

[54] **PRINTING PRESS WITH SHEET INSPECTION STATION**

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[22] Filed: Oct. 12, 1971

[21] Appl. No.: 188,195

[52] U.S. Cl. 101/232, 271/64, 101/408

[51] Int. Cl. B41f 21/08, B65h 29/04

[58] Field of Search 271/64, 79, 88; 101/232, 233

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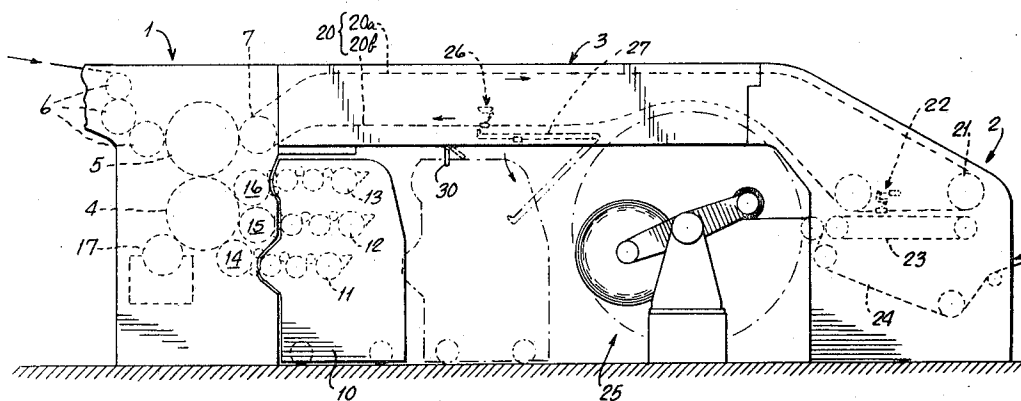
Attorney—Lester W. Clark et al.

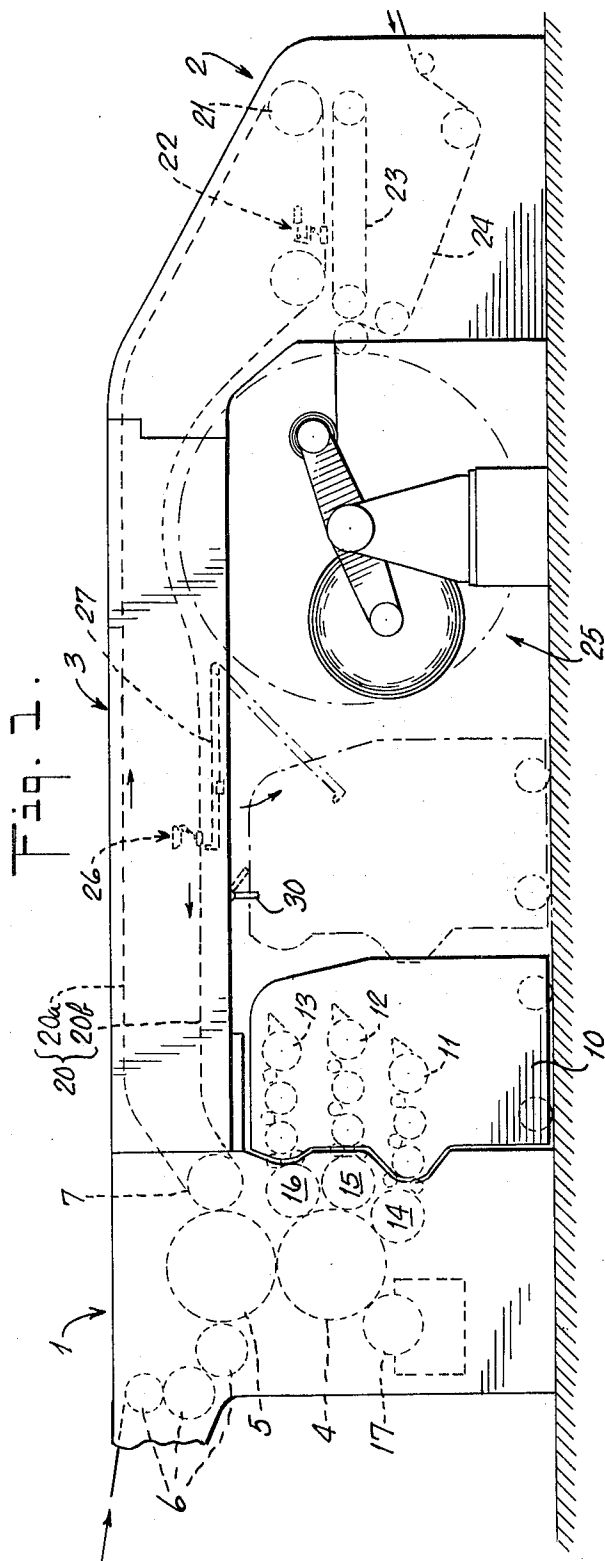
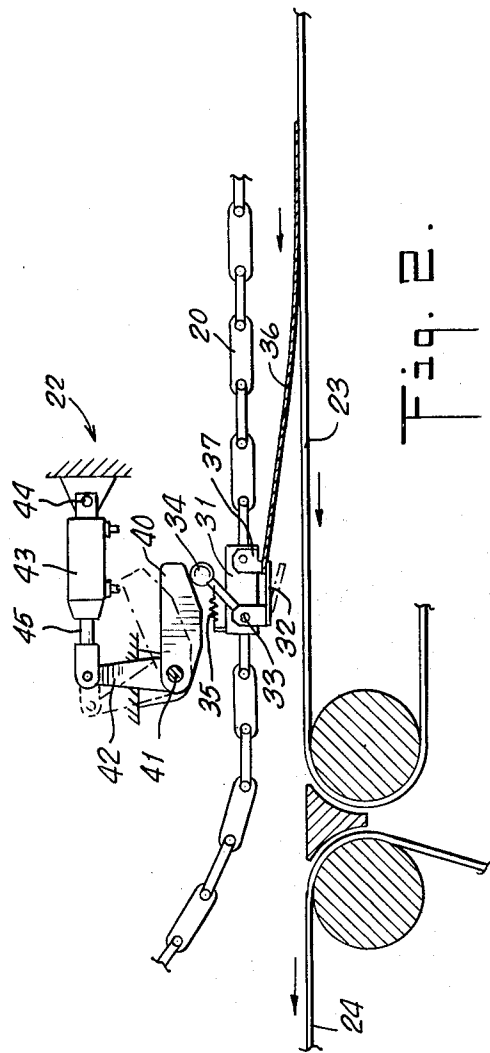
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ABSTRACT

