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Weisgerber

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[54] **REGISTER CONTROL APPARATUS FOR CONTROLLING BOTH AXIAL AND CIRCUMFERENTIAL REGISTER OF A PLATE CYLINDER**

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May 22, 1970 Germany ..... P 20 24 937.0

[52] **U.S. Cl.** **101/248,** 74/395

[51] **Int. Cl.** **B41f 13/24**

[58] **Field of Search** 101/181, 248; 74/395

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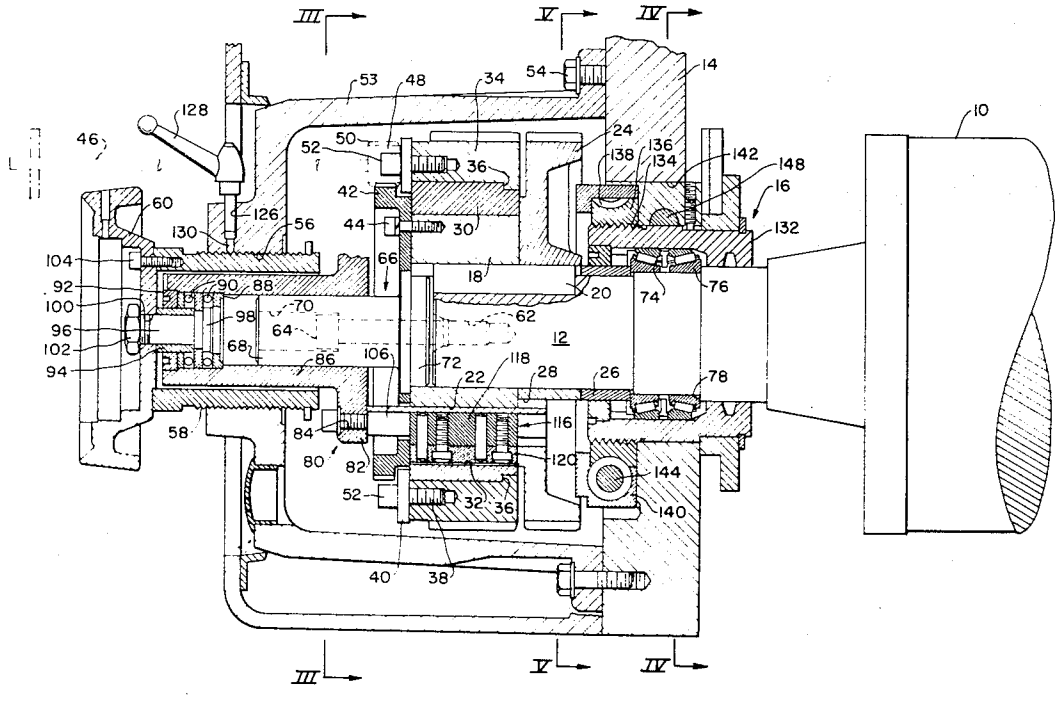
Assistant Examiner—Eugene H. Eickholt
Attorney—Stanley J. Price, Jr.

[57] **ABSTRACT**

The register control apparatus includes a ring member coaxially positioned on a hub portion of the plate cylinder shaft. A drive gear is coaxially positioned on the ring member and drivingly connected thereto. The hub, ring, and drive gear are axially fixed on the plate cylinder shaft and the ring member is rotatable relative to the hub member by means of a circumferential register adjusting apparatus that includes a pair of spline members slidable longitudinally in slots of the hub member and a pair of key members positioned in slots in the ring member. The key members have an upper key portion extending into slots in the slidable splines. The slots and key portion extend angularly relative to the shaft periphery at the same helix angle as the helical gear teeth of the drive gear and in the opposite direction. The lower portion of the key member has arcuate side walls that mate with arcuate side walls of the longitudinal slots in the ring. By axially moving the splines relative to the plate cylinder shaft the hub and plate cylinder are rotated relative to the drive gear to thus change the circumferential register of the plate cylinder. The plate cylinder shaft is rotatably supported in a bearing housing that is axially fixed to the plate cylinder shaft. Apparatus is provided to move the bearing housing axially in the press frame to thus move the cylinder axially and adjust the side register.

