Sept. 23, 1958 R. N. SABEE 2,853,295

GUIDE ROLL

Filed Oct. 28, 1954 4 Sheets-Sheet 1

Fig. 1.

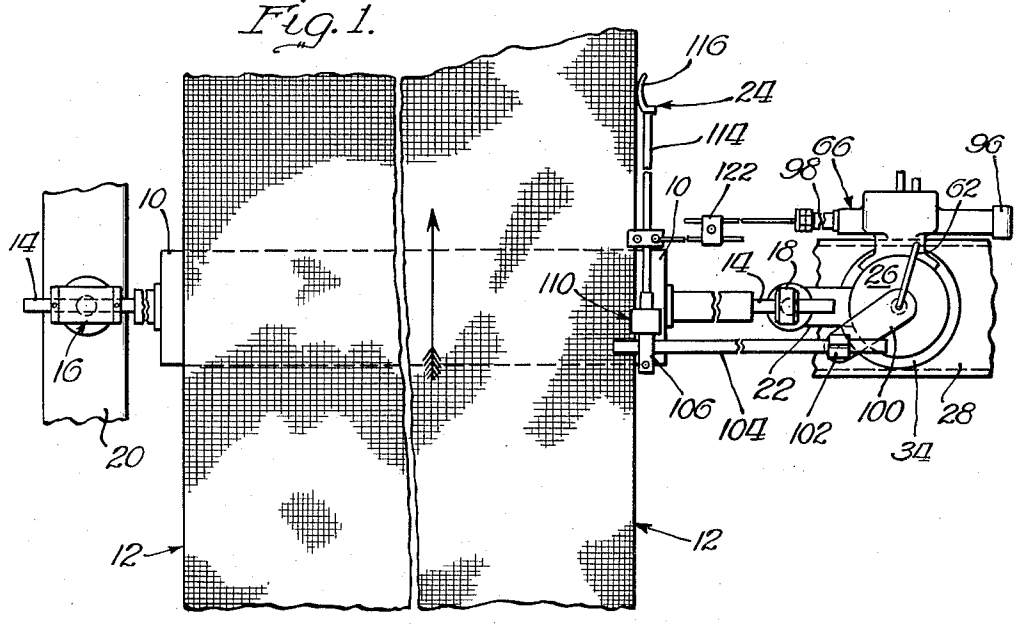
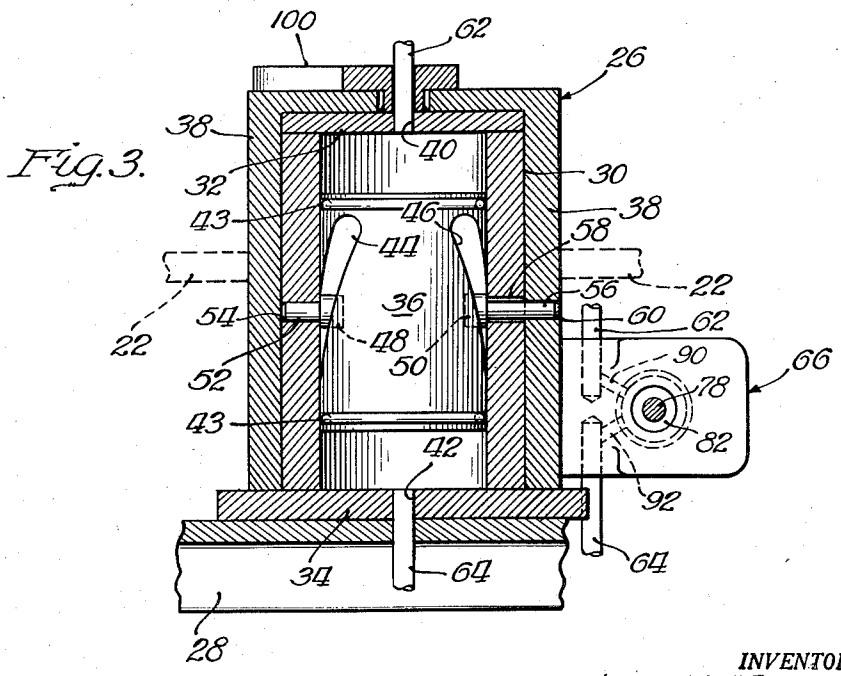


Fig. 3.



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GUIDE ROLL

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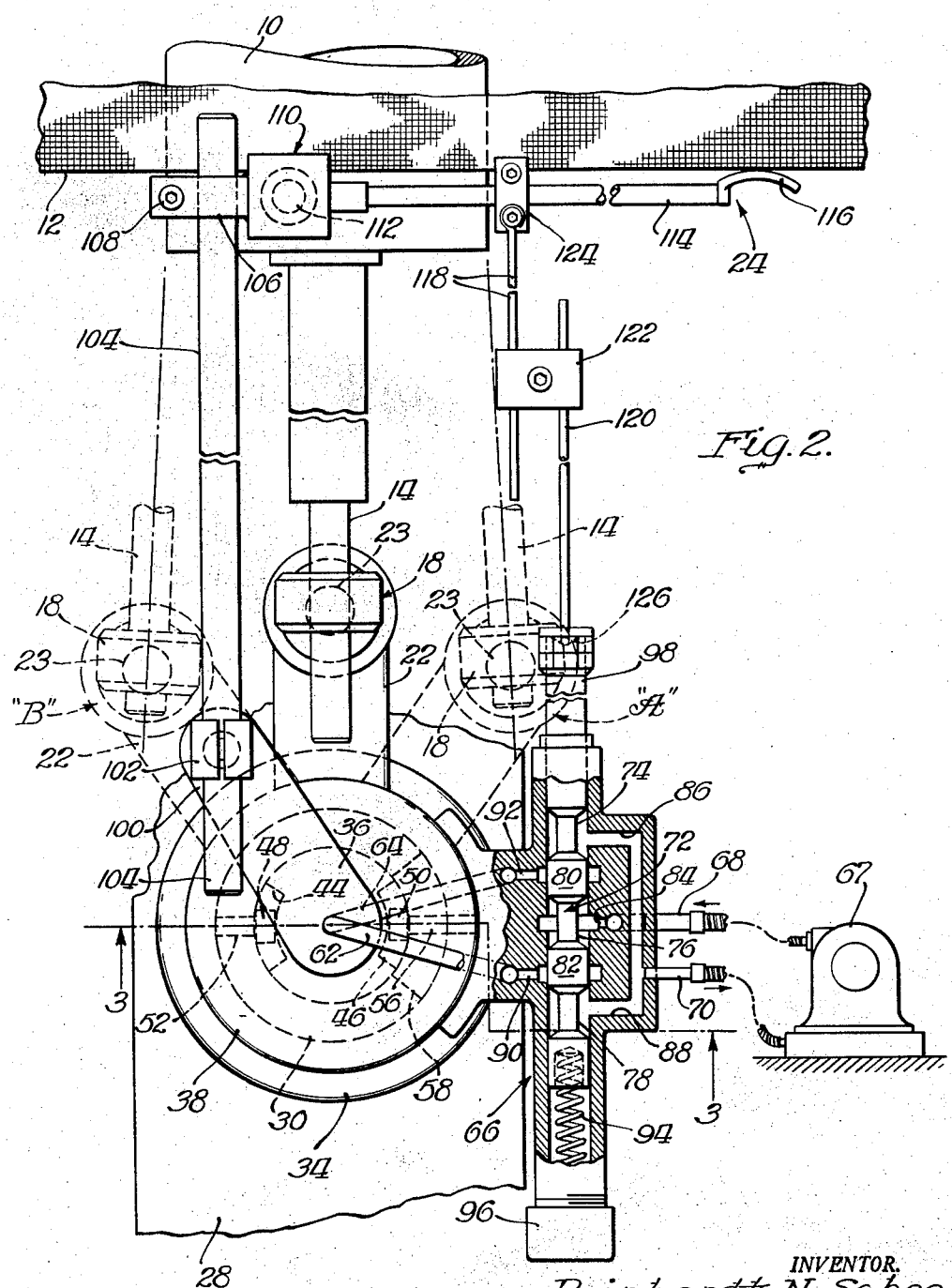


