

June 4, 1963

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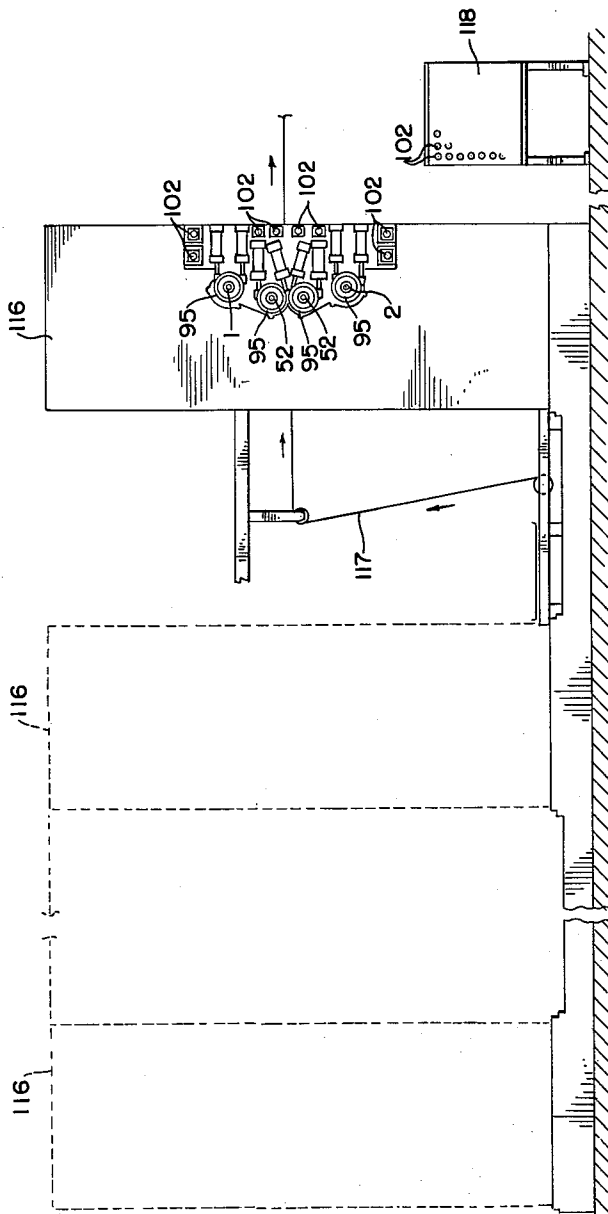
3,092,022

