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Vir Singh

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[54] **PRINTING PRESS CYLINDER SUPPORT AND CONTROL**

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[52] **U.S. Cl.**..... **101/247,** 101/140, 101/145, 101/185, 101/218

[51] **Int. Cl.**.... **B41f 13/24,** B41f 13/26, B41f 13/40

[58] **Field of Search**... 101/140, 144, 184, 145, 185, 101/217, 218, 247; 188/70, 366

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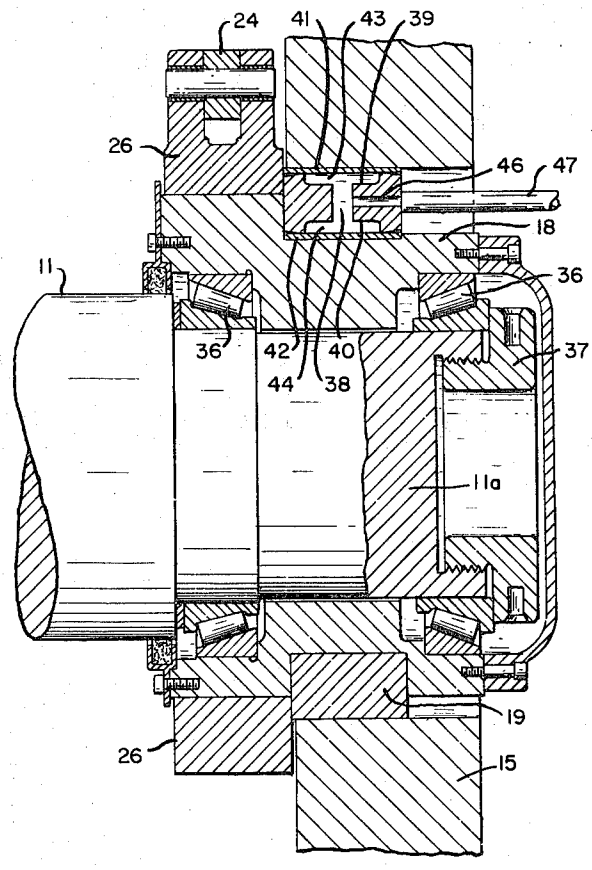
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Assistant Examiner—Paul T. Sewell

[57] **ABSTRACT**

The present invention pertains generally to printing presses and more particularly to improved means for preloading the journal bearing housings for the cylinders of a printing press against the forces of impression. Rotatable eccentric bushings include hydraulically expandable pads for circumferentially restraining and radially stressing the bushings when activated by an elevated fluid pressure. Hydraulic and electric controls are included to provide proper sequential activation when the cylinder is tripped.