Fig. 2.

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GUIDE ROLL

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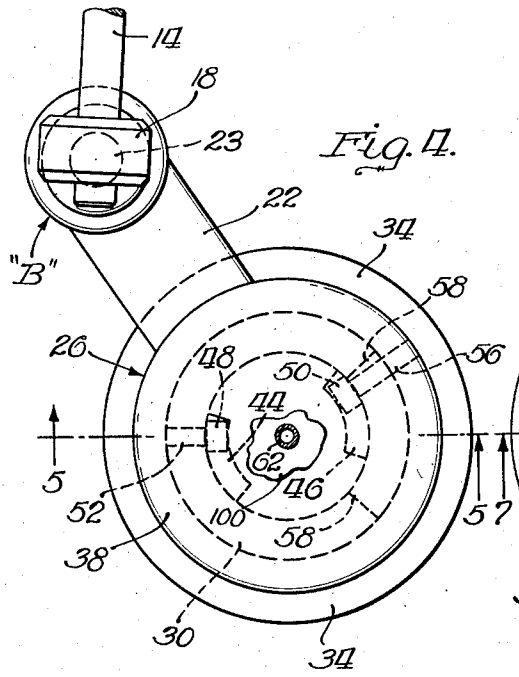


Fig. 4.

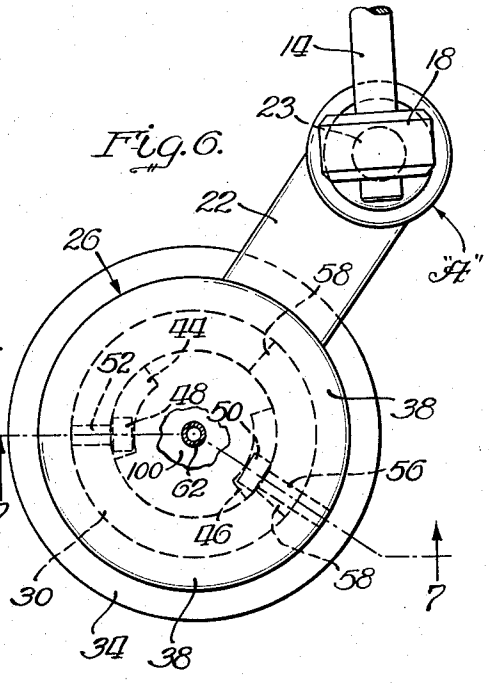


Fig. 6.

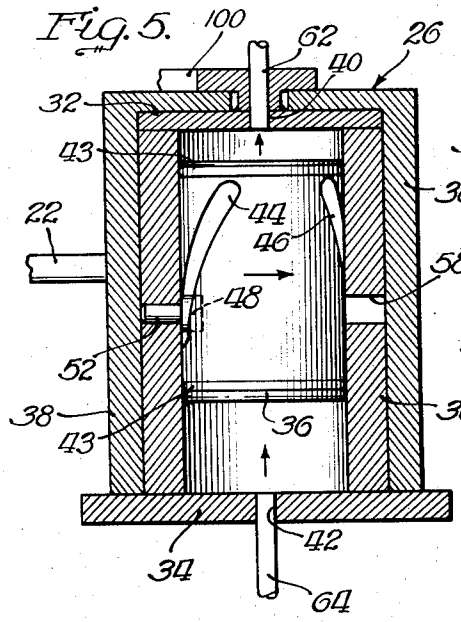


Fig. 5.

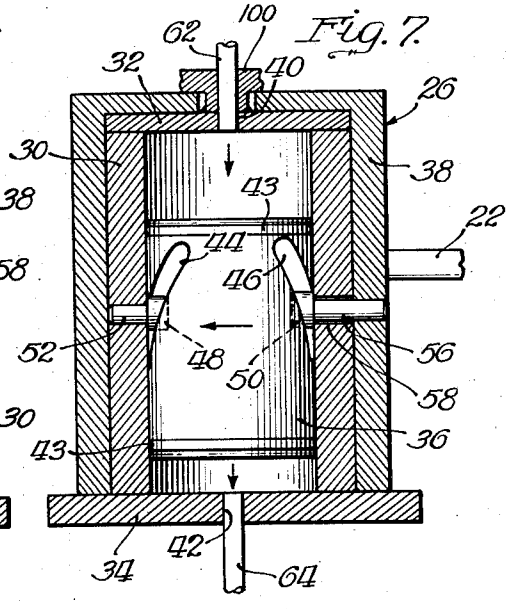


Fig. 7.

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GUIDE ROLL

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Fig. 8.