REGISTER CONTROL MECHANISM FOR A WEB-FED PRINTING PRESS

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5 Sheets-Sheet 1

FIG. 1



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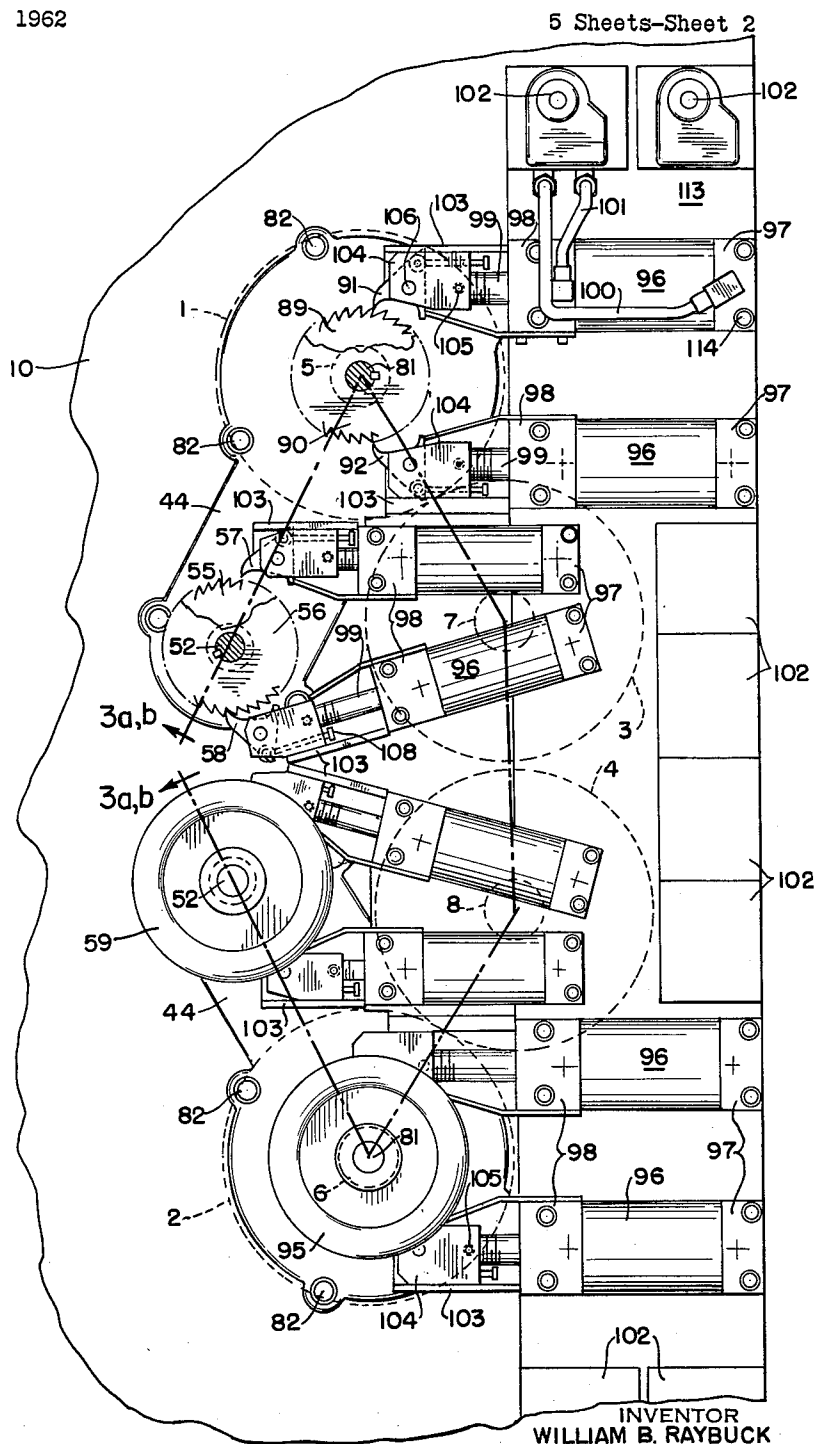
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FIG. 2