2 Claims, 4 Drawing Figures



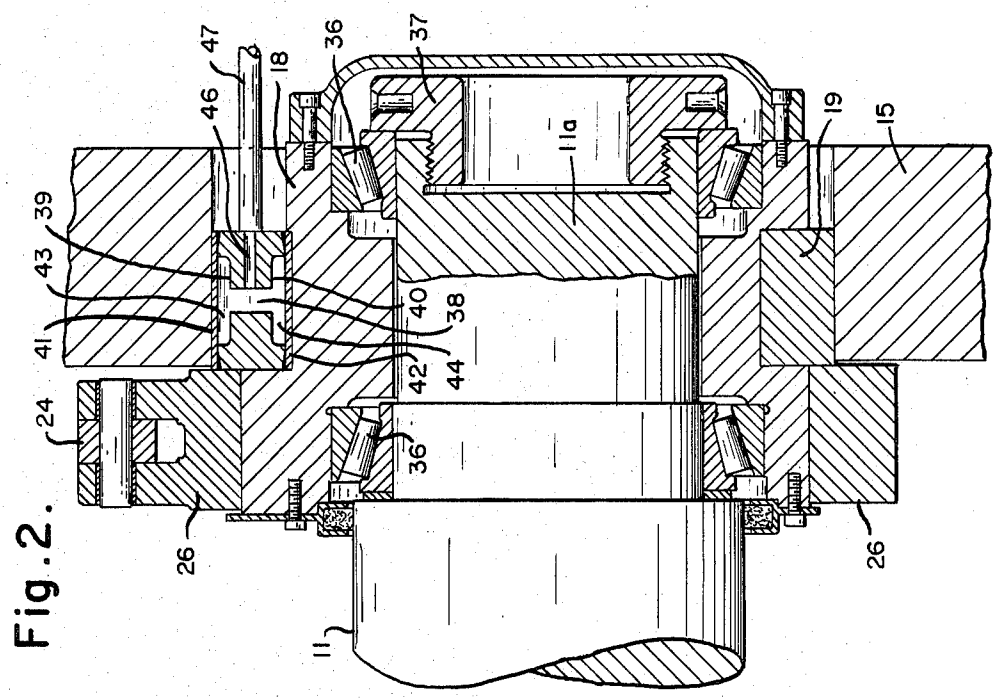

47
46
18
36
37
11a
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15
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43
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44
24
36
26
26
11

Fig. 2.

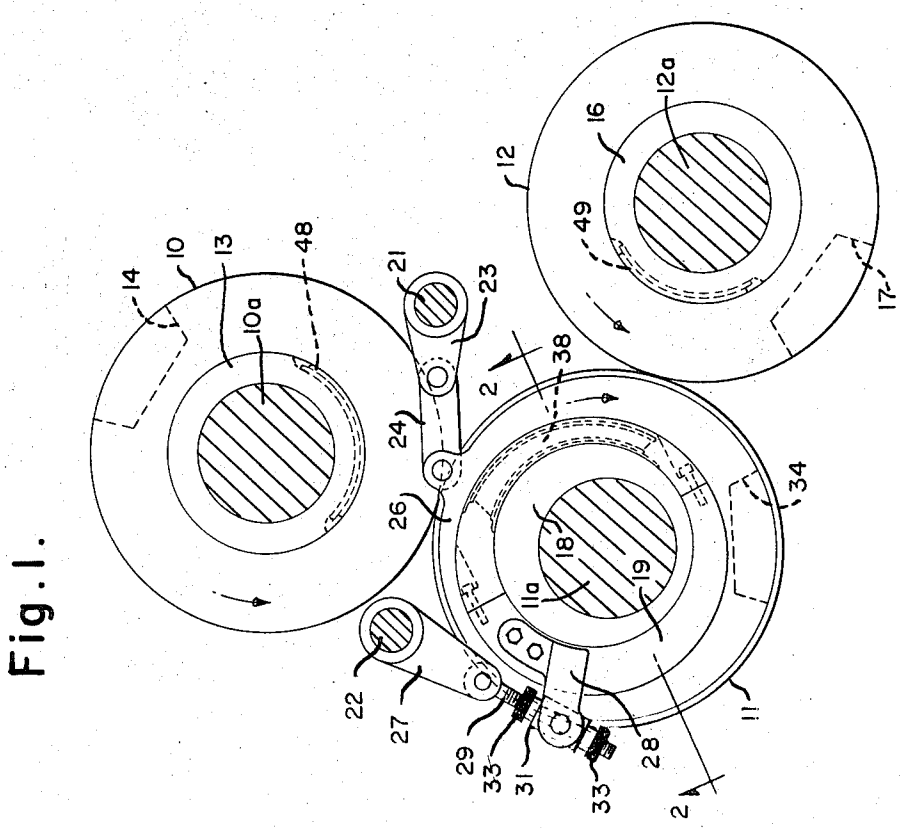

12
12a
16
49
17
14
10
13
48
10a
21
23
24
26
2
38
34
18
11a
19
22
27
29
33
31
33
28
11
2

Fig. 1.

Fig. 3.