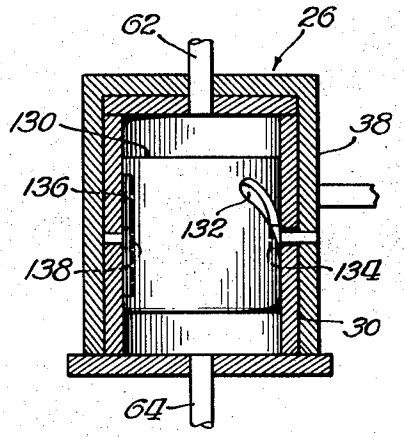


Fig. 9.

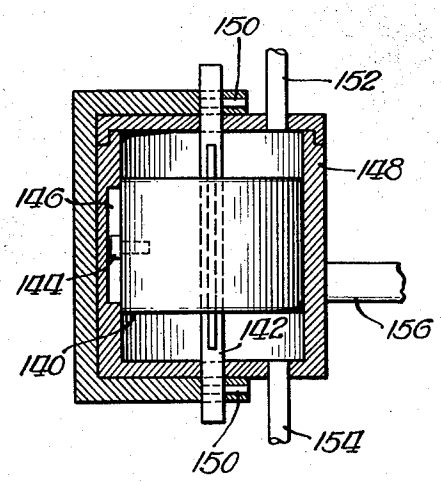


Fig. 10.

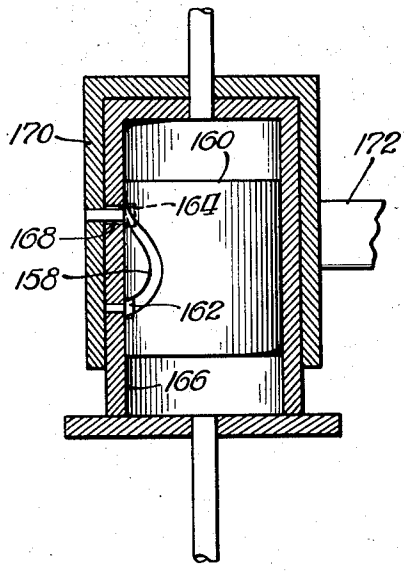
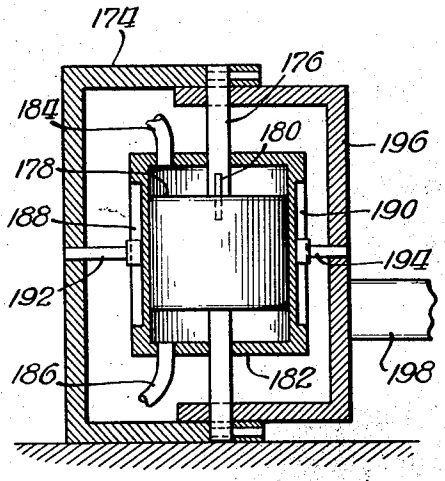


Fig. 11.



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2,853,295

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2,853,295

GUIDE ROLL

Reinhardt N. Sabee, Appleton, Wis.

Application October 28, 1954, Serial No. 465,295

13 Claims. (Cl. 271—2.6)

The present invention relates generally to travelling webs, endless belts, and the like, and is particularly directed to an improved form of guide roll for maintaining such webs or belts in centered relation to their path of movement.

In many installations of generally flat flexible conveyors it is necessary that means be provided for maintaining the travelling web in position with respect to its normal path. For example, in paper making machines wherein a wet web of fibrous pulp is formed on a moving Fourdrinier wire and then carried between felts to press rolls, driers etc., it is important to the operating efficiency of the machine that both the wire and the felts be kept in a true path without any appreciable deviation therefrom. In order to achieve this in each instance there is generally provided a guide roll which is disposed in transverse relation to the upper or functional run of the travelling wire or felt and in frictional engagement therewith. The guide roll is mounted for movement in the direction of travel of the sheet, so that the oblique position of the frictionally engaged roll effects a lateral shifting of the wire or felt. Consequently, whenever the wire or felt deviates from a position centrally of its normal path, the guide roll can be moved to cause a shifting of the felt or wire in a direction which is effective to cause the endless felt or wire to resume its normal position.

Various means have been devised heretofore for effecting a compensating movement of the guide roll in response to lateral shifting of a travelling web or the like. However, such means have generally been rather complicated and bulky and require an appreciable amount of space for installations. As a result there are many instances wherein it is desirable to use a guide roll, but the lack of space does not permit it. This is particularly true in paper machines where the space along the felts and wire is quite limited.

Then too, the known devices for adjusting guide rolls of the type described are prone to override the point of correction, with the result that the travelling web is constantly shifting in a lateral direction with respect to its line of travel. This "hunting" effect of the guide roll is, of course, undesirable in that it tends to shorten the useful life of the Fourdrinier wire, felts, and the like, and may produce wrinkles therein.

It is also noted that in the case of fluid operated devices for shifting a guide roll a failure of the fluid pressure permits the guide roll to shift its position abruptly and this frequently results in damage to the travelling web.

It is the primary object of the present invention to provide a new and improved form of mechanism for adjusting the position of a guide roll. Another object is to provide means for positioning a guide roll, which may be constructed and arranged to be non-reversible in response to failure of the power means actuating the guide roll and, therefore, holds the roll in position until the condition causing such failure can be remedied. Other objects of the invention are to provide a guide roll adjusting means which occupies a minimum amount of space along the edge of the travelling web, which is sensitive to deviations of the web so as to respond rapidly and without excessive correction of the guide roll position, and which is economical to construct. Further objects and advantages of the invention will become apparent as the disclosure progresses with respect to the accompanying drawings, wherein:

Fig. 1 is a plan view structure embodying the present invention, with parts broken away.

Fig. 2 is an enlarged fragmentary view of the structure in Fig. 1, partly in section.

Fig. 3 is a sectional view taken along the line 3—3 in Fig. 2.

Fig. 4 is a plan view of a portion of the structure in Fig. 2, showing another position of some of the parts.

Fig. 5 is a sectional view taken along the line 5—5 in Fig. 4.

Fig. 6 is another plan view similar to Fig. 4 but showing another position for certain portions of the structure.

Fig. 7 is a sectional view taken along the line 7—7 in Fig. 6.

Figs. 8–11 are cross-sectional views of four modifications of the apparatus illustrated in the previous figures.

