the actuation of the power means, thereby eliminating hunting movements of the band guide apparatus.

LLOYD HORNBOSTEL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
711,139	Warren	Oct. 14, 1902
745,377	Parker	Dec. 1, 1903
1,842,946	Prins	Jan. 26, 1932
2,008,318	Ziegler	July 16, 1935
2,199,893	Norton et al.	May 7, 1940
2,342,863	Hlavaty	Feb. 29, 1944