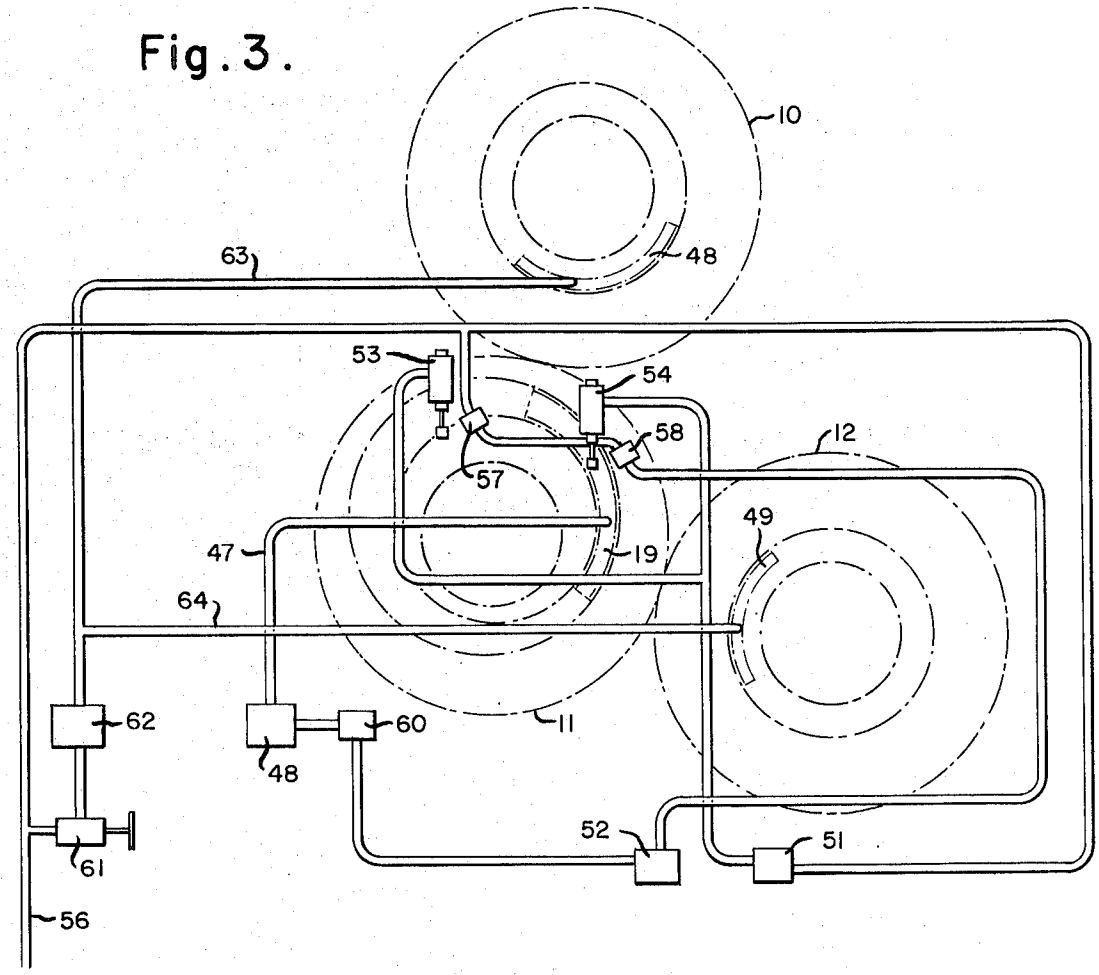
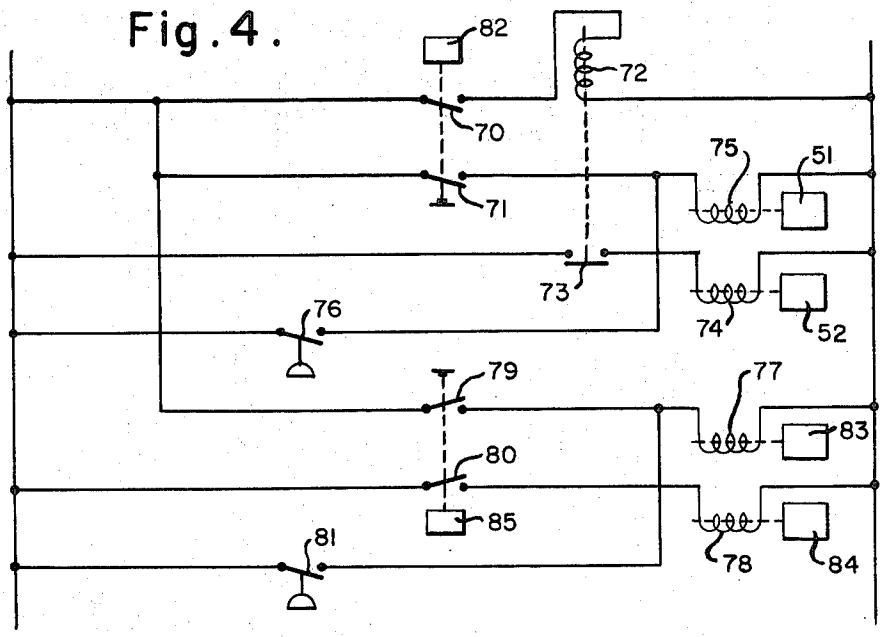

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51
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Fig. 4.