With reference first to Fig. 1 of the drawings, it is seen that apparatus chosen to illustrate the present invention comprises generally a guide roll **10** which is disposed in transverse underlying relation to a travelling web **12** in supporting engagement with the latter. The guide roll **10** includes a supporting shaft **14** which extends beyond each end of the roll and is journalled in a pair of bearings **16** and **18**.

The bearing **16** is suitably supported on an underlying frame member **20** for pivotal movement about a vertical axis. The bearing **18** at the other end of the guide roll is slidable along the shaft **14** and is pivotally supported on a movable arm **22** for movement about an axis indicated at **23** (Fig. 2), in order to provide for movement of the adjacent end of the roll in the direction of travel of the web **12**. This shifting movement of the guide roll axis relative to the direction of travel of the web is utilized to realign the web in the event that it deviates laterally from its normal course.

To produce a shifting of the bearing **18** and thereby angularly adjust the position of the guide roll axis an amount sufficient to compensate for a given web deviation, there is provided mechanism including a detector or feeler **24**, and a fluid motor **26** which carries the support arm **22** for the shiftable guide roll bearing **18**. The detector **24** is preferably a curved surface plate or the like which affords a minimum of resistance to the normal travel of the web and is suitably mounted for lateral movement in unison with the web, as the latter deviates from its normal course. The fluid motor **26**, which is vertically mounted on a frame member **28**, carries the bearing support arm **22** and is operatively connected with the feeler **24** in a manner such that movement of the latter controls the operation of the fluid motor to shift the bearing **18** and thereby angularly shift the axis of the guide roll **10**.

As seen particularly in Figs. 2 and 3, the fluid motor **26** comprises a vertically disposed cylindrical member **30**, which includes a top closure **32** and a bottom closure **34**, with the latter being suitably fixed to the frame member **28** adjacent the shiftable end of the guide roll. A free piston **36** is slidably disposed within the cylinder **30** and the latter is entirely enclosed by a concentric cylindrical housing **38** which is mounted on the bottom closure member **34** for rotation relative to the cylinder **30**. Aligned openings through the top **32** of the cylinder **30** and the top of the rotatable housing **38** provide a passageway **40** affording fluid communication between

the upper portion of the cylinder **30** and a source of pressure fluid to be described later. At the lower end of the cylinder **30** there is provided a similar passage **42** which extends through the bottom plate **34** and the supporting frame member **28**. The ends of the side wall of the piston **36** are suitably sealed, as by O-rings **43**, to prevent the seepage of fluid therepast.

Movement of the piston **36** within the cylindrical member **30** is utilized to provide for rotation of the housing **38** and the arm **22** attached thereto, through means including a pair of grooves **44** and **46** formed on the outer wall of the piston. These grooves are inclined in opposite directions with respect to the axis of the piston and provide a pair of cam surfaces which are disposed for engagement by a pair of followers **48** and **50** which extend into the cylinder **30**.

The follower **48** is rotatably mounted on the end of a pin **52**, which is fixed in a complementary opening **54** in the side wall of cylinder **30** at a position mid-way of the depth of the cylinder. The follower **50** is rotatably mounted on the inner end of a pin or stud **56**, which extends through a transversely slotted opening **58** in the side of cylinder **30**, generally opposite the position of the follower **48**, and is secured in a bore **60** in the rotatable housing **38**. Consequently, as the piston **36** moves up and down in the cylinder **30**, the cam grooves **44** and **46** coact with the followers **48** and **50**, respectively, to produce a limited rotation of the piston as well as a horizontal swinging movement of the follower **50** across the slot **58**. Since the follower pin **56** is fixed to the rotatable housing **38**, the movement of the pin through the transverse slot **58** is translated into a rotary movement of the housing **38** and the bearing support arm **22** which is attached thereto.

It is seen, therefore, that movement of the bearing **18**, which is mounted on the arm **22** and supports one end of the guide roll **10**, is controlled through movement of the piston **36** of the fluid motor **26**. Furthermore, as seen particularly in Figs. 4–7, the grooves **44** and **46** in the piston, as well as the transverse slot **58** in the wall of the cylinder **30**, are preferably designed to provide substantially more movement of the arm **22** than is ordinarily required in adjusting the position of the guide roll **10**. In the illustrated example the slot **58** accommodates approximately 70° movement of the follower pin **56**, with the cam groove **44** affording about 35° rotation of the piston **36** and the cam groove **46** providing an additional 35° movement of the follower **50**. In this respect it should be noted that the grooves **44** and **46** in Figs. 5 and 7 have been distorted and exaggerated with respect to the showings in Figs. 4 and 6, in order to present a clear illustration of the structure in each instance in a single cross-sectional view.

The described angles of the grooves **44** and **46** and the slot **58** are more than ample for most purposes, without interfering with proper operation of the cam followers **48** and and **50** at the ends of the piston stroke, but may be varied as desired. With the motor **26** normally operating intermediate its limit position, the piston **36** is always subjected to fluid pressure on both ends and, in this way, more precise control of the position of the piston is afforded. Thus there is provided a very accurate positioning of the bearing support arm **22** by a means which is readily responsive to any deviation of the web.

It will be seen, therefore, that the primary purpose of the groove **44**, which is engaged by the stationery follower **48**, is to increase the field of movement of the oppositely disposed pin **56**, by effecting a rotation of the piston **36** as it moves up and down in the cylinder **30**. Adequate movement of the follower **50** and the rotatable housing **38** affixed thereto can be afforded in many instances without rotation of the piston, as in the modifications illustrated in Figs. 8, 9 and 11 to be described hereinafter.

It should also be noted that the relationship of the slot **44** to the slot **46** (Figs. 3–5) may be varied to achieve any particularly desired result. That is, these slots may be disposed at different angles which are selected to achieve a predetermined amount of rotation of the piston **36** and a selected range of movement of the rotatable housing **38**.

Looking particularly at Fig. 2, it is seen that fluid communication with the passages **40** and **42** at opposite ends of the cylinder **30** is provided by a pair of pipes or tubes **62** and **64**, respectively, which are connected with a control valve housing **66** mounted on one side of the fluid motor housing **38**. The housing **66** in turn communicates with a suitable source of pressure fluid, such as the pump indicated generally at **67**, through a pair of conduits **68** and **70** which provide for the flow of pressure fluid to the housing **66** and the return flow to the reservoir portion of the pump.