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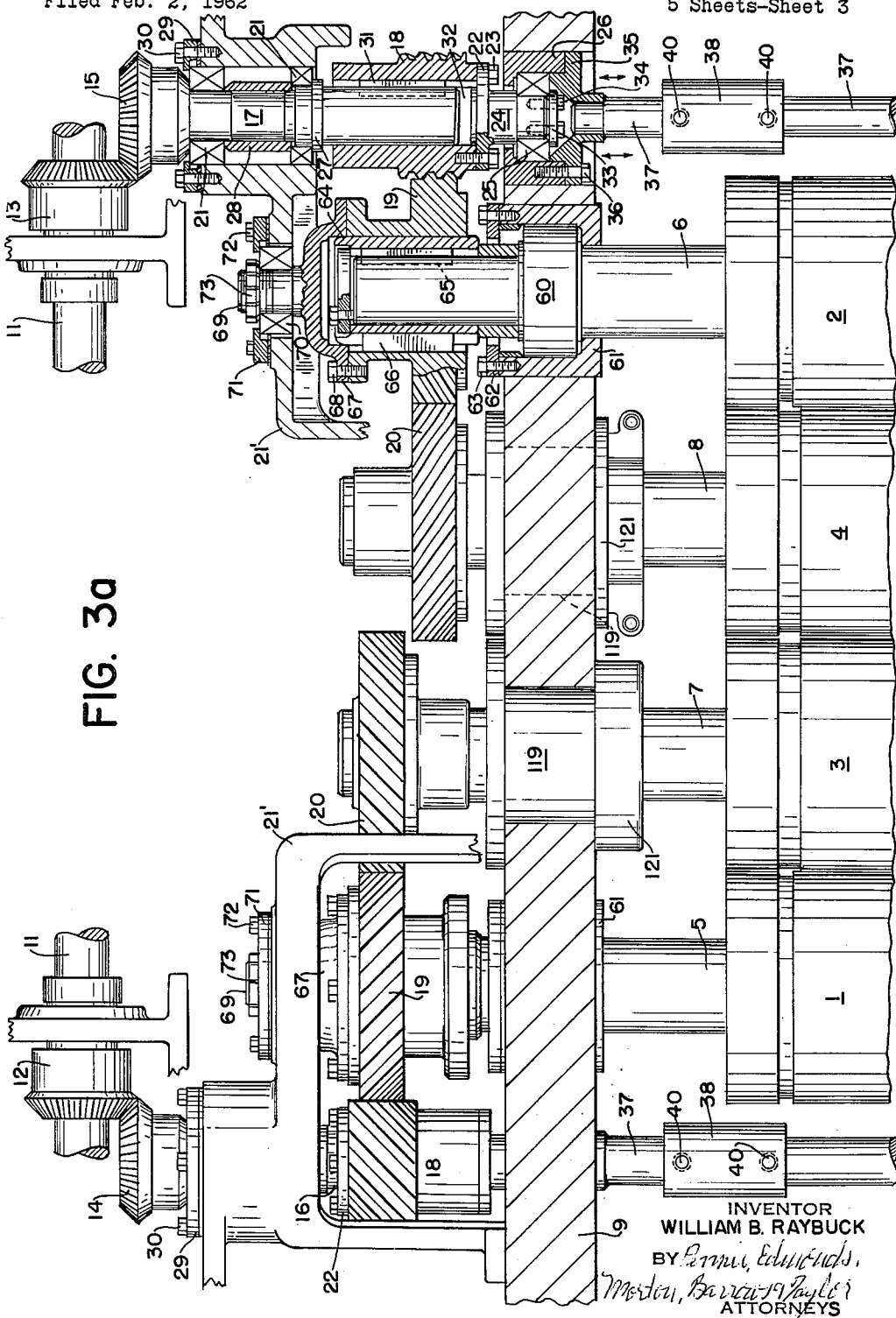
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