The printing press shown has a printing station which discharges printed sheets above the head of the press operator. An overhead conveyor having spaced grippers picks up sheets discharged at the printing station and carries them to a sheet delivery station, where the grippers engage a gripper release mechanism and the sheets are dropped. The return reach of the conveyor, also above the operator's head, passes an inspection station between the sheet delivery station and the printing station. The gripper release mechanism at the delivery station is retractable to allow a selected sheet to pass the delivery station. At the inspection station, a fixed gripper release is provided which releases all the grippers on the passing conveyor. The inspection station includes a tray located under the conveyor to receive any sheet dropped there. The tray is pivoted along one edge and is movable between a sheet receiving position close to the conveyor, and an inspection position below the conveyor, where the operator may inspect the printed sheet. The tray may be movable by a motor controlled by a photoelectric cell on the tray so that the tray is lowered to the inspection position when a sheet is deposited there and the tray remains in its sheet receiving position when there is no sheet on the tray.

5 Claims, 5 Drawing Figures





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Fig. 3.

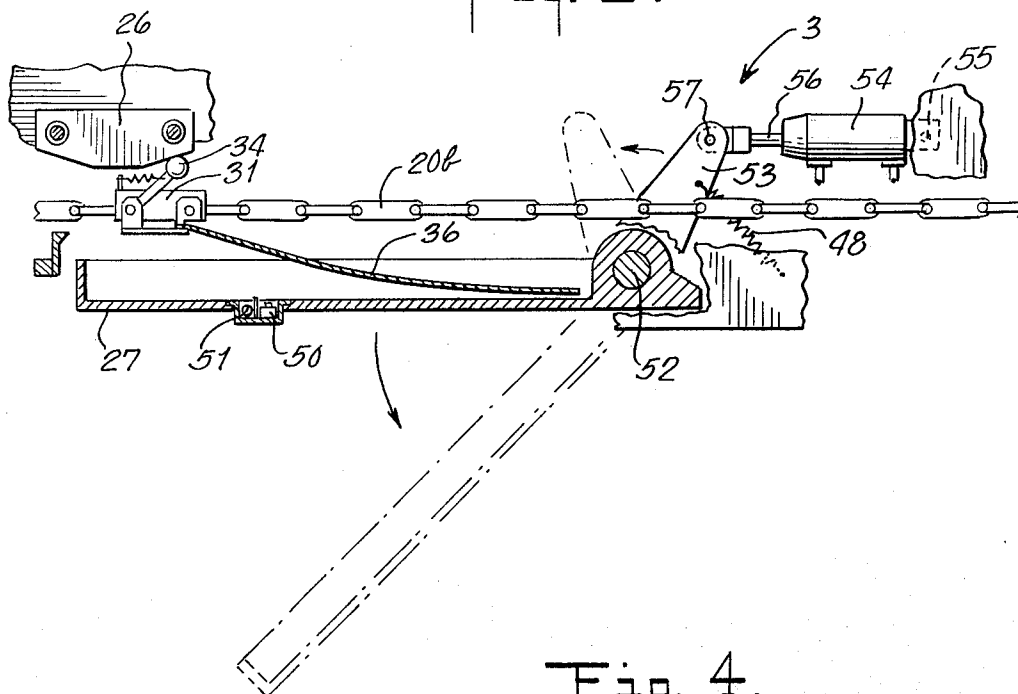
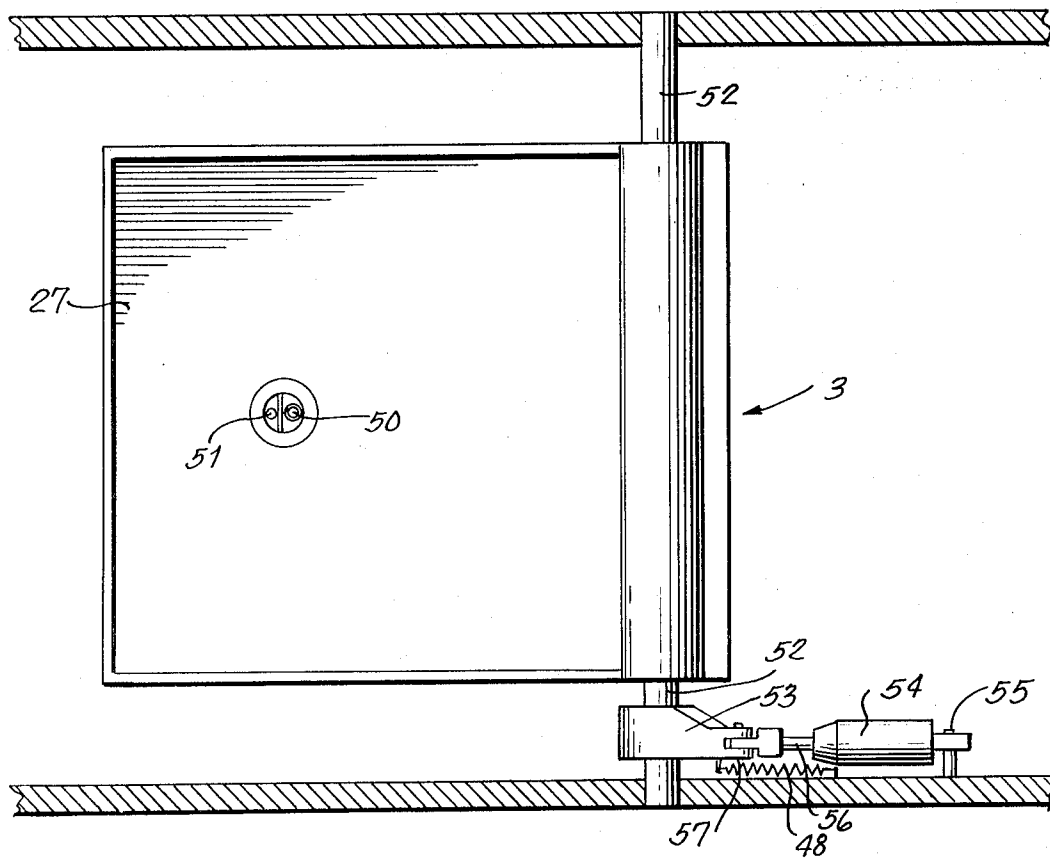
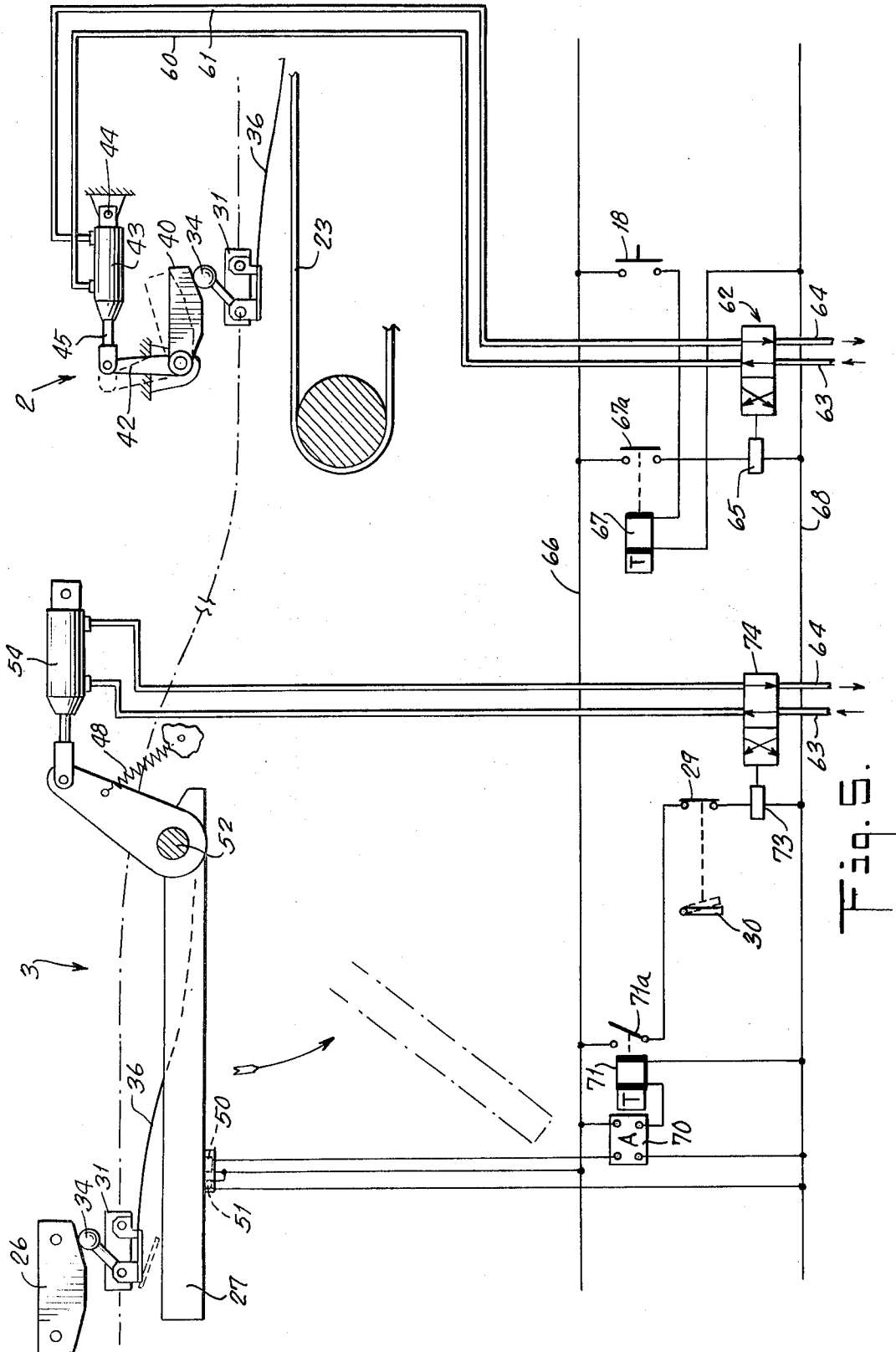