10 Claims, 9 Drawing Figures



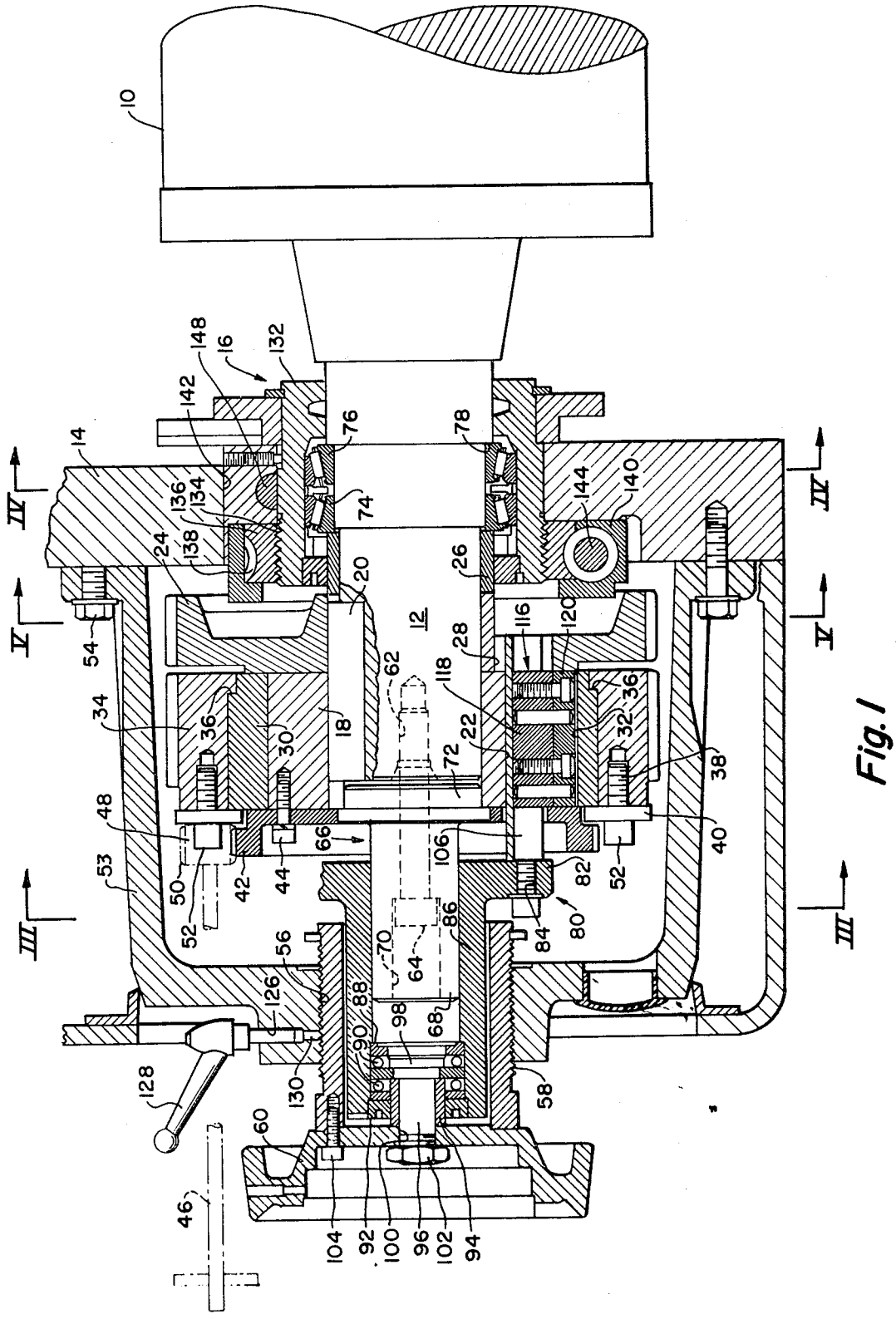

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Fig. 1

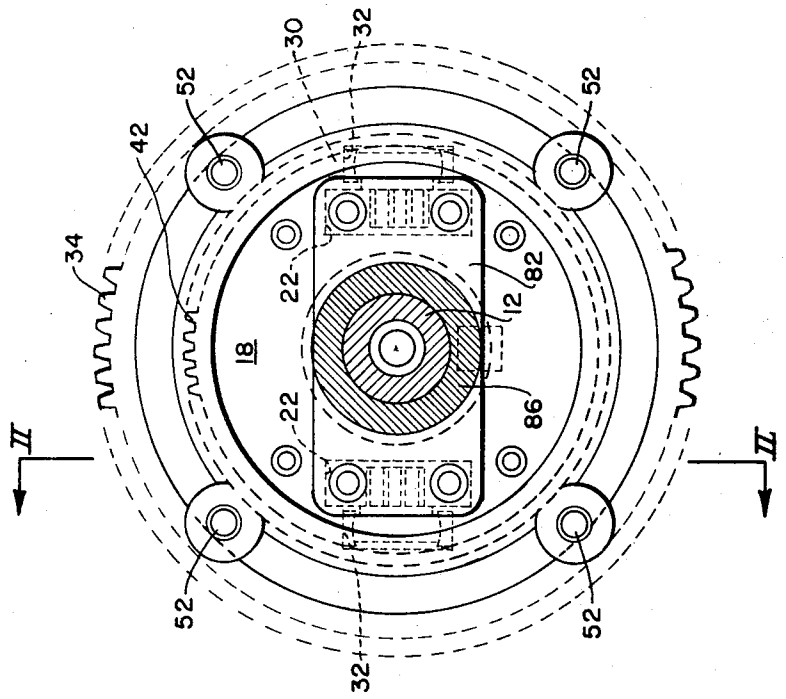

Fig. 3

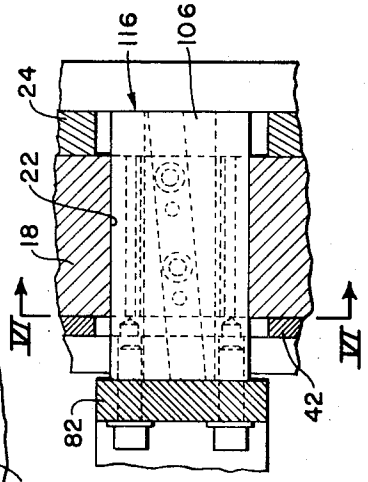

Fig. 2

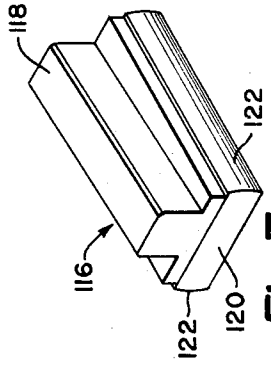

Fig. 7

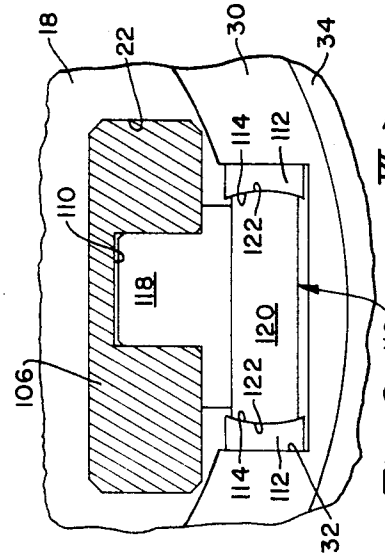

Fig. 6

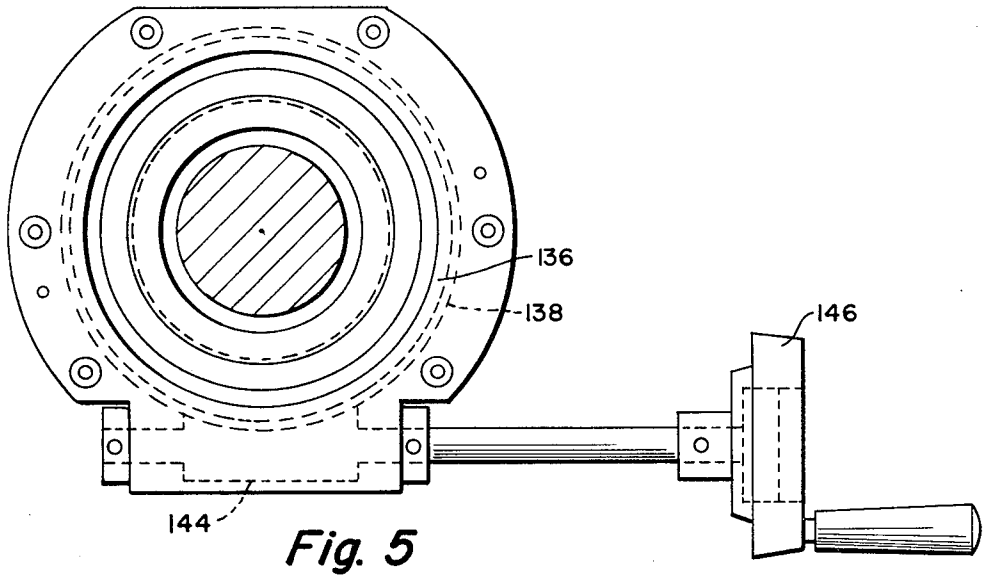

Fig. 5

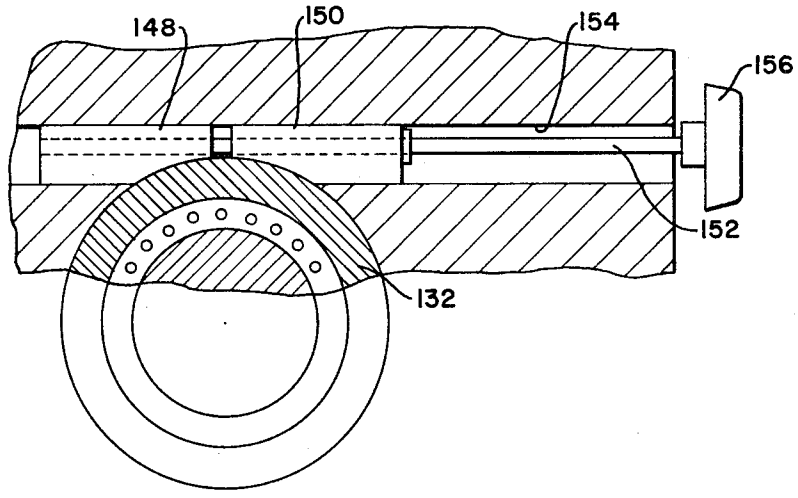

Fig. 4

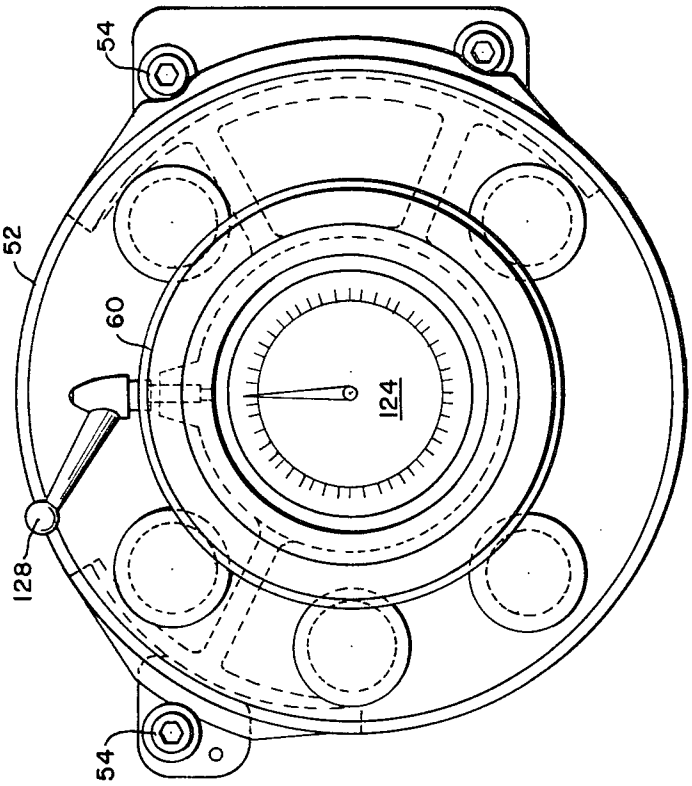

Fig. 8

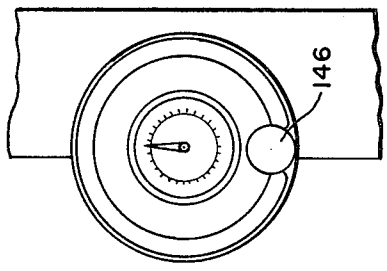

Fig. 9

REGISTER CONTROL APPARATUS FOR CONTROLLING BOTH AXIAL AND CIRCUMFERENTIAL REGISTER OF A PLATE CYLINDER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a register control apparatus for adjusting the axial and circumferential register of a plate cylinder and more particularly to a register control apparatus for adjusting either the axial or the circumferential register of the plate cylinder while the plate cylinder is rotating.

2. Description of the Prior Art

It is necessary in printing presses, particularly multicolor presses, to accurately control and adjust the circumferential and axial register of the plate cylinder while it is running at printing speeds. Many register control mechanisms are known. Some of the register adjusting mechanisms adjust only the circumferential register or only the side register. Other register control devices permit the adjustment of both circumferential and axial register while the printing machine is stopped. To stop the printing operation to make adjustments in side or front register is time consuming and interrupts the printing operation.

There are register control mechanisms that permit the double adjustment of the plate cylinder while the printing machine is running at normal speeds. U.S. Pat. No. 2,425,914 discloses a register control mechanism where the drive gear is moved axially with the plate cylinder to effect adjustment in side or axial register. The circumferential register is accomplished by rotating the shaft relative to the drive gear.