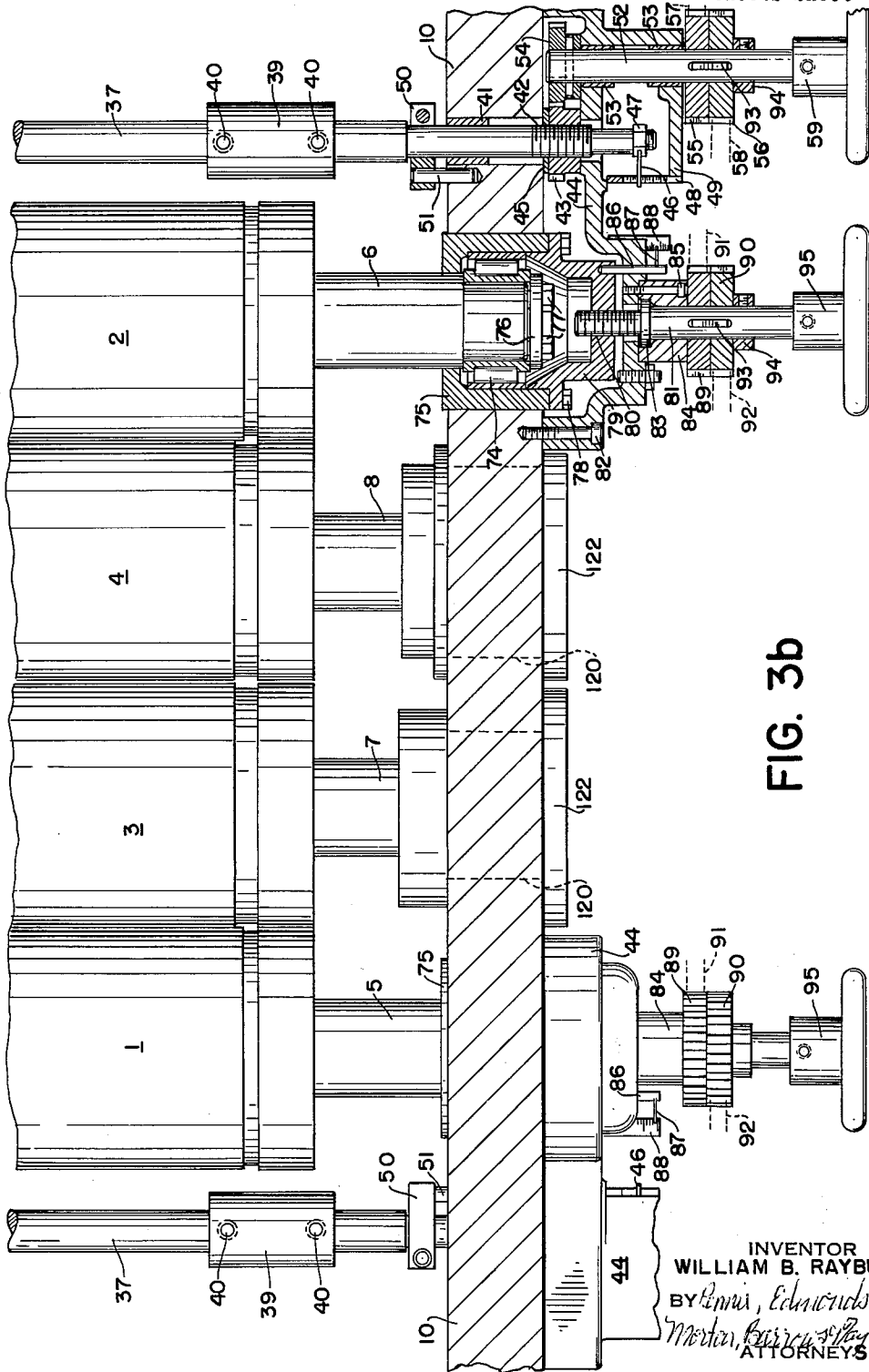
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3,092,022