Fig. 4.





PRINTING PRESS WITH SHEET INSPECTION STATION

SUMMARY OF THE INVENTION

The printing press disclosed is of the vertical type, having an intaglio plate cylinder and a pressure cylinder located vertically above the plate cylinder. Sheets are fed at one side of the pressure cylinder and are delivered at the opposite side. The apparatus for inking the plate on the plate cylinder is mounted on a carriage at one side of the printing station. In order to provide for access by the operator to ink supply roller trains, the ink supply carriage is retractable horizontally away from the printing station.

The sheets delivered from the printing station pass on an overhead conveyor to a sheet delivery station. The conveyor includes an upper reach moving away from the printing station and a lower return reach moving toward the printing station. The sheet delivery station is located on the return reach just after the conveyor reverses direction. A sheet inspection station is provided under the return reach of the conveyor between the delivery station and the printing station. The sheet inspection station includes a tray which moves between a sheet receiving position close to the conveyor and an inspection position spaced below the conveyor. In the inspection position, the tray might interfere with the ink supply carriage in its retracted position.

The inspection tray is driven, in one modification, by a motor controlled by a photoelectric cell mounted on the tray and normally effective to keep the tray in a sheet receiving position when there is no sheet on the tray and to move the tray to the inspection position when there is a sheet on the tray. An interlocking control prevents movement of the tray to its inspection position when the ink carriage is retracted.

In another modification, the tray is spring biased to its sheet receiving position and is manually movable to its inspection position.

A manually operated push button control allows the operator to retract the gripper release means at the delivery station so as to allow the next passing gripper to carry its sheet beyond the delivery station and to the inspection station. The gripper release means at the inspection station operates on all passing grippers.

THE DRAWINGS

FIG. 1 is an elevational, somewhat diagrammatic, illustration of a printing press embodying the invention;

FIG. 2 is an enlarged vertical sectional view showing the sheet delivery station;

FIG. 3 is an enlarged vertical sectional view showing the sheet inspection station;

FIG. 4 is a plan view of the inspection tray shown in FIG. 3 and its operating mechanism;

FIG. 5 is a diagrammatic illustration of the controls for the retractable gripper release means at the delivery station and the tray control means at the inspection station.

FIG. 1

This figure is an overall, partly diagrammatic view of a printing press constructed in accordance with the invention, including a printing station 1, a sheet delivery station 2, and an inspection station 3. The printing station includes a plate cylinder 4, a pressure cylinder 5 located vertically above the plate cylinder, sheet supply

means including an array of sheet supply rolls 6, and sheet delivery means including a delivery roll 7.

The press illustrated is a multicolor intaglio press. Ink supply means are provided including a carriage 10 supporting three ink supply trains 11, 12 and 13 terminating at inking rolls 14, 15 and 16 respectively, which cooperate with the plate cylinder 4, and which are journaled in the frame of the press and geared to the plate cylinder 4. An ink wiping mechanism is shown at 17 for removing the surplus ink from the surface of the plate on the cylinder 4. The carriage 10 is movable from its operating position shown in full lines in the drawing to a retracted position shown in dotted lines. When in the retracted position, an operator can stand in the space occupied by the carriage 10 in its operating position and have complete access to the ink supply trains 11, 12 and 13, and the inking rolls 14, 15 and 16.

Sheets are delivered from the sheet delivery roll 7 to a chain conveyor 20, which is located overhead, above the ink supply carriage 10. The conveyor 20 includes an upper reach 20a which moves away from the printing station 1 and a lower return reach 20b which moves back toward the printing station 1. At the end of the upper reach 20a, the conveyor 20 moves around conventional reversing sprockets 21 and thereafter passes a sheet delivery station including gripper release means 22 for engaging sheet grippers 31 (FIG. 2) that are spaced along the conveyor, each of which holds a sheet which it has picked up at the printing station 1. The gripper release means 22 is retractable, as shown in detail below in connection with FIG. 2. Sheets released by the grippers 31 fall onto a deceleration conveyor 23 which slows the sheets and controls their spacing, delivering them to a strip of paraffin coated paper 24 which carries them onto a reel mechanism generally shown at 25, so that the sheets are wound between turns of a roll or coil of the paper 24, for the purpose of allowing the ink to dry.

When the press operator wants to inspect a sheet, he operates a control such as push-button 18 of FIG. 5, to retract the gripper release mechanism 22, so that the next sheet passes the delivery station 2 and is carried on to the inspection station 3 where its gripper is released by a fixed gripper release cam 26. Sheets dropped from the conveyor at the inspection station 3 fall onto an inspection tray 27. The tray 27 is movable between a sheet receiving position shown in full lines in FIG. 3, and an inspection position, shown in dotted lines in FIG. 3, where a sheet thereon may be readily inspected by a press operator standing under the central part of the conveyor 3. Since the tray 27 in its inspection position might interfere with the ink supply carriage 10 in its retracted position, an interlocking control is provided, including a lever 30 engaged and operated by the carriage as it moves to its retracted position. The lever 30 actuates a switch 29, described below in connection with FIG. 5, which prevents the tray 27 from moving away from its sheet receiving position.

FIG. 2

The chain 20 carries at spaced intervals a plurality of grippers 31, of conventional construction and not illustrated in detail. The grippers 31 are actuated as they pass around the sheet delivery roll 7 to engage and carry away each sheet moving away from the impression cylinder 5. Each gripper is shown as having one or

more fingers 32 fixed on a shaft 33 rotatable by means of a lever 34. A spring 35, shown diagrammatically to simplify the drawing, biases the lever 34 to the full line position shown in which the leading margin of the sheet 36 is held between the ends of the fingers 32 and a set of stops 37, corresponding in number to the fingers 32.

