ABSTRACT

The blanket cylinder of an offset printing press is provided with a bearer at each end thereof, each of which is mounted on an adjustable eccentric ring for movement radially relative to the blanket cylinder so that positive contact will be maintained with coacting bearers on the impression cylinder when the spacing between said cylinders is varied to accommodate changes in the thickness of the stock to be printed. Pneumatic cylinders are provided for adjusting the angular position of the eccentric rings to thereby shift the radial position of the blanket cylinder bearers, and control means activate and deactivate the pneumatic cylinders in timed relation with the tripping motions of the blanket cylinder between printing and non-printing positions.

7 Claims, 5 Drawing Figures
BEARER ARRANGEMENT FOR OFFSET PRINTING PRESS

DESCRIPTION OF THE INVENTION

The present invention relates generally to offset printing presses and, more particularly, to an improved bearer arrangement for offset printing presses.

An offset printing press comprises a plate cylinder and an impression cylinder mounted for rotation about fixed axes and an intermediate blanket cylinder mounted for rotation about a movable axis so that it can be tripped to and from and also adjusted pressure-wise relative to the plate and impression cylinders to obtain the necessary pressure or squeeze between the respective surfaces for printing.

Each of these cylinders has a gap in its peripheral surface to accommodate plate and blanket clamp means or grippers for conveying sheets through the nip between the blanket and impression cylinders. These gaps create a problem in that as they pass adjacent one another there is no contact between the printing surfaces and thus there is a sudden relief of pressure. As the trailing edges of the gaps come together again there is a sudden increase in pressure and this intermittent pressure relationship causes vibrations and/or relative movement between the cylinders, thereby producing imperfections in the printed product which are referred to as "pressure streaks".

The plate and blanket cylinders normally are provided with bearers at each end thereof and the respective printing surfaces of said cylinders are maintained at a level relative to the bearers such that proper impression pressure is obtained when the coating bearers are in contact. This bearer-to-bearer contact serves to stabilize the plate and blanket cylinders as their gaps pass so that the sudden release and application of pressure has substantially no deleterious effect. It is difficult, however, to provide this bearer-to-bearer contact between the blanket and impression cylinders since the blanket cylinder must be adjustable relative to the impression cylinder to accommodate various thicknesses of the stock to be printed.

There have been numerous attempts to compensate or eliminate this condition, but most of these attempts have been only partially successful. In most known attempts to solve this problem, the corrective means have been applied to the cylinder journal housings and/or bearings for the purpose of taking up all looseness or play therein and this has helped to reduce the vibrations (e.g., see Sibree U.S. Patent No. 2,986,086). In other instances, the corrective means have been applied to the cylinder journals between the frames and the cylinder body and here again some improvement was gained (e.g., see Sarke U.S. Patent No. 3,326,439).

However, in all of these cases the stabilizing means are applied near the ends of the cylinders and, therefore, they do not compensate for deflection of the cylinder body, and they severely complicate or completely preclude tripping the blanket cylinder and from its printing position. In Steuer U.S. Patent No. 2,598,726, a structure is described for providing bearers between blanket and impression cylinders, but that structure uses a resilient biasing element which detracts from the rigidity of the bearer arrangement, and which limits the range of adjustability.

It is a primary object of the present invention to provide an improved bearer arrangement for offset printing presses which maintains positive bearer-to-bearer contact between the blanket and impression cylinders under all circumstances, and yet does not interfere with, nor complicate, normal tripping of the blanket cylinder.

It is a further object of the invention to provide such an improved bearer arrangement which is fully automatic and self-compensating in that it adjusts the bearers automatically in response to relative movements of the corresponding press cylinders.

Another object of the invention is to provide such an improved bearer arrangement that is simple and economical to manufacture and maintain.

Still another object of the invention is to provide such an improved bearer arrangement which is readily adaptable to synchronization with the tripping mechanism.

Other objects and advantages of the invention will be apparent from the following detailed description and upon reference to the accompanying drawings in which:

FIG. 1 is an end elevation of the plate, blanket, and impression cylinders of an offset printing press embodying the invention;

FIG. 2 is an enlarged end elevation of the bearer arrangement associated with the blanket cylinder shown in FIG. 1;

FIG. 3 is a partial section taken along the line 3--3 in FIG. 2;

FIG. 4 is a diagram of the pneumatic control system associated with the plate and impression cylinders and their bearers in the press of FIG. 1; and

FIG. 5 is a schematic diagram of the electrical control system associated with the blanket and impression cylinders and their bearers in the press of FIG. 1.