REGISTER CONTROL MECHANISM FOR A WEB-FED PRINTING PRESS

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5 Claims. (Cl. 101-248)

The present invention relates to improvements in rotary web-fed printing presses of the offset type and, more particularly, to printing presses of this general type comprising a plurality of printing units, each adapted to perform a specific printing operation on the web or a ribbon cut therefrom.

Modern printing presses of this type may comprise a large number of cooperating printing units arranged in series and extending over a distance of 100 feet or more. A roll of paper, constituting the web, may be positioned at one end of the composite printing press. In passing to or through the press, the web may be cut into ribbons and these ribbons passed through various printing units for printing the respective ribbons or applying the desired ink colors thereto, and at the far end of the press the ribbons are assembled and passed to conventional cutters, folders and the like to produce signatures ready for binding into a book or other printed publication.

Particularly in high-grade printing, these signatures passing from the far end of the press are carefully inspected for imperfections in register and for other possible defects. Because of the high-speed operation of modern presses, any error detected with respect to register, or otherwise, must be corrected immediately to avoid costly discards. Imperfect register may, of course, be circumferential or longitudinal with respect to the plate cylinder and neither can be tolerated in high-grade printed matter.

The present invention provides improvements in method and means whereby the register of any one or more of the series of printing units may be quickly, and substantially automatically, corrected independently of any other unit of the press by automatic controls, positioned either at the far end of the composite press or at the respective units, or advantageously at each of these positions. In accordance with this invention, I can instantly correct imperfections in register, either circumferential or longitudinal, by increments of a few $\frac{1}{1000}$ of an inch in any one unit of the press, while the press is in normal operation and without in any way disturbing other units of the press.

The invention will be more fully described and illustrated with reference to the accompanying drawings which represent a highly effective embodiment of the invention. It will be understood, however, that the invention is not restricted to the specific details or to the specific embodiment shown, but is limited only by the appended claims.

FIG. 1 of the drawings represents diagrammatically and conventionally, and somewhat fragmentarily, a side elevational view of one type of multi-unit press to which the present invention is especially applicable.

FIG. 2 is a somewhat enlarged elevational view of a pneumatic or hydraulic control mechanism found especially desirable in conjunction with the other control mechanism of a single press unit.

FIGS. 3a and 3b, taken together, represent a developed section of a single press unit along line 3a, b-3a, b of FIG. 2 showing in detail the driving gears for the respective cylinders and means for effecting adjustment of register.

FIG. 4 is a further enlarged, more detailed view of the pawl and ratchet arrangement shown in FIG. 2, and

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FIG. 5 is a still further enlarged detailed view along the line 5-5 of FIG. 4.

The basic principle of the invention is best explained by reference to FIGS. 3a and 3b of the drawing. Two plate cylinders are indicated at 1 and 2, respectively, and two cooperating blanket cylinders are indicated at 3 and 4, respectively. The web passes between the blanket cylinders so that a printed image is simultaneously applied to each side of the web.

These cylinders are respectively mounted on coaxially-extending shafts 5, 6, 7 and 8 which, in turn, are rotatably supported by the press side frames 9 and 10. The unit is driven from line shaft 11 through beveled gears 12 and 13 keyed to the line shaft and beveled gears 14 and 15 keyed to shafts 16 and 17, respectively.

Except for inconsequential changes for convenience in construction and compactness, the mechanism for driving and adjusting the register of cylinders 1 and 3 may be identical with that for cylinders 2 and 4, the latter being shown in greater detail in the drawing, and particular reference will be made thereto.

Slidably keyed to shaft 17, and driven thereby, is a helical gear 18 which cooperates with, and drives, helical gear 19 which is keyed to shaft 6. In turn, gear 19 cooperates with, and drives, the helical gear 20 keyed to shaft 8.

Shaft 17 is rotatably supported by bearings 21 which, in turn, are supported by housing 21' rigidly secured to the press frame. The gear 18 is positioned about the lower portion of shaft 17 and is attached at its lower end, by means of flange plate 22 and machine screws 23 to coaxially-extending shaft 24 which is rotatably supported by press frame 9 through bearings 25 and bearing housing 26.

The bearings 21 are held in position by means of collar 27, sleeve 28 and retaining ring 29, the latter being secured to the housing 21' by means of machine screws 30.

As previously noted, gear 18 is slidably keyed to shaft 17 as indicated at 31 and a clearance is provided at 32 between the lower end of shaft 17 and the flange plate 22 so that the helical gear 18 may be moved longitudinally along the shaft 17.

The bearing housing 26 is mounted in the press side-frame 9 so that it can slide longitudinally through the frame. The bearing 25 is held in position by the retaining plate 33 secured to the lower end of shaft 24 by means of machine screws 34.

At the lower end of bearing housing 26, there is positioned dish member 35 secured to the bearing housing by machine screws 36, and attached to member 35, as by welding, there is a coaxially-extending shaft 37 in which there may be provided couplings 38 and 39, secured to the shaft by any suitable means, for instance by bolts indicated at 40.

The lower end of shaft 37 passes through side-frame 10 and is there supported by bearing 41 through which the shaft is free to slide longitudinally.