As the conveyor 20 with its grippers 31 moves through the sheet delivery station 2, the end of each lever 34 engages a gripper release cam 40, which turns the lever 34 clockwise as viewed in FIG. 2, thereby moving the gripper fingers to the dotted line position and releasing the sheet 36 so that it drops onto the decelerating conveyor 23.

The gripper release cam 40 is fixed on a shaft 41 rotatable by means of a crank arm 42 between the releasing position shown in full lines and a retracted position shown in dotted lines. The crank arm 42 is operated by a hydraulic cylinder 43 pivoted at its right-hand end to a fixed support, as shown at 44. The cylinder 43 operates a piston rod 45 which is pivotally connected to the upper end of the crank arm 42. By controlling the supply of hydraulic fluid to the cylinder 43, the gripper release cam 40 may be actuated between its releasing position, shown in full lines, and its retracted position, shown in dotted lines, at the will of the operator. Control mechanism operable to control the fluid supply to cylinder 43 is described below in connection with FIG. 5.

FIGS. 3-4

These figures illustrate the inspection station 3, including the tray 27 and the mechanism for actuating it. At the inspection station, the grippers pass a fixed gripper release cam 26 which releases every passing gripper. Thus, every sheet which approaches the inspection station 3 is dropped onto the tray 27. The tray 27 supports a detector which includes a photocell 50, and a lamp 51. The photocell 50 is shielded from the lamp 51 when no sheet is on the tray, and is then in a low output condition. When a sheet is on the tray, light from the lamp is reflected back on the photocell, and it produces a higher output.

The tray 27 is fixed along its right-hand edge, as viewed in FIG. 3, to a shaft 52, which is journaled in the side frames of the press. The shaft 52 also has fixed thereto a crank arm 53, which is operated by a hydraulic cylinder 54. The cylinder 54 is pivoted at its right-hand end, as indicated at 55 and operates a piston connected by a piston rod 56 to a pivot pin 57 at the end of the crank arm 53.

When the parts are in the positions shown in full lines in FIGS. 3 and 5, the tray 27 is in its sheet receiving position, immediately below the lower reach 20b of the conveyor. A spring 48 biases the tray 27 to the full-line position. When the cylinder 54 is actuated to push piston rod 56 to the left, the crank arm 53 and the shaft 52 are rotated in a counterclockwise direction and the tray 27 is lowered to the inspection position shown in dotted lines in FIGS. 1 and 3, where a sheet resting thereon may be observed by an operator standing under the overhead conveyor 20. It should be understood that the overhead conveyor 20 and the side frames supporting it are sufficiently high above the floor so that an operator of average height can comfortably stand under the conveyor without bending.

The cylinder 54 and its connections may be omitted, and the tray may be operated manually by a suitable

handle (not shown), to the inspection position, against the force of the spring 48.

FIG. 5

This figure illustrates electrical apparatus for supplying hydraulic fluid to the cylinder 43 of FIG. 2, controlling the gripper release retraction mechanism at the delivery station 2, and the cylinder 54 controlling the tray 27.

The respective ends of the hydraulic cylinder 43 are connected through a pair of conduits 60 and 61 to a reversing valve diagrammatically indicated at 62 and thence to a fluid supply line 63 and a fluid drain line 64. The reversing valve 62 is biased to the position shown, in which the supply line 63 is connected through conduit 60 to the left-hand end of cylinder 43 and the right-hand end of cylinder 43 is connected through conduit 61 to the drain line 64. The piston of that cylinder is thereby actuated to its right-hand position, rotating the gripper release cam 40 to its full line position, where it engages each gripper lever 34 passing through the delivery station, so as to cause the grippers to drop their sheets 36 onto the decelerating conveyor 23.

The reversing valve 62 is operable against its bias by means of a solenoid 65, to a right-hand position in which the connection between the supply line 63 and conduit 64 on the one hand and the conduits 60 and 61 on the other hand are reversed, and the cylinder 43 actuates its piston to drive the cam 40 to its retracted position, shown in dotted lines.