The housing **66** contains a four-way, slidable spool valve **72** which includes three spaced apart sections **74**, **76** and **78** of reduced diameter, which are separated by larger cylindrical sections **80** and **82** to thereby provide means for controlling a pressure fluid inlet passage **84**, a pair of return passages **86** and **88** communicating with the return conduit **70**, and a pair of passages **90** and **92** providing communication with the conduits **62** and **64**, respectively, to the fluid motor **26**.

The valve **72** is biased into a neutral position (Fig. 2) by a spring **94** interposed between one end of the valve and the end of the valve housing **66**. Preferably the end of the valve housing containing the spring **94** includes a detachable closure member **96** having an internally threaded end portion which is engageable with an externally threaded end portion of the housing. In this way access to the valve **72** is provided and, also, the disposition of the spring **94** is easily adjusted by turning the closure member **96**.

The end of the valve **72** opposite that which bears against the spring **94** extends through the housing **66** to present a post **98** which is connected through suitable linkage with the feeler **24**. More particularly, the feeler assembly **24** is supported by an arm **100** which is carried by the fluid motor **26** in fixed relation to the stationary cylinder **30** (Fig. 2). The outer end of arm **100** includes a split sleeve element **102** which is disposed to adjustably receive one end of an elongated rod **104** extending toward the web **12** and at generally right angles to the direction of travel of the web. The inner end of the rod **104** overlies the adjacent edge portion of the travelling web and has suitably secured thereto a bracket **106**.

The bracket **106** is adjustably fixed to the rod **104**, as by a nut **108** disposed through a bifurcated portion of the bracket which clamps on to the rod **104**, and extends generally parallel to the direction of travel of the web **12**. The free end of the bracket **106** has mounted thereon a pivot bearing means **110**, rotatably supporting a depending stub shaft **112**. The lower end of the stub shaft has suitably fixed thereto a palm arm **114** which extends along the edge of the web and carries the palm portion **116** of the feeler assembly **24** at its outer end. Intermediate the ends of the palm arm **114** there is provided an adjustable linkage connection with the control valve **72** which regulates the movement of the fluid motor **26**. More specifically, a pair of rods **118** and **120** are disposed in extension forming relation to one another by a suitable coupling element **122**. The end of the rod **118** adjacent the palm arm **114** is pivotally secured thereto by a bracket **124** adjustably positioned along the arm. The opposite end of the other rod **120** is pivotally connected to the end of the post **98** on the valve **72**, as by a ball and socket bearing joint **126**.

Consequently, the linkage intermediate the palm arm **114** and the valve spool **72** is free to swing relative to each of these attached parts, to thereby accommodate the swinging movement of the palm arm **114** as well as the rotation of the outer housing **38** of the fluid motor

26. Furthermore, it is seen that the spring 94 in the valve housing 66 constantly urges the palm 116 into engagement with the edge of the web 12, and that any lateral shifting of the web is transmitted through the linkage just described to the valve 72. The valve 72 then provides a corresponding motion of the fluid motor 26 to shift the position of the guide roll 10.

Assuming that the web 12 is travelling in its intended course, the bearings 16 and 18 are then disposed in axial alignment so as to position the guide roll 10 at right angles to the direction of web travel, and the fluid motor 26 is in its neutral position shown in Figs. 2 and 3. A deviation of the web to the right, as viewed in Fig. 1, creates a pressure against the feeler 24 which in turn operates through the linkage connection with control valve 72 to move the latter inwardly of the housing, that is downwardly in Fig. 2.

The control valve section 82 is thus moved to provide fluid communication between the pressure fluid inlet 84 and the passage 90, around the reduced section 76, to cause a flow of pressure fluid through the passage 62 to the upper side of the piston 36. At the same time, the valve section 80 is moved to provide communication between the passage 92 and the return flow passage 86, around the reduced section 74, to thereby permit fluid to drain from the lower side of the piston through the conduit 64 and the control valve housing 66 and thus return to the source.

The above movement of pressure fluid forces the piston 36 downwardly (Figs. 6 and 7) whereupon the piston groove 46 presses against the follower 50 to move the pin 56 clockwise as seen in Fig. 6. The housing 38 and the arm 22 are, therefore, rotated clockwise to thereby shift the bearing 18 and the associated end of the guide roll 10 in the direction of travel of the web 12, that is, to the right as seen in Fig. 2. This axial shifting of the guide roll produced a non-uniform drag on the web which causes the latter to move to the left (Fig. 1) toward its normal course.

Sufficient shifting of the web to the left will of course permit the feeler 24 to follow such movement and return the control valve to its neutral position or, if the web goes beyond its normal course, it will be followed by the feeler 24 which will then cause the control valve 72 to move outwardly of the housing 66 (upwardly in Fig. 2). The pressure fluid will then be directed to move the piston 36 upwardly (Fig. 5) and thereby shift the bearing 18 in the opposite direction, or to the left in Fig. 2.

The latter action is, of course, a "hunting" effect which is undesirable. This effect is largely eliminated by the novel disposition of the control valve on the rotatable housing 38. As a result of this arrangement, the end 98 of control valve 72 is not only movable in response to movement of the feeler 24 but, also, moves in an arcuate-like path, as indicated by the positions "A" and "B" in Fig. 2, as the fluid motor housing 38 rotates to shift the guide roll axis. Consequently, in the above described operation wherein the control valve 72 moves inwardly of the housing and produces a clockwise rotation of the housing 38, the latter rotation causes the valve housing 66 to move away from the valve 72, i. e. downwardly in Fig. 2. This causes the valve 72 to move outwardly of the housing 66, whereupon valve section 82 will close off passage 90 to prevent further clockwise rotation of the fluid motor housing.

The disposition of the valve housing 66 and the arrangement of the linkage between the control valve and the feeler 24 is such that the return of the valve to its neutral position, to thereby shut off the flow of pressure fluid to the motor 26, occurs after a predetermined amount of rotation of the housing 38 within which movement proper compensation for the web deviation has been effected. This automatic shut-off feature is important in eliminating "hunting" of the guide roll control which is common with installations wherein the control valves are disposed in stationary housings.