That portion of shaft 37 extending outwardly beyond the press frame is finely threaded, as indicated at 42, and about the threaded portion of the shaft, there is a cooperating internally-threaded spur gear 43 secured against longitudinal movement by the housing 44 and bushing 45. At the lower end of the shaft, there is an indicator arm 46, secured to the shaft as by nut 47, and a scale 48, supported by bracket arm 49, is provided for reading the position of the indicator. Just inside the frame, there is secured to shaft 37 a bracket 50 pinned to the frame at 51 to secure shaft 37 against rotation.

Also, on the outside of the press frame and rotatably supported by bracket 44, there is provided a shaft 52 extending through bushings 53 and secured to the inner end of the shaft there is spur gear 54 designed to cooper-

ate with spur gear 43 and to effect rotation of the latter in either direction as the shaft 52 is turned.

Also positioned on shaft 52 are two rachets 55 and 56 having their teeth inclined in opposite directions and adapted to be rotated in opposite directions by means of pawls indicated at 57 and 58, said pawls being adapted to be automatically operated, as hereinafter more fully described. The shaft 52 may also be rotated manually, when desired, by means of hand wheel 59.

For adjusting circumferential register in accordance with my present invention, shaft 52 is turned slightly in the appropriate direction thereby causing the internally-threaded spur gear 43 to rotate accordingly about the cooperating threaded section 42 of shaft 37 and thus causing the shaft 37 to move longitudinally and effect corresponding longitudinal movement of the helical gear 18.

Since gear 18 is keyed to drive shaft 17, it cannot rotate relative thereto, and consequently the longitudinal movement of the helical gear 18 causes rotation of the cooperating helical gear 19, which is keyed to shaft 6, and thus causes circumferential movement of the plate cylinder in the appropriate direction to effect the desired correction in circumferential register.

The shaft 6 of plate cylinder 2 is rotatably supported by press side-frame 9 by means of a bearing surface 60 positioned in bearing housing 61 the latter being adapted to slide longitudinally through the press frame. The upper portion of the bearing housing is closed by member 62 secured to the main portion of the bearing housing by machine screws 63.

The helical gear 19 fits over the end of shaft 6 extending outwardly beyond side-frame 9 which is provided with a sleeve 64 keyed to the shaft at 65 and which, in turn, is keyed to gear 19 at 66. The outer portion of the helical gear 19 assembly is closed by a cover plate 67 secured thereto by machine bolts 68. This cover plate is provided with a coaxially-extending shaft 69 supported by bearings 70 which, in turn, is supported by housing 21' and is held in position by ring 71 secured to the housing by machine bolt 72. The outer end of shaft 69 is threaded and is provided with a lock nut 73.

By this means, gear 19 is prevented from moving longitudinally. However, shaft 6 is free to move longitudinally with respect to the gear 19.

The other end of shaft 6 is rotatably supported by side-frame 10 through bearings 74 and bearing housing 75, the latter being adapted to slide longitudinally through the press frame. The bearing is held in position by means of retaining plate 76 secured to the end of shaft 6 by machine screws 77.

Secured to the outer end of the bearing housing 75, as by machine screws 78, is dished member 79 and finely threaded into the center of member 79, as indicated at 80, is a coaxially-extending shaft 81 which is rotatably supported by housing 44 secured to the press frame, for instance by machine bolts 82. The shaft 81 is secured against longitudinal movement by means of shoulder 83 and collar 84, the latter being secured to the bracket 44 as by means of machine screws 85.

Extending outwardly from member 79 through the housing 44 is an indicating rod 86 having an indicator arm 87 at its lower end adapted to cooperate with scale 88 for indicating the relative longitudinal movement of shaft 6.