In U.S. Pat. No. 2,948,216 there is disclosed a series of meshing gears for circumferentially adjusting the plate cylinder. U.S. Pat. No. 3,565,006 discloses a motor driven harmonic gear drive for changing the angular phase relationship of the driving gear and the printing roller. German Pat. No. 1,032,755 also discloses apparatus for adjusting both the side and circumferential register of a plate cylinder during the printing operation. The circumferential register adjustment is accomplished by the axial shifting of the helical drive gear on the plate cylinder. The side register adjustment is affected by direct axial shifting of the plate cylinder whereby the drive gear opposite the machine frame remains axially stationary. German Pat. No. 1,077,231 discloses apparatus for adjusting the circumferential register by means of a lever type pivoting device.

All of the above patents are directed to register mechanisms that include either a plurality of adjusting gears for circumferential register when helical drive gears are employed or complex lever type pivot devices. There is a need for a compact register control apparatus that is arranged to control both the axial and circumferential register of the plate cylinder with a minimum number of parts between the plate cylinder and the drive gear.

SUMMARY OF THE INVENTION

This invention relates to apparatus for adjusting the circumferential and axial register of a plate cylinder in a press frame and includes a plate cylinder that has a shaft end portion. A hub member is nonrotatably and axially fixed on the shaft end portion. A ring member is coaxially positioned on the hub member in rotatable relation thereto. The ring member is also axially fixed on the hub member. A helical drive gear is coaxially mounted on the ring member and axially fixed thereon. The hub member has a longitudinal peripheral slot and the ring member has a longitudinal slot communicating with and in overlying relation with the hub member slot. A key member is positioned in the ring member slot, and has a key portion extending into the hub member slot. The key portion extends angularly to the axis of the shaft end portion and has an angular deviation from the axis of the cylinder substantially equal to the helix angle of the helical drive gear so that the axial movement of the helical drive gear during axial movement of the plate cylinder for axial register adjustment is compensated by the angular deviation of the key member key portion.

A sliding wedge is positioned in the hub member slot and has a recessed portion that has substantially the same angular deviation as the key portion of the key member. Axial movement of the spline rotates the hub member relative to the ring member and drive gear to thereby rotate the plate cylinder relative to the drive gear and provide circumferential register adjustment.

The plate cylinder shaft is mounted in a bearing support axially fixed on the plate cylinder shaft. Means are provided to move the bearing support axially within the press frame to provide axial register adjustment while the circumferential register remains fixed.

Accordingly, the principal object of this invention is to provide a register control mechanism for controlling and adjusting both circumferential and axial register of a plate cylinder that eliminates additional gearing between the helical drive gear and the plate cylinder shaft for providing circumferential drive.

Another object of this invention is to provide a register control mechanism for controlling and adjusting both circumferential and axial register of a plate cylinder without complex pivoting devices within the helical drive gear for providing adjustment of circumferential register.

Another object of this invention is to provide a register control apparatus for both circumferential and axial register that has a minimum number of parts and is compact in construction and located on the same end of the plate cylinder.

These and other objects and advantages of this invention will be more completely disclosed and described in the following specification, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view in side elevation and partially in section illustrating the apparatus for adjusting the register and axial register of the plate cylinder.

FIG. 2 is a fragmentary view in plan taken along the line II—II of FIG. 3 illustrating a slotted portion in the hub in which the axially movable adjusting mechanism is positioned and arranged to move axially to adjust the circumferential register of the plate cylinder.

FIG. 3 is a view in front elevation and partially in section taken along the line III—III of FIG. 1 illustrating the adjusting flange that moves axially to adjust the circumferential register of the plate cylinder.

FIG. 4 is a view in elevation and in section taken along line IV—IV and illustrating the mechanism for axially locking the bearing housing.

FIG. 5 is a view in section taken along the line V—V of FIG. 1 illustrating the apparatus for axially moving the bearing housing and the plate cylinder to adjust the axial register.

FIG. 6 is a view in section taken along the line VI—VI of FIG. 2 illustrating one of the axially movable splines positioned in the hub member slot and the key member positioned in a longitudinally extending slot of the coaxial ring member with an upper key portion extending into a recessed portion of the axial spline.

FIG. 7 is a perspective view of the key member illustrated in FIGS. 3 and 6.

FIG. 8 is a view in front elevation of the adjusting wheel with the dial for the circumferential register adjustment.

FIG. 9 is a view in front elevation of the handle for axial adjustment of the plate cylinder.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Throughout the specification the terms "front register" and "circumferential register" will be used interchangeably to designate the angular relationship of the plate cylinder to the drive gear and the terms "axial register" and "side register" will also be used interchangeably to designate the axial adjustment of the plate cylinder relative to the printing press frame.