Another very important advantage afforded by the described arrangement is that it provides stability for the guide roll in the event of fluid pressure failure. That is, in the event the fluid pressure exerted on the piston 36 should fail, the piston is not readily susceptible to movement by virtue of the force exerted by the travelling web on the guide roll 10, which force tends to swing the guide roll about the fixed pivot mounting 16 and which is transmitted through the bearing 18, arm 22, housing 38, and the follower 50 to the piston 36. The disposition of the groove 46, as well as the groove 44, is such that a considerable force is required to be exerted through the follower 50 in order to move the piston 36 and thereby permit a shift of the guide roll, as compared with the force required on the end of the piston to effect a shifting of the follower and a resulting movement of the guide roll 10. This difference in mechanical advantage is sufficient to resist the tendency of the guide roll to swing about the pivot 16 when the pressure in the fluid motor 26 fails, without detracting from the sensitivity of the guide roll control and its ability to readily correct the position of the guide roll during ordinary operation.

It will be apparent that the angular disposition of the grooves 44 and 46 is a great factor in determining whether or not the piston 36 can be reversed through the force of the guide roll 10 when pressure in the fluid motor 26 fails. The greater the angle between the path defined by the slot 58 and the direction of the grooves 44 and 46 the more difficult it will be for action of the guide roll to move the piston 36. In most guide roll installations the required sweep of the guide roll is not very great and, consequently, rather sharp inclines of the grooves 44 and 46 will afford the desired range of guide roll movement. For example, in most instances a total sweep of 60° for the guide roll would afford adequate control of the web deviations encountered. To provide a sweep of 60° in the structure of Figs. 1–7, each of the grooves 44 and 46 need be disposed at an angle of only 15° with respect to a vertical line through the midpoint of the length of the grooves. This arrangement provides 30° rotary movement of the piston 36 with respect to each of its followers 48 and 50 for a total of 60°.

It will also be recognized that the above described feature of construction which prevents movement of the piston 36 when the fluid pressure in the cylinder 30 fails, is particularly important when the guide roll is disposed in other than a horizontal plane. In such case there is present not only the drag of the web on the guide roll but also the gravitational effect on the guide roll, which produce a force on the follower 50 tending to move the piston 36.

It should further be recognized that various modifications of the described structure can be made without departing from the principles of this invention. For example, in Fig. 8 there is shown an arrangement for the fluid motor 26 wherein no rotation of the piston is provided. In this instance the piston 130 includes a curved groove 132 and a follower 134 extending through a radial slot in the cylinder 30 in the manner shown in Fig. 3. However, the piston also includes a straight vertical slot 136 receiving a follower 138 which is fixed to the cylinder 30 and thus rotation of the piston is prevented.

In Fig. 9 is shown a fluid motor arrangement wherein the piston 140 is slidably mounted on a rod 142 and keyed thereto to prevent rotation of the piston. A follower 144 is fixed to the piston and extends into a curved groove 146 disposed along the inside wall of a rotatable cylindrical member 148. A semi-cylindrical housing 150 or the like provides a support for the rotatable cylinder 148 and the rod 142 extends through both of

these parts and is fixedly secured to the outer housing. Fluid pressure means communicates with the interior of the cylinder 148 through a pair of conduits 152 and 154. An arm 156 is fixed to the rotatable cylinder to provide means for connection with the shiftable guide roll bearing. Consequently, as the piston 140 is moved along the rod 142, the follower 144 moves through the curved groove 146 to effect a rotation of the cylinder 148 and the arm 156 to thereby shift the guide roll.

Another embodiment shown in Fig. 10 depicts the use of a single groove 158 in a free piston 160, wherein a reverse curve is formed by the groove and a pair of followers 162 and 164 are both disposed within the single groove. The follower 162 is fixed in the stationary cylindrical member 166 and provides a guide for determining the amount of rotation of the piston 160. The other follower 164 extends through a radial slot 168 in the cylinder 166 and is secured to the rotatable housing 170. A suitable bracket 172 which is secured to the housing 170 provides means for connection with the guide roll to shift the latter as the housing is rotated by vertical movement of the piston 160. As the piston is moved through the introduction of pressure fluid into the cylinder 166, the follower 162 affords a controlled rotation of the piston and this rotation plus the vertical movement of piston 160 is translated, through the force exerted by the upper follower 164, into rotation of the housing 170.

In Fig. 11 is shown still another modified form of fluid motor which may be used with the apparatus shown in Figs. 1 and 2. In this embodiment there is provided a stationary housing 174 which fixedly supports a center rod 176 having a piston 178 non-rotatably and axially secured thereto by means including a key 180. The piston is enclosed by a relatively movable cylindrical member 182 having fluid communication with a source of pressure fluid through a pair of conduits 184 and 186 which are disposed at opposite ends of the chamber.

The outer wall surface of the cylindrical member 182 includes a pair of grooves 188 and 190 which receive a pair of follower elements 192 and 194, respectively. The follower 192 is secured in position on the housing 174 and, consequently, defines the extent of rotation afforded for the cylinder 182 in a manner similar to that described with respect to the previous embodiments. The groove 188 may be curved or, if no rotation of the cylinder 182 is desired, the groove 188 can be made parallel to the axis of the rod 176. The follower 194 is secured to a rotatable structure 196 having connection with the guide roll through means including an arm 198.

The follower 194 extends into the groove 190 which is suitably curved so that, as the cylinder 182 moves along the wall of the piston 178, a force is transmitted through the follower 194 to effect a rotation of the structure 196 and a corresponding shifting of the guide roll. In order to provide room for the fluid pressure conduits 184 and 186 it is preferred that the structure 196 be in the form of a partial cylinder. The housing 174 may be in any suitable form such as an angle bracket or a partial cylinder which is complementary to the casing 196 and forms therewith a complete enclosure for the cylinder 182.

The foregoing are intended only to illustrate some of the possible modifications of the preferred structure in Figs. 1–7, and it should be apparent that other modifications might readily be made without departing from the principles of the present invention.

It is seen from the foregoing, therefore, that apparatus constructed in accordance with this invention provides an improved means for controlling the position of a guide roll, wherein movement of a piston through a path generally normal to the plane of the travelling web is effective to shift the guide roll in the direction of movement of the web. This arrangement provides a more positive and precise control of the guide roll in a manner affording a considerable saving in the space required for the guide roll control unit.

And, as indicated above, another important advantage offered by this invention is that it provides for a construction which does not afford free movement of the guide roll in the event of failure of the pressure fluid in the control system. The particular arrangement of parts holds the operating piston in position when such failure occurs and thereby avoids possible damage to the travelling web. It is also seen that the arrangement of the control valve for the fluid motor is such that an automatic shut-off is provided for the fluid pressure at the ends of a predetermined range of movement of the fluid motor. This is very effective in minimizing the tendency of the guide roll to overcorrect and thus continually "hunt" for the normal path of the travelling web.