Secured to shaft 81 are two rachets 89 and 90 having their teeth sloping in opposite directions, as previously indicated, and adapted to be turned in the appropriate direction by means of pawls 91 and 92, respectively. These rachets, and also ratchet 55 and 56, are keyed to the respective shafts as indicated at 93 and are held in position thereon by lock rings 94. Also, attached to the end of shaft 81, there is provided a hand wheel 95 by which shaft 81 may be manually turned if desired.

By the means described, longitudinal registry may be adjusted by rotation of shaft 81 in the appropriate direc-

tion, the threaded portion of the shaft causing the shaft 6 and the plate cylinder 2 thereon to move longitudinally in the corresponding direction. By reason of the described arrangement, whereby shaft 6 is free to slide longitudinally through helical gear 19, the circumferential register of plate cylinder 2 is not thereby disturbed.

The pitch of the threads at 42 and 80 is subject to considerable variation depending upon the required fineness of adjustment. Similarly, the number of teeth in the respective rachets may be varied as desired. I have, with particular advantage, so coordinated the pitch of threads 80 and the number of ratchet teeth that the side-lay register, i.e., longitudinal register, is adjusted in increments of 0.0017 inch per stroke of the pawl. Similarly, I have, with advantage, so coordinated the pitch of threads 42, the number of teeth in the rachets and the pitch of the helical gears, that the circumferential register will be adjusted in increments of 0.0014 inch per stroke of the pawl.

An especially advantageous method and means for effecting adjustment of registry of the respective printing units by remote control will be described and illustrated with reference to FIGS. 2, 3 and 4 of the drawings.

The previously described pawls may, with advantage, be actuated by remotely-controlled pneumatic or hydraulic cylinders or solenoids. In the illustrative apparatus, each pawl is provided with a cylinder 96 having a rear end cap 97 and a forward end cap 98. Coaxially extending through the forward end cap there is a plunger 99 which is actuated by a fluid under pressure, which is introduced into the cylinder by way of rear end cap 97 through conduit 100 to force the plunger forward or through conduit 101 and forward end cap 98 into the cylinder to retract the plunger.

The fluid under pressure is supplied to the respective conduits from any convenient source and its flow to the respective conduits may be controlled, from a point more or less remote from the cylinder, by means of valves of conventional type and operated conventionally, for instance by means of push buttons indicated at 102. Normally, pressure will be maintained in the cylinder ahead of the plunger-packing so as to maintain the plunger in the retracted position. At will, by pressing the push buttons 102, pressure in the forward end of the cylinder is released and pressure is applied to the rear end of the cylinder to force the plunger forward.

As more clearly shown in FIGS. 4 and 5 of the drawings, the plunger extends outwardly from the forward end of the cylinder into the pawl housing 103 within which there is positioned a pawl block 104 threaded onto the forward end of plunger 99 and locked thereon by means of bolt 105.

The pawl 91 is pivotally supported by the pawl block at 106, and pivotally connected to the upper portion of the pawl at 107 is a tension rod 108 extending through the pawl block and urged forward by means of spring 109.

A projection 110 of the pawl, at its lower side, is brought to bear upon a shoulder 111 of the housing as the plunger 99 is retracted so as to lift the pawl out of contact with the ratchet. When the plunger 99 is forced forward, and the pressure on the shoulder 111 thereby released, the pawl is forced downwardly into contact with the ratchet teeth by means of the spring 109 and rod 108.

As more clearly shown in FIG. 5, tension on the spring 109 may be adjusted by means of bushing 112 which is threaded into the pawl block 104. The entire cylinder and pawl assembly may be secured to any suitable rigid panel, such as indicated at 113, as by means of machine screws 114 and the lower portion of the pawl housing, comprising the shoulder 111, may be secured to the forward end cap of the cylinder by means of machine screws 115.

The mechanism for operating pawl 92 and the other

pawls of the system may be substantially the same as that described and need not again be described herein.

It will be understood that by actuating pawl 91, shaft 81 will be rotated in a counterclockwise direction through an angle subtended by one tooth of the ratchet 89 and that by actuating pawl 92, shaft 81 will be rotated through a like angle in the clockwise direction. Similarly, shaft 52 may be rotated counterclockwise or clockwise by actuating pawls 57 or 58, respectively.