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PRINTING PRESS CYLINDER SUPPORT AND CONTROL

SUMMARY OF THE INVENTION

An offset-type printing press is provided with a plate cylinder, an impression cylinder, and a resilient blanket cylinder which cooperates with both the plate cylinder and the impression cylinder during printing operation and which is disengaged from both cylinders by tripping action during non-printing operation of the press. The blanket cylinder is tripped relative to the plate and impression cylinders by the rotation of eccentric bushings which support the blanket cylinder bearings and bearing housings on the press frame. The bearing housings incorporated in the press for the plate and impression cylinders, and also the blanket cylinder eccentric bushings, are each provided with radially expandible hydraulic pad means to provide position rigidity during printing operations. The printing press is provided with control means responsive to the absence of substrate material to be printed on. Such control means regulates hydraulic pressure applied to the eccentric bushing hydraulic pads prior to tripping of the press blanket cylinder.

DESCRIPTION OF DRAWINGS

FIG. 1 is a schematic elevation, partially in section, of the plate, blanket, and impression cylinders of an offset press embodying the invention;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a diagram of the pneumatic and hydraulic control system associated with the plate, blanket, and impression cylinder combination of FIG. 1; and

FIG. 4 is a schematic diagram of the electrical control system for the invention.

DETAILED DESCRIPTION

With reference now to the drawings and particularly FIGS. 1 and 2, there is illustrated the plate cylinder **10**, blanket cylinder **11**, and impression cylinder **12** of an offset printing press. The journal **10a** of the plate cylinder **10** is mounted for rotation about a fixed axis in bearing housing **13** located in bores provided therefore in the main printing press frame **15** and it has a longitudinal gap **14** in its peripheral surface to accommodate conventional plate clamping devices.

The journal **12*a*** of the impression cylinder **12** also is mounted for rotation about a fixed axis in bearing housing **16** located in bores in the main printing press frame **15** and it has a longitudinal gap **17** to accommodate grippers for engaging the leading edge of a sheet and carrying it through the nip with the blanket cylinder to receive an impression.

As distingushed from the plate and impression cylinders, the blanket cylinder **11** of FIG. 1 must be movable relative to the plate and impression cylinders to and from a printing position wherein it is in peripheral contact with said cylinders and a tripped position wherein it is spaced from said cylinders. For this reason, the journals **11*a*** of the blanket cylinder **11** is journalled for rotation in the main frame **15** by means of a pair of nested eccentrics **18** and **19** in bushing form which are adapted to be rotated in response to sheet sensing means to thereby move the blanket cylinder between its printing and tripped positions. Eccentric **18** also is essentially a bearing housing for the bearings (**36**, FIG. 2) which support blanket cylinder **11**.

A mechanism for activating the eccentrics has not been shown. It will suffice to known that it is essentially the same as the mechanisms illustrated in U.S. Pat. Nos. 2,635,539 and 2,653,537 and that it includes similar auxiliary pawls and coacting dogs that are instrumental in imparting independent rotary motion to the respective shafts **21** and **22**. The shaft **21** has a lever **23** which is connected by means of the link **24** to a bracket **26** mounted on and secured to the inner eccentric **18**. Shaft **22** has a lever **27** which is connected to a bracket **28** on the outer eccentric **19** by means of a connecting rod **29**. Th latter fits loosely in a pivot block **31** and is prevented from axially moving relative to the block by means of thumb nuts **33** which are adjustable to control the pressure between blanket cylinder **11** and the plate cylinder **10**. Equivalent means, not shown, are provided for adjusting the inner eccentric **18** whereby to adjust the blanket cylinder relative to the impression cylinder in the printing position to accommodate different thicknesses of stock to be printed.

The blanket cylinder **11** is also provided with a gap **34** to accommodate clamp means for securing a blanket in position about its peripheral surface.

In operation the respective cylinders are rotated in unison in the direction indicated by the arrows in FIG. **1**, by intermeshing gears on their respective journals whereby the inked image on the plate carried by the plate cylinder **10** will be transferred to the surface of the resilient blanket on the blanket cylinder **11** from whence it is offset onto sheets carried by the impression cylinder **12**. While the respective printing surfaces are in contact there is substantial pressure exerted upon the respective cylinders in order to transfer the ink image from the plate to the blanket and thence to the sheet. As the respective gaps coincide at the nips, however, the pressure is suddenly relieved and the sudden application and relief of pressure induces vibrations in the respective cylinders which adversely affects the printed products.