Although shown and described with respect to particular apparatus and in connection with a horizontally moving web, it will be readily apparent to those skilled in the art that the principles of the present invention may also be applied in connection with other apparatus and to travelling webs disposed in a plane other than horizontal.

I claim:

1. In combination with a guide roll mounted on a cross shaft for movement relative to a travelling web being guided thereby, adjusting means for effecting movement of said guide roll comprising a cylindrical housing, a piston disposed within said housing for relative axial movement therebetween, said adjusting means also including means affording guided relative rotation between said piston and cylindrical housing in response to relative axial movement therebetween, fluid pressure means communicating with opposite ends of said piston and operable to produce said relative axial movement, said fluid pressure means including a control valve housing mounted for rotation about the axis of said piston along with said relative rotation between said piston and cylindrical housing, and a control valve movably positioned in said control valve housing to direct the flow of pressure fluid relative to said piston, means associated with said control valve and operable in response to deviating movement of the travelling web to alter the position of said control valve relative to said control valve housing, and means connecting said adjusting means with said cross-shaft so that said relative rotation of said piston and cylindrical housing is effective to produce a shifting of said cross-shaft with respect to the direction of travel of the web.

2. In combination with a guide roll mounted on a cross-shaft for movement relative to a travelling web being guided thereby, means for effecting movement of said guide roll comprising a cylindrical housing mounted adjacent one end of said guide roll for rotation about an axis which is generally normal to the travelling web, a bearing support for one end of said guide roll fixed to said cylindrical housing for rotation therewith, a piston slidably disposed within said housing for movement relative thereto, means connecting said piston with said cylindrical housing so that axial movement of said piston relative to said housing causes the latter to rotate, fluid pressure means communicating with said cylindrical housing and operable to produce movement of said piston, said fluid pressure means including a control valve mounted on said rotatable housing which is operable to selectively direct the flow of pressure fluid relative to said piston housing, a feeler means engaging the edge of said travelling web and mounted for movement in response to lateral shifting movement of the web, means connecting said feeler means with said control valve for operation of the latter in response to lateral shifting of the web, said connecting means being also operative to respond to the rotation of said control valve with said rotatable housing to return said control valve to its neutral position after a predetermined amount of movement of said valve with said housing.

3. A guide for a travelling web comprising a guide

roll engageable with said web, means supporting said guide roll in a manner affording swinging movement thereof about an axis normal to said web, a feeler means mounted for engagement with an edge of said web and movable in response to lateral shifting of the web, and guide roll control means operable to effect a swinging movement of said guide roll in response to movement of said feeler means, said guide roll control means including a hydraulic motor comprising a cylindrical housing rotatably mounted on a fixed cylindrical member in concentric relation thereto with the axis of said cylindrical member and housing being disposed generally normal to the path of the travelling web, a piston slidably disposed within said cylindrical member, said piston including a pair of recesses formed along its outer wall in spaced relation to each other and disposed in generally oppositely inclined relation to the direction of travel of the piston, a first follower fixed to said cylindrical member and disposed within one of the recesses in said piston, means defining a transverse slot in said cylindrical member, a second follower fixed to said cylindrical housing and extending through said transverse slot to a position within the other of said recesses in said piston, means for selectively supplying pressure fluid to opposite ends of said piston, whereby axial movement of said piston is accompanied by a rotation of said piston within the limits defined by said first follower and said one recess and by a movement of said second follower across said transverse slot to effect a rotation of said cylindrical housing, said means for supplying pressure fluid being connected with said feeler means for operation in response to movement of said feeler means, and means connecting said rotatable cylindrical housing with the support means for said guide roll.

4. In combination with a guide roll mounted on a cross-shaft for movement relative to a travelling web being guided thereby, means for effecting mnvement of said guide roll comprising a cylindrical housing having its axis disposed substantially normal to the path of the travelling web, a piston disposed within said housing for guided movement relative thereto, said piston including an elongated groove formed in the surface thereof and extending therealong at an angle with respect to the central axis of said piston, a follower disposed in said groove and extending outwardly therefrom through a radial slot in said cylindrical housing, means connecting said follower with said cross-shaft, fluid pressure means communicating with opposite ends of said piston and operable to produce said axial movement of said piston, whereby said groove and follower coact to provide rotation of the piston as said piston moves axially of said cylindrical housing to thereby afford movement of said cross-shaft, said groove and follower being thereby constructed and arranged with respect to said cylindrical housing to provide sufficient resistance to the force exerted by said cross-shaft, due to its frictional engagement with said travelling web, so as to prevent an axial shift in the position of said piston in response to the failure of the fluid pressure within said cylindrical housing.

5. In combination with a guide roll mounted for movement relative to a travelling web being guided thereby, means for effecting movement of said guide roll comprising a cylindrical housing disposed with its longitudinal axis generally normal to the travelling web, a piston disposed within said housing for sliding movement relative thereto, said piston including a groove formed along its outer wall in angularly extending relation to the axis of said piston, a pair of spaced apart follower elements disposed within said groove, one of said follower elements being fixed to said housing, the other of said follower elements extending through a radial slot through said cylindrical housing, means connecting said other follower element with said cross-shaft, and fluid pressure means communicating with opposite ends of said piston, whereby axial movement of said piston in response to said fluid pressure also affords a rotation of said piston which is transmitted through said other follower element to said cross shaft so as to effect a corresponding shifting thereof.

6. In combination with a guide roll mounted for swinging movement relative to a travelling web being guided thereby, means for effecting movement of said guide roll comprising a fixed piston having its axis generally normal to the path of the travelling web, a cylindrical member enclosing said piston and movable relative thereto, fluid pressure means communicating with said cylindrical member and operable to afford axial movement of said cylindrical member relative to said piston, said cylindrical member including a pair of grooves formed along its outer wall surface in obliquely extending relation to the axis of said member, a first follower element fixedly disposed in position for engagement with one of said grooves to thereby afford limited rotation of said member as it is moved axially of said piston, rotatable means disposed adjacent to the other of said grooves in said member and supported for circumferential movement about the axis of said piston, a second follower element secured to said rotatable means in position for engagement with said said other groove, and additional means affording a connection between said rotatable means and said guide roll, whereby axial movement of said cylindrical member affords a rotation of said rotatable means through the coaction of said other groove with said second follower element and whereby said rotation effects a corresponding movement of said guide roll.