According to a preferred aspect of this invention, the controls 102 for actuating the respective pawls are positioned on a panel 118 conveniently located at the delivery end of the series of printing units, where the signatures are inspected, so that any defects in register of any one or more printing units may be immediately remedied in small increments by the inspector, through remote control and actuation of the appropriate pawl or pawls, until perfect register is obtained.

Frequently, it is desirable also to have control buttons on the respective printing units such as indicated on FIG. 1 of the drawings. Further, in setting up the press, it is frequently desirable to provide means such as hand wheels 95 for adjusting the register manually.

As shown diagrammatically in FIG. 1 and as previously described herein, a multiplicity of the press units, as indicated at 116 are arranged serially and a web or ribbon of paper, as indicated at 117, is passed through each press unit between the cooperating blanket cylinders 3 and 4, the printed ribbons being assembled, cut and folded at the far end of the press to form the signatures for binding.

Again referring to FIGS. 3a and 3b of the drawings, the shafts 7 and 8 of blanket cylinders 3 and 4 are similarly rotatably supported, in conventional manner, by the press side frame through bearings indicated at 119 and 120 held in position by retaining rings 121 and retaining plates 122.

In view of the foregoing description, it will be apparent that many modifications of the structure and arrangement of the various elements described are possible and it will be understood that the invention is not restricted to the specific details and construction shown.

I claim:

1. A web-fed rotary printing press unit for offset printing comprising:

- (a) at least one plate cylinder and cooperating blanket cylinder supported on coaxially-extending parallel shafts rotatably supported by side-frames of the press unit,
- (b) cooperating spiral gears keyed to the respective shafts and secured against longitudinal movement with respect to the side-frames,
- (c) a drive shaft parallel to said supporting shaft,
- (d) a spiral gear slidably keyed to said drive shaft and adapted to cooperate with, and drive, the spiral gear on the plate cylinder shaft,

(e) the shaft of the plate cylinder being adapted to be moved longitudinally with respect to the side-frames and the gear keyed thereto,

(f) automatic means adapted to move the drive shaft spiral gear longitudinally in small increments of predetermined magnitude along the drive shaft and thereby effecting rotation of the spiral gear keyed to the plate cylinder shaft to effect circumferential register adjustment, and

(g) automatic means for moving the plate cylinder shaft longitudinally in small increments of predetermined magnitude to effect longitudinal register adjustment.

2. The apparatus of claim 1 further characterized in that the automatic means (g) comprises a threaded shaft and a cooperating threaded coupling, the shaft being secured against longitudinal movement, and automatic means for effecting rotation of said shaft in either direction to effect longitudinal movement of the plate cylinder shaft.

3. The apparatus of claim 1 further characterized in that the automatic means (f) comprises a threaded control shaft secured against rotation and a cooperating threaded member secured against longitudinal movement and automatic means for effecting rotation of said threaded member in either direction to move the drive shaft helical gear longitudinally with respect to the drive shaft.

4. A printing press comprising a multiplicity of serially-arranged printing units, as defined by claim 1, each printing unit comprising respectively two blanket cylinders arranged to operate in rolling contact, means for passing a web between the blanket cylinders, a plate cylinder cooperating with each of the blanket cylinders and adapted to apply the image thereto and means for applying ink to the respective plate cylinders and in which the automatic means for effecting register adjustment are remotely controlled from the delivery end of the press.

5. The apparatus of claim 1 further characterized in that the automatic means for effecting circumferential register adjustment and for effecting longitudinal register adjustment comprise, respectively, two ratchets having their teeth sloping in opposite directions and each provided with a cooperating pawl, each pawl being provided with propulsion means for actuating the pawl and thereby turning the cooperating ratchet through a predetermined increment, said ratchet propulsion means being adapted to automatic remote control.

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