The plate and blanket cylinders **10** and **11** normally are provided with coacting bearers (not shown) at each end thereof which are preloaded against each other while printing and this bearer to bearer contact tends to stabilize these cylinders. Bearer to bearer contact cannot be maintained between the blanket and impression cylinders **11** and **12**, however, since the blanket cylinder **11** must be adjustable relative to the impression cylinder **12** to accommodate different thicknesses of paper and therefore the sudden pressure changes which occur as the gaps **17** and **34** coincide will cause these cylinders to vibrate and/or move relative to one another such that the printed product is adversely affected. Any looseness or play in the bearings or housings which support the cylinders obviously will aggravate the condition.

In order to eliminate all looseness or play in the cylinder journalling means, the blanket cylinder is journalled for rotation in the inner eccentric **18** by means of tapered roller bearings **36**, see FIG. **2**, which can be preloaded axially in part by means of the bearing retainer **37** to remove all end play. The inner eccentric **18** is in turn rotatably mounted within the outer eccentric **19** in surface to surface contact and fluid pressure means or hydraulic pads are provided on the outer eccentric for removing all clearances between the respec-

tive eccentrics and between the outer eccentric and the bore in the main frame while the press is in operation.

As shown in dotted lines in FIG. 1 and in solid lines in FIG. 2, an arcuate segment of the outer eccentric 19 is provided with a radial slot 38 which connects with circumferential grooves 39 and 40 formed in the peripheral outer and inner surfaces of the eccentric. The grooves in turn are covered by arcuate, relatively thin steel plates 41 and 42 which are welded to the eccentric to thereby form leakproof pressure chambers 43 and 44 adjacent the inner eccentric and the bore in the frame. The chambers are connected to a source of hydraulic fluid through an opening 46 and tubing 47 as will be explained hereinafter.

It will be appreciated that in its normal, relaxed state, the outer surfaces of the steel plates 41 and 42 will be precisely coincident with the normal radii of the eccentric surfaces and thus the eccentric will readily fit into the bore in the main printing press frame. When an elevated hydraulic pressure is applied to the chambers 43 and 44, however, the plates 41–42 will bow radially from their welded edges thereby taking up all clearance between the coacting members and actually preloading the assembly against the force of impression.

Although the detailed structure has not been disclosed, it is preferred that the plate and impression cylinders be journalled in a manner similar to the blanket cylinder 11. In other words cylinders 10 and 12 are preferably rotatably supported by preloadable tapered roller bearings mounted in the respective bearing housings 13 and 16 and such bearing housings are provided with hydraulic pads 48 and 49 respectively which may be located in positions as indicated in FIG. 1 and which have a construction similar to the construction of the hydraulic pad means comprised of internal, arcuate, radial slot 38 and cover plate 41 cooperating with opening 46 and hydraulic line 47.

As previously stated, the blanket cylinder 11 must be tripped to and from the coacting impression and plate cylinders 12 and 10 in the event of a missing or misregistered sheet and thus the pressure on the hydraulic pads must be controlled in timed sequence with the tripping mechanism which actuates shafts 21 and 22 so that the eccentrics 18 and 19 are free to rotate when required. The control system, which includes a plurality of control elements for accomplishing this function is illustrated in FIGS. 3 and 4 wherein the hydraulic pressure supplied to the chambers 43 and 44 is controlled by the hydraulic pressure in the output line 47 leading from a hydraulic intensifier 48.