While the invention will be described in connection with certain preferred embodiments, it will be understood that it is not intended to limit the invention to these particular embodiments. On the contrary, it is intended to cover all alternatives, modifications and equivalent arrangements as may be included within the spirit and scope of the invention.

Turning now to the drawings, and referring first to FIG. 1, there are shown the conventional impression cylinder 10, blanket cylinder 11, and plate cylinder 12 of an offset printing press. The impression cylinder 10 and the plate cylinder 12 are mounted for rotation about fixed axis, while the intermediate blanket cylinder 11 is mounted for rotation about an axis that is movable with respect to the axes of the impression and plate cylinders 10 and 12, thereby enabling movement or "tripping" of the blanket cylinder 11 toward and away from the impression and plate cylinders 10 and 12 and also adjustment of the pressure between the cooperating cylinders. The journaling means for the blanket cylinder has not been shown since it forms no part of the present invention, but it may comprise means as shown in U.S. Patent No. 2,568,761.

As mentioned previously, the cylinders 10, 11 and 12 have longitudinal gaps in the surfaces thereof to accommodate clamp means or grippers, and these gaps may cause pressure streaks in the printed product due to pressure variations caused by the gaps as they pass the opposing rolls.
To eliminate or at least minimize these pressure variations, it is the practice to provide a bearer at each end of each cylinder for cooperation with a corresponding bearer mounted at the ends of each coating cylinder. These bearers have continuous peripheral surfaces, without any gaps, and as regards the plate and blanket cylinders, they ride continuously on each other so as to provide a continuous support for said cylinders at both ends thereof.

Although the impression cylinder also is normally provided with bearers at each end thereof, it has been impossible heretofore to maintain them in contact with the blanket cylinder bearers because the blanket and impression cylinders must be spaced apart in accordance with the thickness of the stock to be printed. Thus, as the gaps in these cylinders coincide on each revolution, the resultant pressure changes cause vibrations and pressure streaks in the printed product.

To compensate for this condition, the present invention contemplates the provision of a pair of bearers 13 and 13a, see FIG. 3, at each end of the blanket cylinder for cooperation with the coating bearers on the impression and plate cylinders, respectively.

In accordance with the present invention, adjustable eccentric means are provided for mounting the bearers 13 at each end of the blanket cylinder so that said bearers can be shifted laterally with respect to the axis of the blanket cylinder to maintain contact with the impression cylinder bearers upon radial displacement of the blanket and impression cylinders relative to each other. Thus, in the illustrative arrangement each blanket cylinder bearer 13, which cooperates with an impression cylinder bearer not shown, is rotatorily mounted on an eccentric adjusting annulus or ring 14 journalled on the hub of the blanket cylinder 11. More specifically, the eccentric adjusting ring 14 is mounted on a roller bearing assembly 16 on the cylinder hub 15, and the bearer 13 is mounted on a roller bearing assembly 17 on the outer periphery of the ring 14. The inner periphery of the ring 14 is concentric with the blanket cylinder 11, but the outer periphery of the ring 14 is eccentric thereto. The axis of the eccentric outer periphery is located with respect to the blanket cylinder axis such that when the ring 14 is moved in the circumferential direction, the eccentric outer periphery thereof moves the bearer 13 laterally or radially in a direction toward or away from the cooperating impression cylinder bearer. As a result, the cooperating bearers on the blanket and impression cylinders can be maintained in firm engagement with each other as the distance between the axes of the two cylinders is adjusted to accommodate various thicknesses of the stock to be printed.

To effect angular or circumferential movement of the eccentric adjusting ring 14, and to thereby effect lateral or radial displacement of the bearer 13, an arm 18 integral with the ring 14 extends laterally therefrom for connection to a pneumatic cylinder 19. When the pneumatic cylinder 19 is actuated, the eccentric ring 14 is rotated to adjust the radial position of the bearer 13 mounted thereon. More particularly, when the pneumatic cylinder is advanced to rotate the eccentric ring 14 in the counterclockwise direction as viewed in FIGS. 1 and 2, the bearer 13 is displaced toward the impression cylinder. Conversely, when the pneumatic cylinder 19 is retracted to move the eccentric ring 14 in the clockwise direction, the bearer 13 is displaced radially away from the impression cylinder. It will be appreciated that the pneumatic cylinder 19 not only provides a means of effecting angular movement of the eccentric ring 14, but also applies a continuous biasing force on the ring 14 so as to maintain any desired preseleced pressure between the blanket cylinder bearer 13 and the cooperating impression cylinder bearer.