Referring to FIG. 1 there is illustrated a plate cylinder 10 having a shaft end portion 12 suitably supported in the press frame 14 by means of a bearing support generally designated by the numeral 16. The shaft 12 has a ring-like hub member 18 suitably secured thereto by a key member 20 to nonrotatably secure the hum member 18 to the shaft 12. The hub member has a pair of diametrically opposed longitudinal slotted portions 22 (FIGS. 2, 3 and 6) one of which is illustrated in FIG. 1.

A gear 24 is nonrotatably positioned on the shaft 12 and secured thereto by means of the key 20 and is axially fixed on shaft 12 by bushing 26. The gear 24 has a pair of apertures 28 that are aligned with the longitudinal slots 22 in the hub member 18.

A ring member 30 is coaxially positioned on the hub member 18 in rotatable relation therewith and both the hub 18 and ring 30 are fixed against axial movement on shaft 12 by abutting the face of gear 24. The ring member 30 has a pair of diametrically opposed longitudinal slots 32 (FIGS. 3 and 6) one of which is illustrated in FIG. 1. The slots 32 in ring 30 are in overlying relation with the longitudinal slots 22 in the hub member 18.

A helical drive gear 34 is coaxially positioned on the ring member 30 and is rotatable relative thereto. The drive gear 34 is axially fixed on the hub 18 by means of the mating shoulder portions 36 on the ring 30 and drive gear 34. The drive gear 34 is nonrotatably secured to the ring 30 by means of bolts 38 having enlarged head portion 40 abutting the faces of the ring 30 and drive gear 34. An adjusting gear 42 is coaxially positioned on the shaft 12 and is secured to the hub member by means of bolts 44. The adjusting gear 42 is utilized to rotate the plate cylinder 10 through hub 18 relative to drive gear 34. To rotate the cylinder 10 relative to the drive gear 34 an adjusting wrench 46 having a socket head portion 48 with an externally geared surface 50 is positioned with the bolt head 52 within the socket 48 and the geared surface 50 meshing with adjusting gear 42. Rotation of the adjusting wrench 46 then rotates the adjusting gear 42 and plate cylinder 10 relative to the drive gear 34.

The circumferential register of the plate cylinder 10 may be adjusted by means of the peripheral adjusting apparatus that includes a housing 53 secured to the frame member 14 by bolts 54. The housing 53 has a threaded bore 56 therethrough axially aligned with the plate cylinder shaft 12. Positioned in the threaded bore 56 is an externally threaded sleeve 58. An adjusting wheel 60 is secured to the sleeve 58 so that rotation of wheel 60 moves the sleeve 58 axially toward and away from the plate cylinder 10.

The shaft member 12 has an axial threaded bore 62 in its end portion to receive a bolt member 64. An end cap 66 having a cylindrical end portion 68 with a central bore 70 therethrough and an enlarged other end portion 72 is positioned in abutting relation with the end portion of shaft 12. A bolt 64 extending through the bore 70 in the cylindrical end portion 68 of cap 66 urges the flange end portion against the key member 20 and the key member 20 abuts the bushing 26 and urges the bushing 26 against the inner race 74 of the roller bearing 76. The inner race of bearing 76 abuts a shoulder 78 on shaft 12 to axially fix the hub 18 with the ring 30 and drive gear 34 coaxially positioned thereon and the inking drive gear 24 on the plate cylinder shaft 12.

An adjusting member generally designated by the numeral 80 has a generally rectangular body portion 82 with a plurality of apertures 84 therethrough and a rearwardly extending cylindrical sleeve portion 86. The sleeve portion 86 is supported on the cylindrical end portion 68 of cap 66. The cylindrical sleeve portion 86 has an internal shoulder 88. A double row of ball bearings 90 are positioned within the sleeve portion 86 in abutting relation with the shoulder 88. A threaded ring member 92 secures the bearings within the sleeve 86 and a bushing 94 abuts the inner race of one of the bearings 90. A stud bolt 96 having an enlarged end portion 98 extends through the bushing 94 and an aperture 100 in the adjusting wheel 60. A bolt 102 secures the stud 96 to the adjusting wheel 60. With this arrangement the adjusting member 80 sleeve portion 86 is freely rotatable relative to the adjusting wheel 60 connected thereto by means of the bearings 90 between the sleeve 86 and the stud bolt 96. The externally threaded sleeve 58 is connected to the adjusting wheel 60 by means of bolts 104. With this arrangement the adjusting member 80 is movable axially relative to the plate cylinder shaft 12 by rotation of the wheel 60. Wheel 60 rotates the sleeve 58 in the housing threaded bore 56 to move both the sleeve 58 and the adjusting member 80 axially toward or away from the plate cylinder shaft 12.