At the start of the printing run, the operator actuates a pressure lever to close switches 70 and 71 (FIG. 4). The closing of switch 70 energizes a relay coil 72 thereby closing contacts 73 to energize solenoid 74. The closing of switch 71 energizes a solenoid 75 at the same time. The energization of solenoids 74 and 75 opens first and second control elements in the form of two corresponding solenoid operated air valves 51 and 52, respectively, (FIG. 3), with valve 51 supplying air from pressurized air source 56 to two conventional spring-return air actuators 53 and 54 which control the mechanism for tripping the blanket cylinder toward and/or away from the plate and impression cylinders 10 and 12. Although the air valve 52 is opened at the same time, pressurized air does not pass from source 56 through this valve because it is blocked by a preceding third control element in the form of normally closed air spool valves 57 and 58. These valves are actuated (opened) by movement of activating levers (not shown) only when blanket cylinder 11 is in its printing position relative to cylinders 10 and 12. As the press is tripped "on," i.e., the blanket cylinder is moved to its printing position relative to the plate and impression cylinders 10 and 12 in response to the opening of the valve 51, the movement of the trip mechanism levers (not shown) to their "on" position, causes the mechanical air spool valves 57 and 58 to open and to supply air from source 56 to the previously opened valve 52 and on through the hereinafter explained exhaust valve 60 to the intensifier 48 thereby producing intensified hydraulic pressure in the hydraulic output line 47 for pressurizing the hydraulic chambers 43 and 44. The air pressure in the line leading from valve 52 to the hydraulic intensifer 48 may be house air at a pressure of about 80 to 90 p.s.i. which is transformed by the intensifier to hydraulic pressure of about 800 to 900 p.s.i. in the line 47. This pressure obviously may be regulated to produce the pressure desired in the chambers 43 and 44 to effectively stablize the eccentrics 18 and 19. As the pressure builds up in the chambers, a fourth, pressure responsive control element in the form of a pressure switch 76 closes in response to the pressure change in the output line 47, for a purpose to be explained later.

Further in accordance with the invention, the hydraulic pads of eccentric 19 and of bearing housings 13 and 16 are adapted to be de-actuated in response to the detection of a misregistered sheet or the absence of a sheet to be printed. Thus, if conventional sheet detecting means 82 on the register table of the printing press, for example, senses the absence of a sheet or the presence of a misregistered sheet at a specific time in the cycle of operation, it will open switch 70 and also switch 71 which is mechanically coupled to the switch 70. When switch 70 is opened, the relay coil 72 is de-energized to open contacts 73 and thereby de-energize solenoid 74. This closes the solenoid operated air valve 52 so as to cut off the supply of pressurized air to the dump valve 60 and intensifier 48 whereupon the pressure in line 47 is rapidly reduced. As the pressure in line 47 is reduced, the hydraulic pad in eccentric 19 having covers 41 and 42 is deactivated so that the eccentrics 18 and 19 are both freed for movement.

When the switch 71 is simultaneously opened in response to the detection of a "no sheet" or misregistered sheet condition by means 82 on the register table, the solenoid 75 remains energized through the closed pressure switch 76. Consequently, the solenoid-operated air valve 51 remains open until the pressure switch 76 is opened in response to a reduction in the pressure in the output line 47 from the intensifier 48, following the closing of valve 52. When pressure switch 76 is opened, the solenoid 75 is de-energized so as to close the valve 51 and thereby cut off air pressure to the spring-biased trip actuating cylinders 53 and 54. These cylinders are spring biased so that automatically actuate attached trip dog levers which, in turn, cause shafts 21 and 22 to be rotated and the blanket cylinder 11 to be tripped to an "off" condition of disengagement from cylinders 10 and 12 when the valve 51 is closed. Thus, it can be seen that the de-energization of solenoid 75 is delayed for a short interval following de-energization of solenoid 74 so that the blanket cylinder 11 is not tripped "off" until the pressure of the hydraulic pad restricting

movement of eccentrics 18 and 19 relative to each other is relieved. When the blanket cylinder 11 is tripped "off," the trip dog levers also move away from the spool valves 57 and 58 to allow these valves to return to their normally closed conditions.

In the electrical portion of the control system illustrated in FIG. 4, a second pair of solenoids 77 and 78 are shown for controlling the trip actuating cylinders and hydraulic pads of a subsequent or "down-stream" unit of a multicolor printing press incorporating the present invention therein also. These solenoids operate air valves 83 and 84 which function in the same manner as the valves 51 and 52 described above and shown in FIG. 3. However, the energization of the solenoids 77 and 78 is controlled by a pair of switches 79 and 80, respectively, which are adapted to be actuated by a conventional sheet detector 85 which may be located on a transfer cylinder or other mechanism which is employed to transfer sheets between units of a multicolor press. Consequently, as the first sheet passes through the first unit having control elements 70 through 76 its presence is detected by the sheet detector 85 for the next succeeding unit which causes switches 79 and 80 to close in the manner of manually closing switches 70 and 71 at the start of the printing run for the first unit. This energizes the solenoids 77 and 78 to trip "on" the blanket cylinder of the subsequent multicolor unit at the proper time in the cycle and in the same manner described above for the first unit, closing switch 81 in the process.