7. In combination with a guide roll mounted on a cross-shaft for movement relative to a travelling web being guided thereby, means for effecting movement of said guide roll comprising a cylindrical housing having its axis disposed substantially normal to the path of the travelling web, a piston disposed within said housing for movement relative thereto, said piston including a pair of recesses formed along the outer wall thereof, one of said recesses extending in generally parallel relation to the center axis of said piston, a first follower fixed to said cylindrical housing and disposed within said one recess in said piston, the other of said recesses being disposed in inclined relation with respect to the center axis of said piston, means defining a transverse slot in said cylindrical housing, a second follower disposed within said other recess in said piston and extending outwardly therefrom through the transverse slot in said cylindrical housing, means connecting said second follower with said said cross-shaft, and means affording pressure fluid communication with opposite ends of said cylindrical housing, whereby movement of said piston causes said second follower to move across said transverse slot and move said cross-shaft.

8. In combination with a guide roll mounted on a cross-shaft for movement relative to a travelling web being guided thereby, means for effecting movement of said guide roll comprising a cylindrical housing having its axis disposed substantially normal to the path of the travelling web, a rod disposed axially of said housing, a piston slidable within said cylindrical housing and carried by said rod for axial movement therealong, said cylindrical housing including a recess formed along the inner wall thereof and disposed in inclined relation to the direction of travel of said piston, a follower fixed to said piston and disposed within said recess formed in the inner wall of said housing, means connecting said cylindrical housing with said cross-shaft, and means affording pressure fluid communication with opposite ends of said cylindrical housing, whereby movement of said piston causes said follower to move in said recess formed in the housing inner wall to thereby rotate said housing and effect an adjustment of the position of said cross-shaft.

9. A guide for a travelling web comprising a guide roll engageable with said web, means supporting said guide roll in a manner affording swinging movement thereof about an axis normal to said web, a feeler means

mounted for engagement with an edge of said web and movable in response to lateral shifting of said web, and guide roll control means operable to effect a swinging movement of said guide roll in response to movement of said feeler means, said guide roll control means including a hydraulic motor comprising a cylindrical housing rotatably mounted on a fixed cylindrical member in concentric relation thereto, with the axis of said cylindrical member and housing being disposed generally normal to the path of the travelling web, a piston slidably disposed within said cylindrical member, said piston including a pair of recesses formed along its outer wall in spaced relation to each other and disposed in generally oppositely inclined relation to the direction of travel of the piston, a first follower fixed to said cylindrical member and disposed within one of the recesses in said piston, means defining a transverse slot in said cylindrical member, a second follower fixed to said cylindrical housing and extending through said transverse slot to a position within the other of said recesses in said piston, means for selectively supplying a pressure fluid to opposite ends of said piston including a control valve which is mounted on said rotatable housing and which is operable to direct the flow of pressure fluid relative to said cylindrical member, said control valve being connected with said feeler means for operation in response to movement of said feeler means, whereby axial movement of said piston is accompanied by a rotation of said piston within the limits defined by said first follower and said one recess and by a movement of said second follower across said transverse slot to effect a rotation of said cylindrical housing, said connection between said feeler means and said control valve being also operative to respond to the rotation of said control valve with said rotatable housing to return said control valve to its neutral position after a predetermined amount of movement of said valve with said housing.

10. In combination with a guide roll mounted on a cross-shaft for movement relative to a travelling web being guided thereby, means for effecting movement of said guide roll comprising a cylindrical housing having its axis disposed substantially normal to the path of the travelling web, a piston disposed within said housing for movement relative thereto, said piston including a pair of recesses formed along the outer wall thereof and disposed in generally oppositely inclined relation with respect to the direction of travel of said piston, a first follower fixed to said cylindrical housing and disposed within one of the recesses formed in said piston, means defining a transverse slot in said cylindrical housing, a second follower disposed within the other of the recesses formed in said piston and extending outwardly therefrom through the transverse slot in said cylindrical housing, means connecting said second follower with said cross-shaft, and means affording pressure fluid communication with opposite ends of said cylindrical housing whereby movement of said piston causes said second follower to move across said transverse slot and move said cross-shaft, and whereby the oppositely inclined relation of the recesses in said piston is effective to provide a rotation of said second follower which is the sum of the amounts of rotation afforded by each recess in said piston.

11. A fluid motor comprising a cylindrical housing rotatably mounted on a fixed cylindrical member in concentric relation thereto, a piston slidably disposed within said cylindrical member, said piston including a groove formed along its outer wall in angularly extending relation to the axis of said piston with one portion of said groove extending at an angle with respect to another portion of said groove, a pair of spaced apart follower elements disposed within said groove, one of said follower elements extending through a transverse slot in said cylindrical member and connected with said rotatable housing, the other of said follower elements being fixed to said cylindrical member, and means affording pressure fluid communication with opposite ends of said cylindrical member, whereby axial movement of said piston causes said one follower to move across said transverse slot and rotate said cylindrical housing.

12. A fluid motor comprising a fixed piston, a cylindrical member enclosing said piston and movable relative thereto, means affording pressure fluid communication with opposite ends of said cylindrical member to thereby provide for axial movement of said member relative to said piston, said cylindrical member including a pair of grooves formed along its outer wall surface in obliquely extending relation to the axis of said member, a first follower element fixedly disposed in position for engagement with one of said grooves to thereby afford limited rotation of said cylinder member as it is moved axially of said piston, rotatable means disposed adjacent to the other of said grooves in said member and supported for movement about the axis of said piston, a second follower element secured to said rotatable means in position for engagement with said other groove, whereby axial movement of said cylindrical member affords a rotation of said rotatable means.

13. A fluid motor comprising a cylindrical housing rotatably mounted on a fixed cylindrical member in concentric relation thereto, a piston slidably disposed within said cylindrical member, a pair of recesses formed along the outer wall of said piston and disposed in generally oppositely inclined relation to the direction of travel of said piston, a first follower fixed to said cylindrical member and disposed within one of said recesses in said piston, means defining a transverse slot in said cylindrical member, a second follower fixed to said cylindrical housing and extending through said transverse slot in said cylindrical member to a position within the other of said recesses in said piston, and means affording pressure fluid communication with opposite ends of said cylindrical member, whereby movement of said piston causes said second follower to move across said transverse slot and rotate said cylindrical housing.

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