The adjusting member 80 is connected to the hub member 18 by a pair of slidable splines 106 positioned in the slots 22 of hub member 18. One of the splines is illustrated in FIG. 2. The splines 106 are secured to the adjusting member body portion 82 by means of bolts 108. The splines 106 have an angular slot or recessed portion 110 therein extending generally longitudinally relative thereto. The angle of the slot 110 is equal to the helix angle of the helical gear teeth on the drive gear 34 so that during axial shifting of the plate cylinder the displacement angle or angle of twist between the hub 18 and the ring 30 will be equal to the angle of twist or displacement angle of the helical gear teeth on the helical drive gear 34.

Positioned in each of the slots **32** of the ring **30** are pairs of pins **112** having arcuate side walls **114.** A key member **116** has an upper elongated rectangular key portion **118** and a lower body portion **120** with arcuate side walls **122.** The upper key portion **118** extends angularly on the body portion **120** at the same angle as the slot **110** in the spline **106.** The key member **116** is positioned in the slot **32** of ring **30** with the arcuate side walls **122** abutting the arcuate walls **114** of the pins **112** positioned in the slot **32** (FIG. **6**) and is axially fixed therein by the end portions abutting the faces of gears **24** and **42.** With axial movement of the adjusting member **80** the above described apparatus moves the spline **106** axially relative to the key member **116.** The key member remains axially fixed and the axial movement of the spline **106** moves the rectangular key portion **118** of key member **116** in the slot **110** of spline **106** to thus rotate or angularly displace the plate cylinder **10** relative to the ring **30** and helical drive gear **34** to thereby adjust the circumferential front register of the plate cylinder **10.** The axial displacement of the rectangular key portion **118** of key **116** within the recessed slot **110** is the same as the helix angle of the helical drive gear **34.** The arcuate side walls **122** of the key lower portion **120** abuts the arcuate walls of the pins **112** and prevents binding of the key due to the arcuate angle of the helical gear teeth and minimizes wear of the movable parts during adjustment.

The recessed portion of adjusting wheel **60** has a dial **124** secured thereto showing the setting position and the front register setting of the plate cylinder **10.** The dial is illustrated in FIG. **8.**

The housing **53** has a radial bore **126** therethrough that communicates with the threaded axial bore **56.** A toggle member **128** is threadedly positioned in the bore **126** and abuts a stopper **130.** The stopper **130** is urged into frictional engagement with the sleeve **58** to prevent inadvertent rotation of the sleeve **58** and and unintentional front register adjustment.

The side register of the plate cylinder **10** may be adjusted by axially moving the bearing housing **16** within the frame **14.** The bearing housing **16** has a sleeve member **132** which has an externally threaded portion **134** on which a collar **136** is threadedly positioned. The external periphery of the collar **136** has outwardly extending worm gear surface **138.** A ring **140** maintains the collar **136** fixed within an aperture **142** in the housing **14.** A worm gear **144** is positioned in the ring **140** and meshes with the worm teeth **138** of collar **136.** By rotating the worm **144** by handle **146** (FIGS. **5** and **9**) the collar **136** is turned relative to bearing housing **132** to move the bearing housing **132** axially relative to the frame **14** to thus move the plate cylinder **10** axially and adjust the axial or side register of the plate cylinder **10.** The axial movement of the plate cylinder **10** by the axial movement of the bearing housing **132** moves the hub **18,** ring **30** and drive gear **34** axialy relative to the adjusting member **80** and the splines **106** connected thereto. The key member **116** is axially fixed in the slot **32** of ring **30** and moves axially therewith. The axial movement of helical gear **34** which would normally cause the plate cylinder **10** to rotate and change front register, is compensated by the angular arrangement of the slot **110** in spline **106** and the key portion **118** of key member **116.**

Referring to FIGS. **1** and **4,** a locking device to prevent unintentional adjustment of the side register setting includes clamp toggles **148** and **150** connected onto a threaded shaft **152** within a bore **154.** The shaft has a handle **156** that upon rotation moves the toggles **148** and **150** into clamping relation with the sleeve **132** to prevent inadvertent rotation of the sleeve member **132.**