When the absence of a sheet is detected by the sheet detectors 85, the switches 79 and 80 are opened to de-energize the solenoids 77 and 78 and thereby deactivate the hydraulic pads associated with the movable eccentrics of the second ("down-stream") press unit. As the hydraulic pads are deactivated, the pressure switch 81 is opened, thereby actuating the tripping mechanism (valve 83) which causes the blanket cylinder of the subsequent multicolor unit to trip "off" in the same manner described above for the actuators 53 and 54 of the first unit. If three or more units are involved in the press, each additional "down-stream" unit is provided with switches, solenoids and valves corresponding to the switches 79, 80, 81, 83 and 84 responsive to similar sheet transfer detectors.

As can be seen from the foregoing detailed description the invention provides hydraulic pressure pads for taking up all clearances in the blanket cylinder eccentrics and for preloading the eccentrics against the force of impression at all times during normal operation. Moreover, the pads are arranged to be energized and de-energized in sequence with the blanket cylinder trip mechanism so that they do not interfere with nor complicate normal tripping of the blanket cylinder.

As previously mentioned, hydraulic pads 48 and 49 are provided for preloading the bearing housings 13 and 16 for the plate and impression cylinders 10 and 12 respectively, against the force of impression. These pads may be constructed similar to those on the blanket cylinder eccentric 19 except that normally only one pad on the outer periphery of each bearing housing is required. Also, because the plate and impression cylinders 10 and 12 are not required to be "tripped" during operation of the press, the hydraulic pads 48 and 49 are not associated with the blanket cylinder trip mechanism and are adapted to be energized independently of the pads 41 and 42.

As illustrated in FIG. 3, house air from the source line 56 is directed through a valve 61 to an intensifier 62 which utilizes an air pressure of 80 to 90 p.s.i., for example, to increase the hydraulic pressure in the lines 63 and 64 leading to the respective hydraulic pads 48 and 49 to about 800 to 900 p.s.i. Consequently, at all times when the printing press is in operation, the pads 48 and 49 are normally energized to preload the housings 13 and 16 against the frame. However, when the press is shut down or when adjustments of the plate and/or impression cylinder are to be effected, the valve 61 can be closed either automatically or manually to shut off the house air and open the intermediate line to intensifier 62 to atmosphere thereby de-activating the intensifier 62 and relieving the hydraulic pressure of the pads 48 and 49.

I claim:

1. In a printing press, in combination,
a main frame,
cooperable plate, blanket and impression cylinders each having journals,
bushing means supported for rotation in said main frame and eccentrically supporting said blanket cylinder journals,
trip mechanism connected to said bushing means and selectively operable to rotate said bushing means and thereby move said blanket cylinder to and from a printing position relative to said impression cylinder,
radially expandable pad means in said bushing means for circumferentially restraining and radially, compressively stressing said bushings relative to said main frame when activated by an elevated fluid pressure,
fluid containing circuit means connected to said pad means in fluid pressure conducting relation,
intensifier means connected to said fluid circuit means and adapted when activated to generate an elevated fluid pressure in said fluid circuit means,
sheet detector means adapted to produce an output signal indicative of the presence or absence of a sheet to be printed,
and control means responsive to said sheet detector means for activating said trip mechanism and said expandable pad means in reverse sequence upon the detection of the presence or absence, respectively, of a sheet to be printed,
said control means including a first control element normally responsive to a signal from said detector means for activating said trip mechanism,
a second control element normally responsive to a signal from said detector means for simultaneously activating said intensifier means,
a third, normally closed control element connected between said trip mechanism and said second control element and operable upon detection of the presence of a sheet to prevent activation of said intensifier means by said second control element until said trip mechanism has moved the blanket cylinder to its printing position,
and a fourth, pressure responsive control element connected between said fluid circuit means and said first control element and operable when detection of the absence of a sheet to prevent said first control element from activating said trip mechanism to move said blanket cylinder from its printing position until said intensifier means is deactivated

and the elevated pressure in said fluid circuit means is relieved.

2. The printing press defined in claim 1 wherein said bushing means is comprised of a first bushing member supported for rotation in said main frame and of a second bushing member supported for rotation in said first bushing member, said bushing members eccentrically supporting said blanket cylinder journals with respect to said plate and impression cylinders, said pad means being in one of said bushing members and additionally circumferentially restraining and radially, compressively stressing the other of said bushing members relative to said main frame when said control mans activates said intensifier means to generate an elevated fluid pressure in said circuit means and expand said pad means.

* * * * *