In accordance with a further aspect of the present invention, the eccentric adjusting means for 6-cylinder bearers are actuated in timed the tripping of the blanket cylinder toward and/or away from the impression cylinder. Thus, in the illustrative control 6n FIGS. 4 and 5, the pressure supplied to the actuating cylinder 19 is controlled by the pressure in an output line 36 from an intensifier 40 (FIG. 4). When printing is to start, the operator actuates a pressure handle to close switches SW1 and SW2 (FIG. 5). The closing of switch SW1 energizes a relay coil CR1 thereby closing contacts CR1z to energize solenoid S1, while the closing of switch SW2 energizes solenoid S2 at the same time. The energization of solenoids S1 and S2 opens the two corresponding solenoid-operated air valves 41 and 42 (FIG. 4), with valve 41 supplying air to two conventional trip cylinders 43 and 44 which control conventional mechanism for tripping of the blanket cylinder toward or away from the impression cylinder. Although the air valve 42 is opened at the same time, air does not pass through this valve because the air supplied thereto from the source 35 is stopped by normally closed spool valves 45 and 46 which are adapted to be actuated by movement of levers, not shown, forming part of the blanket mechanism. As the press is tripped "on", i.e., the blanket cylinder is moved to its printing position relative to the plate and impression cylinders, in response to the opening of valve 41, the movement of the trip mechanism levers to their on positions, causes the mechanical spool valves 45 and 46 to open and to supply air to the previously opened valve 42 and on through valve 42 to the intensifier 40, thereby producing pressure in the output line 36 for energizing the pneumatic actuating cylinder 19 to move the blanket cylinder bearer 13 into engagement with the cooperating impression cylinder bearer. As mentioned previously, the cylinder 19 also maintains a biasing force on the eccentric ring 14 so as to maintain the requisite pressure between the blanket and impression cylinder bearers to stabilize these cylinders while in operation. The purpose of the intensifier 40 is to raise the house air pressure from the source 35, typically 80 to 90 psi, to an increased pressure, typically settling to 900 psi, which of course can be regulated to provide the desired force on the eccentric ring 14. As the cylinder 19 is energized, a pressure switch PS1 closes in response to the pressure change in the output line 36 from the intensifier 40, for a purpose to be described below. It will thus be evident that when the blanket cylinder goes on impression it will reach its operational, printing position before the cylinder 19 is energized to shift the bearers into contact.

In accordance with still another particular aspect of the invention, the actuating cylinder 19 is de-energized in response to the detection of the absence of a sheet to be printed. Thus, if a conventional sheet detector on the register table of the press, for example, senses the absence of a sheet at a specific time in the cycle of operation it will open the switch SW2, thereby also opening switch SW1 i.e. is mechanically coupled to switch
SW2. When switch SW1 is opened, the relay coil CR1 is de-energized to open contacts CR1a and thereby de-energize solenoid S1. This closes the solenoid operated air valve 42 so as to cut off the supply of air pressure to the intensifier 40 whereupon the pressure in line 36 is rapidly exhausted through i.e. quick exhaust valve 47. As the pressure in line 36 is reduced, the actuating cylinder 19 is de-energized to remove the pressure from the eccentric ring 14, and thus from the bearer 13.

When the switch SW2 is opened in response to the detection of a "no sheet" condition on the register table, the solenoid S2 remains energized through the closed pressure switch PS1. Consequently, the solenoid-operated air valve 41 remains open until the pressure switch PS1 is opened in response to a reduction in the pressure in the output line 36 from intensifier 40, following the closing of valve 42. When pressure switch PS1 is opened, the solenoid estension is de-energized so as to close the valve 41 and thereby cut off air pressure to the trip cylinders 43 and 44. These trip cylinders 43 and 44 are spring biased so that they automatically move attached trip dog levers which, in turn, cause the blanket cylinder to trip "off" when the valve 41 is closed. Thus, it can be seen that the de-energization of solenoid S2 is delayed for a short interval following the de-energization of solenoid S1 so that the blanket cylinder is not tripped off until the biasing effect of the actuating cylinders 19 is removed from the blanket cylinder bearers. When the blanket cylinder is tripped off, the trip dog levers also move away from the spool valves 45 and 46 to allow these valves to return to their normally closed positions.

In the electrical portion of the control system illustrated in FIG. 5, a second pair of solenoids S3 and S4 are shown for controlling the trip actuating cylinders and bearer actuating cylinders of a subsequent multicolor unit. These solenoids S3 and S4 control a pair of solenoid operated air valves which function in the same manner as the valves 41 and 42 described above and shown in FIG. 4. However, the energization of the solenoids S3 and S4 is controlled by a pair of switches SW3 and SW4 which are adapted to be actuated by sheet detectors which may be located on a transfer cylinder or other mechanism which is employed to transfer sheets between units of a multi-color press. Consequently, as the first sheet passes through the first unit, its presence is detected by the sheet detectors for the next succeeding unit which cause the switches SW3 and SW4 to close. This energizes the solenoids S3 and S4 to trip on the blanket cylinder of the subsequent multi-color unit in the same manner described above for the first unit, closing switch PS2 in the process. When the absence of a sheet is detected by the sheet detectors the switches SW3 and SW4 are opened to de-energize the solenoids S3 and thereby de-energize the pneumatic cylinders associated with the blanket cylinder bearers. As the pneumatic cylinders are de-energized, the pressure switch PS2 is opened, thereby tripping off the blanket cylinder of the subsequent multi-color unit in the same manner described above for the first unit. If three or more units are involved in the press, each unit is provided with its own sheet detectors and switches and solenoids corresponding to the switches SW3, SW4, PS2 and solenoids S3, S4.

As an alternative to the control system of FIGS. 4 and 5, the pneumatic cylinder 19 may be actuated continu-ouslly while the press is in operation, regardless of whether the blanket cylinder is tripped on or off. In this case, a stop is provided to limit the throw of the cylinder 19 when the blanket cylinder is tripped off, then upon return of the blanket cylinder to the impression position it overcomes the pressure of the pneumatic cylinder 19 and shifts the eccentric ring 14 back to its normal operating position.

As can be seen from the foregoing detailed description, this invention provides an improved bearer arrangement which maintains positive bearer-to-bearing contact between the blanket and impression cylinders under all circumstances, and yet does not interfere with, nor complicate, normal tripping of the blanket cylinder. This improved bearer arrangement is fully automatic and self-compensating in that it adjusts the bearers automatically in response to relative movements of the corresponding press cylinders. Furthermore, the bearers can be pre-loaded to any desired degree without any fatigue problems. This improved bearer arrangement is simple and economical to manufacture and maintain, and is readily adaptable to synchronization with the tripping mechanism. It also will be readily apparent that although the adjustable levers have been illustrated herein as being mounted on the blanket cylinder, they could be mounted on the impression cylinder without necessitating any change in the actuating or control means.

I claim as my invention:

1. In an offset printing press, the combination of a blanket cylinder and a cooperating impression cylinder having parallel axes and mounted for adjustment of the distance between said parallel axes, cooperating non-resilient bearers mounted on said cylinders at opposite ends thereof, adjustable eccentric means mounting the bearers on one of said cylinders for displacement laterally relative to the axis of said one cylinder so as to move said bearers on said one cylinder into engagement with the bearers on the other of said cylinders under a predetermined pressure.

2. In an offset printing press, the combination of claim 1 in which the bearers displaced by said eccentric adjusting means are journalled on said eccentric adjusting means.

3. In an offset printing press, the combination of claim 1 in which said eccentric adjusting means comprises a pneumatic cylinder.

4. In an offset printing press, the combination of claim 1 further comprising tripping actuator means for adjusting the distance between the parallel axes of said cylinders, said tripping actuator means actuating said biasing means in response to movement of one of said cylinders toward the other of said cylinders.

5. In an offset printing press, the combination of claim 1 further comprising control means responsive to the presence or absence of a sheet to be printed, said control means de-actuating said biasing means in the absence of a sheet to be printed.
7. In an offset printing press, the combination of claim 6 further comprising pressure-sensitive holding relay means operably connected to said biasing means and to said tripping actuator means, said pressure-sensitive holding relay means assuring the sequential actuation of first said biasing means and second said tripping actuator means in response to the detection of the absence of a sheet to be printed by said control means.
CERTIFICATE OF CORRECTION


Inventor(s) Bruno B. Pasquinelli

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, Line 9, delete "6cylinder" and substitute therefor ---the blanket cylinder---.

Line 10, delete "4the" and substitute therefor ---relation to the---.

Line 12, delete "6in" and substitute therefor ---system illustrated in---.

Line 32, delete "6mechanism" and substitute therefor ---cylinder trip mechanism---.

Line 34, delete "(x the" and substitute therefor ---to the---.

Line 50, delete "settling" and substitute ---800---.

Line 67, delete "i.e." and substitute therefor ---which---.

Column 5, Line 6, delete "i.e." and substitute therefor ---a---.

Line 19, delete "estession" and substitute therefor ---S2---.

Line 30, delete "off" and substitute therefor ---"off"---.

Line 59, delete "off" and substitute therefor ---"off"---.

Signed and sealed this 14th day of January 1975.

(SEAL)

Attest:

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Attesting Officer Commissioner of Patents