According to the provisions of the patent statutes, I have explained the principle, preferred construction and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, it should be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. Apparatus for adjusting the circumferential and axial register of a plate cylinder in a press frame comprising,

a plate cylinder having a shaft end portion,

a hub member nonrotatably and axially fixed on said shaft end portion,

a ring member coaxially positioned on said hub member, said ring member rotatably mounted on said hub member and axially fixed thereon,

said hub member having a peripheral slot and said ring member having a longitudinal slot in overlying relation with said hub member slot,

a helical drive gear coaxially positioned on said ring member, said drive gear rotatably mounted on said ring member and axially fixed thereon,

a key member positioned in said ring member slot and having a key portion extending into said hub member slot, said key member key portion extending angularly to the axis of said cylinder and having an angular deviation from said axis of said cylinder substantially equal to the helix angle of said helical drive gear so that the axial movement of said helical drive gear during axial movement of said plate cylinder for side register adjustment is compensated by the angle of the deviation of said key member key portion.

2. Apparatus for adjusting the circumferential and axial register of a plate cylinder in a press frame as set forth in claim **1** in which,

said hub member peripheral slot extends longitudinally relative to a shaft end portion spline member positioned in said hub member peripheral slot and movable longitudinally therein,

said spline member having a slotted portion therein, said spline member slotted portion having substantially the same angular deviation as said key member key portion,

said key member key portion positioned in said spline member slotted portion so that upon axial movement of said spline member relative to said hub member, said plate cylinder is rotated peripherally relative to said helical drive gear to thereby adjust the circumferential register of said plate cylinder.

3. Apparatus for adjusting the circumferential and axial register of a plate cylinder in a press frame as set forth in claim **2** which includes,

an adjusting member connected to said axially movable spline member, said adjusting member having a sleeve portion axially positioned relative to said shaft portion,

means to move said sleeve portion axially relative to said shaft end portion to thereby rotate said plate

cylinder and adjust the circumferential register of said plate cylinder.

4. Apparatus for adjusting the circumferential and axial register of a plate cylinder in a press frame as set forth in claim 3 which includes,

a housing member secured to the press frame and having a threaded bore therethrough axially aligned with said shaft end portion,

a sleeve member having an externally threaded portion secured in said housing threaded bore,

means connecting said adjusting member sleeve to said threaded sleeve to permit rotation of said adjusting member relative to said threaded sleeve and to move said adjusting member axially upon axial movement of said threaded sleeve.

5. Apparatus for adjusting the circumferential and axial register of a plate cylinder in a press frame as set forth in claim 1 which includes,

said ring member longitudinal slot having side walls,

said key member having means abutting said ring member longitudinal slot side walls.

6. Apparatus for adjusting the circumferential and axial register of a plate cylinder in a press frame as set forth in claim 2 in which,

said ring member longitudinal slot has a generally rectangular configuration with planar side walls,

pin mmebers positioned in said ring member longitudinal slot, said pin members having planar walls abutting said planar walls of said ring member longitudinal slot,

said pin members positioned in said ring member having opposed arcuate walls,

said key member having arcuate side walls of substantially the same arcuate configuration as said pin member arcuate walls.

7. Apparatus for adjusting the circumferenlial and axial register of a plate cylinder in a press frame as set forth in claim 3 which includes,

an adjusting wheel axially positioned relative to said shaft end portion,

said adjusting wheel rotatably connected to said adjusting member,

means associated with said adjusting wheel so that upon rotation of said adjusting wheel, said adjusting member moves axially relative to said plate cylinder shaft end portion.

8. Apparatus for adjusting the circumferential and axial register of a plate cylinder in a press frame as set forth in claim 1 which includes,

an adjusting gear positioned coaxially relative to said shaft end portion and nonrotatably secured to said hub member, said helical drive gear being rotatable relative to said ring member,

means operable to engage said adjusting gear and said helical drive gear to rotate said helical drive gear relative to said ring member.

9. Apparatus for adjusting the circumferential and axial register of a plate cylinder in a press frame as set forth in claim 1 which includes,

a press frame member having an opening therethrough,

said shaft end portion journaled in said frame member and extending through said opening,

a bearing housing mounted on said shaft end portion and axially fixed relative thereto,

said bearing housing mounted in said opening of said press frame member,

means to move said bearing housing axially relative to said press frame member to thereby adjust the axial register of said plate cylinder.

10. Apparatus for adjusting the circumferential and axial register of a plate cylinder in a press frame as set forth in claim 9 in which,

said bearing housing has an externally threaded portion,

a collar coaxially positioned on said bearing housing and having an internal threaded surface and an external geared surface,

said collar being axially fixed in said press frame member opening,

means to engage said gear surface of said collar to thereby rotate said collar and axially move said bearing housing relative thereto to adjust the axial register of said plate cylinder.

* * * * *