The energizing circuit for solenoid 65 may be traced from a power line 66 through a contact 67a of a relay 67 and thence through the winding of solenoid 65 to the opposite power line 68. The circuit for energizing relay 67 may be traced from power line 66 through the contacts of push-button 18 and thence through the winding of relay 67 to the power line 68. The relay 67 is a time delay relay, in that after it is momentarily energized, closing its contact 67a, its contact remains closed for a predetermined time and then opens. The time delay of the relay 67 is designed for coordination with the inherent time delays in solenoid 65 and cylinder 43, so that the cam 40 is retracted for a time substantially equal to the time required for the space between two sets of grippers 31 to pass the gripper release cam 40. Thus, if the push-button switch 18 is momentarily closed by the operator, the relay 67 closes the contact 67a thereby energizing solenoid 65 and causing the cam 40 to retract. The cam 40 remains retracted for substantially the time required for a complete space between the two grippers 31 to pass the cam 40. Thus, it is ensured that upon each actuation of the push-button 18, at least one sheet 36 passes through the delivery station 2 and is carried on to the inspection station 3. By holding the push-button switch 18 closed, the operator can secure the delivery to the inspection station 3 of as many successive printed sheets as he wishes.

The photocell 50 is connected in series with the input terminals of an amplifier 70, whose output terminals are connected in series with the winding of a time delay relay 71. The relay 71 controls a contact 71a connected in an energizing circuit for a solenoid 73. That energizing circuit may be traced from power line 66 through contact 71a, contact 29 actuated by the ink carriage interlock lever 30, and thence through solenoid 73 to power line 68. The solenoid 73 controls a re-

versing valve 74 which regulates the flow of hydraulic fluid from the source 63 through the cylinder 54 and from the cylinder 54 to the drain 64. The reversing valve 73 is biased to the position diagrammatically shown in the drawing, in which the piston of cylinder 54 is forced to the right, holding the tray 27 in its sheet receiving position. The spring 48 is effective, in the event of failure of hydraulic pressure from the source 63, to move the tray 27 in its sheet receiving position.

When a sheet 36 reflects a ray of light from the lamp 51 to the photocell 50, the relay 71 is energized, closing contact 71a and energizing solenoid 73 to move the valve 74 to its reversing position, thereby causing the cylinder 54 to move the tray 27 down to the inspection position, where the sheet resting thereon may be observed by the press operator. The time delay involved in actuating the relay 71 and solenoid 73 is enough to allow the dropping of the sheet 36 onto the tray 27 to be completed before the tray 27 starts moving downward.

When the ink carriage 10 is moved to its retracted position, shown in dotted lines in FIG. 1, it engages the lever 30, which opens the switch 29 preventing energization of solenoid 23, so that under those conditions, the tray 27 remains in its upper sheet receiving position and cannot be moved down into its inspection position, where it might interfere with the movement of the carriage 10.

Instead of using light reflected from a sheet 36 to illuminate the photocell 50, an alternative arrangement might be employed, where the photocell is illuminated in the absence of a sheet 36 on the tray 37, and the illumination is cut off when a sheet is deposited there. Such a system would have to operate off a back contact of relay 71, instead of a front contact, as shown.

A counter of a suitable conventional type may be provided to count the sheets reaching the delivery station. Another counter may be used to count the sheets reaching the inspection station, and this count may be subtracted from the count of sheets reaching the delivery station to get a count of the sheets delivered to the delivery station.

We claim:

1. A printing press including:
 - a. A printing station including sheet delivery means;
 - b. a conveyor for receiving sheets from said sheet delivery means, said conveyor including an upper reach moving away from the printing station and a lower return reach moving toward the printing station;
 - c. a sheet delivery station located under a portion of the return reach;
 - d. a sheet inspection station located under another portion of the return reach and between the delivery station and the printing station;
 - e. grippers on said conveyor at uniformly spaced intervals and operable between sheet gripping positions in which they grip the leading edges of sheets delivered by the printing station, and sheet releasing positions;
 - f. retractable gripper actuating means at the delivery station and movable between a gripper engaging position and a retracted position, said gripper actuating means being effective in its gripper engaging position to engage the passing grippers and operate them to their sheet releasing positions, said gripper actuating means being located adjacent the lower

reach of the conveyor so that the released sheets drop by gravity from the conveyor;

- g. means selectively operable to retract the gripper actuating means so as to allow a sheet held by a gripper to pass along the return reach beyond said sheet delivery station;
- h. fixed gripper actuating means at said inspection station for engaging and releasing every gripper passing said inspection station so that sheets which have passed the retractable gripper release means at the delivery station are dropped from the grippers at the inspection station;
- i. a tray under the return reach of the conveyor at the inspection station to receive sheets dropped from the conveyor;
- j. means supporting said tray for movement between a sheet receiving position close to the conveyor and an inspection position in which the tray is spaced downwardly from the conveyor so that a sheet on the tray may be inspected by the press operator;
- k. motor means for moving the tray between its sheet receiving position and its inspection position; and
- l. means responsive to the presence or absence of a sheet on the tray for controlling said motor means to move the tray to its sheet receiving position when there is no sheet on the tray and to move it to its inspection position when there is a sheet on the tray.

2. Sheet inspection means for a printing press, including:

- a. a conveyor for printed sheets including a reach where the printed sheets travel below the conveyor; and
- b. an inspection station adjacent a portion of said reach including:
 1. means for releasing sheets from the conveyor;
 2. a tray under the conveyor for receiving sheets released from the conveyor;
 3. means supporting the tray for movement between a sheet receiving position close to the conveyor and an inspection position in which the tray is spaced downwardly from the conveyor so that a sheet on the tray may be inspected by the press operator;
 4. motor means for moving the tray between its sheet receiving position and its inspection position; and
 5. means responsive to the presence or absence of a sheet on the tray for controlling the motor means to move the tray to its sheet receiving position when there is no sheet on the tray and to move it to its inspection position when there is a sheet on the tray.

3. Sheet inspection means as defined in claim 2, in which said sheet responsive means comprises:

- a. a light source mounted to direct a beam of light along a path which impinges upon a single sheet on the tray; and
- b. light sensitive means in the path of the beam and effective to produce a first response when no sheet is on the tray and a second distinctively different response when at least one sheet is on the tray.

4. A printing press, including:

- a. a printing station comprising a plate cylinder, a pressure cylinder located vertically above the plate cylinder and cooperating with the plate cylinder, and a sheet delivery cylinder cooperating with the

- pressure cylinder and located at one side thereof;
- b. a sheet conveyor extending from the printing station, said conveyor extending around the delivery cylinder and including an upper reach moving away from the printing station and a lower return reach moving toward the printing station;
- c. a sheet delivery station located under a portion of the return reach;
- d. a sheet inspection station located under another portion of the return reach and between the delivery station and the printing station;
- e. selectively operable sheet release means at the delivery station for releasing printed sheets from the conveyor;
- f. positively operable sheet release means at the inspection station for releasing from the conveyor all sheets which pass the delivery station;
- g. means for controlling said selective sheet release means;
- h. said inspection station including a tray under the conveyor for receiving sheets released from the conveyor;
- i. means for moving the tray between a sheet receiving position close to the conveyor and an inspection position spaced below the conveyor;
- j. means for supplying ink to said plate cylinder;
- k. a carriage supporting said ink supplying means and movable between an operating position wherein the ink supplying means engages the plate cylinder and a retracted position allowing access to the plate cylinder by an operator, said carriage in the retracted position extending below said tray when the latter is in its sheet receiving position; and
- l. means for retaining the tray in its sheet receiving position when the carriage is moved to its retracted position, to prevent mechanical interference between the carriage and the tray.
5. A printing press, including:
- a. a printing station including sheet delivery means;
- b. a conveyor extending from said printing station to

- a delivery station and thence past an inspection station;
- c. grippers on the conveyor at uniformly spaced intervals and operable between sheet gripping positions in which they grip the leading edges of the sheets delivered by the printing station, and sheet releasing positions;
- d. retractable gripper actuating means at the delivery station and movable between a gripper engaging position and a retracted position, said gripper actuating means being effective in its gripper engaging position to engage the passing grippers and operate them to their sheet releasing positions;
- e. means selectively operable to retract the gripper actuating means so as to allow a sheet held by a gripper to pass beyond the sheet delivery station;
- f. manual control means for the selectively operable means, said manual control means including:
1. a member manually movable between a normal position and an active position;
 2. means responsive to the position of the member and effective upon movement thereof to the active position to move the gripper actuating means to its retracted position, and to hold the gripper actuating means in its retracted position as long as the member remains in its active position; and
 3. time controlled means effective after each restoration of the movable member to its normal position to maintain the gripper actuating means retracted for a period substantially equal to the time required for the passage of two grippers on the conveyor at normal operating speed;
 4. said member position responsive means being effective after the expiration of each such period to return the gripper actuating means to its gripper engaging position; and
- g. fixed gripper release means at the inspection station for releasing every gripper passing said inspection station.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,759,177 Dated September 18, 1973

Inventor(s) Ivaldo Gazzola, Salvatore F. D'Amato, Chauncey P. Foote

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

Col. 8, line 37, claim 5, paragraph (g) should read as follows: "gripper actuating means at the inspection station for releasing every sheet passing said inspection station".

Signed and sealed this 9th day of April 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents