United States Patent

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[33] **Germany**
[31] **Sch 40,451**

[54] **COLOR PRINTING ROTARY PRESS WITH A MATCH CORRECTION DEVICE IN A TRANSFER DRUM**
10 Claims, 7 Drawing Figs.

[52] **U.S. Cl.** **101/248,** 101/410, 271/82
[51] **Int. Cl.** **B30b 5/00**
[50] **Field of Search** ..... 101/246, 248, 251, 177, 142, 408—410, 183, 137; 271/82, 51

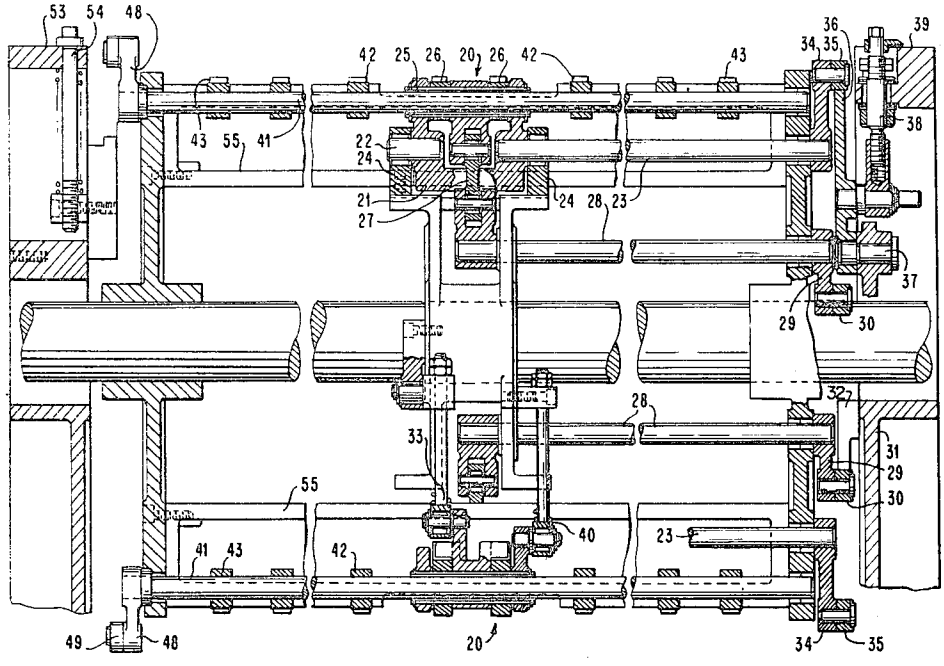
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ABSTRACT: In a color printing rotary press the transfer drum for passing the impressed sheet from one to the next printing unit has its sheet seizing grippers combined with a device for the correction of mismatch due to changes in tension or moisture content of the paper. The correction device comprises grippers which are located in the center region of the transfer drum for seizing a center portion of the sheet leading edge and which are selectively displaceable an adjusted amount in the forward or reverse direction of the sheet travel. The other grippers of the transfer drum likewise seize the sheet leading edge and are located laterally of the centrally located grippers. Control cams operate during sheet transfer to open the lateral grippers, except those located at the extremities of the leading edge, and to simultaneously displace the centrally located grippers of the correction device. Hence, only the outermost grippers keep gripping the sheet while the correction device operates by shifting the central portion of the sheet edge in the forward or reverse direction.



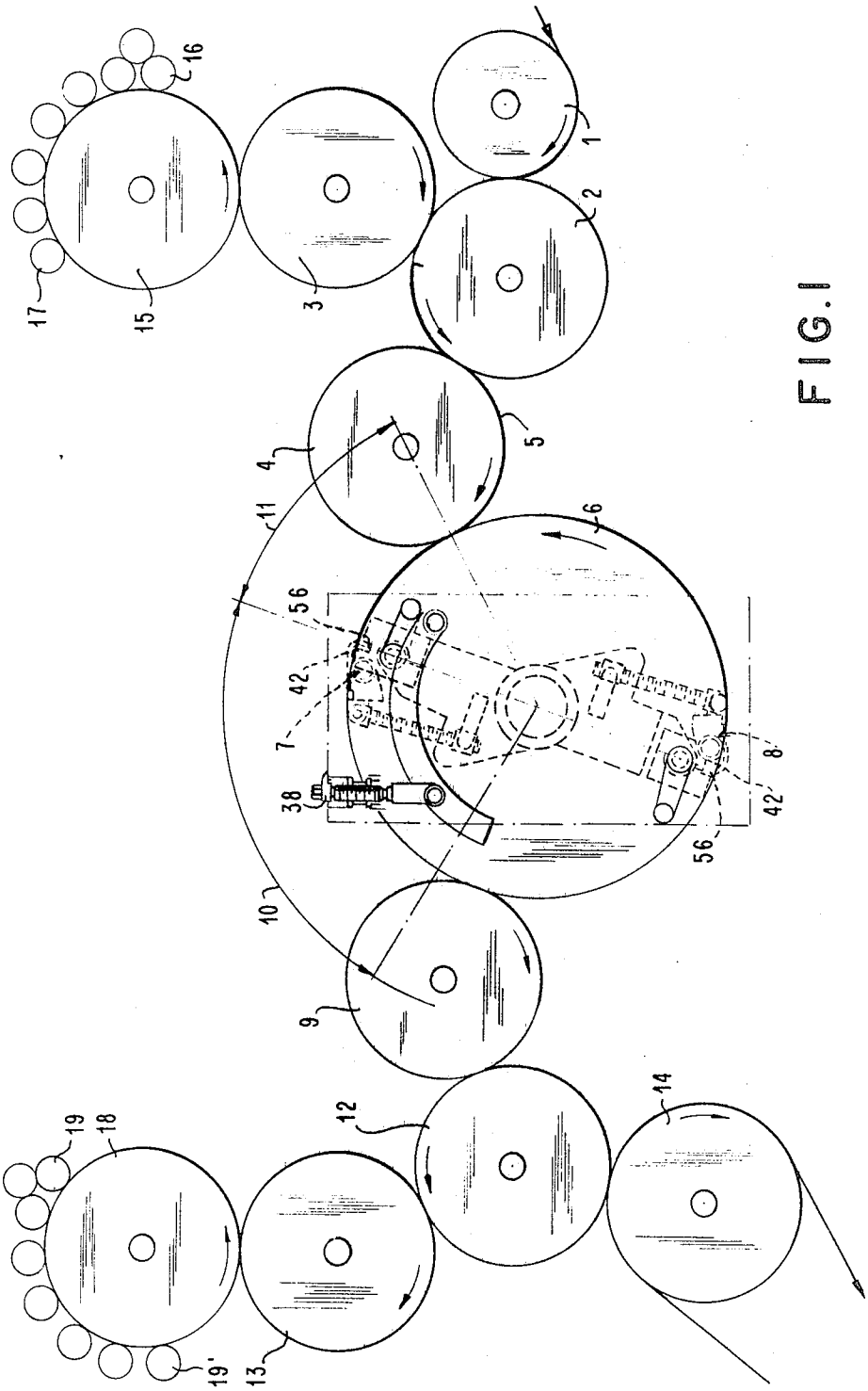


FIG. 1

FIG. 2

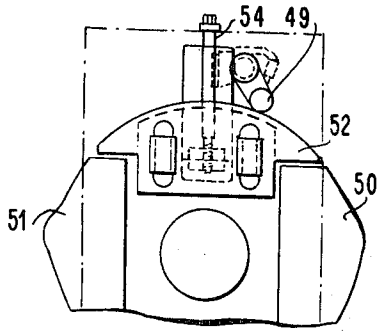
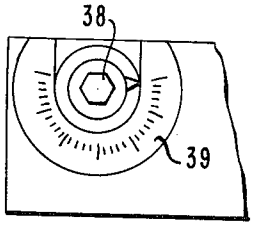


FIG. 4



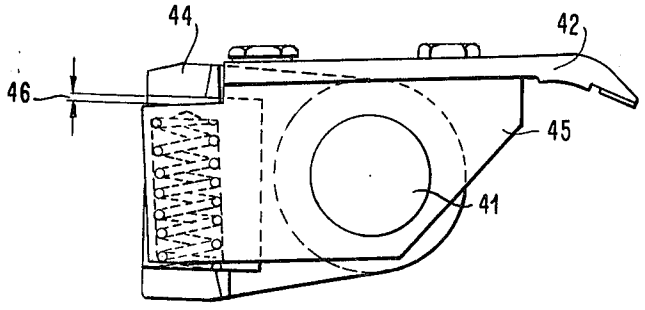


FIG. 6

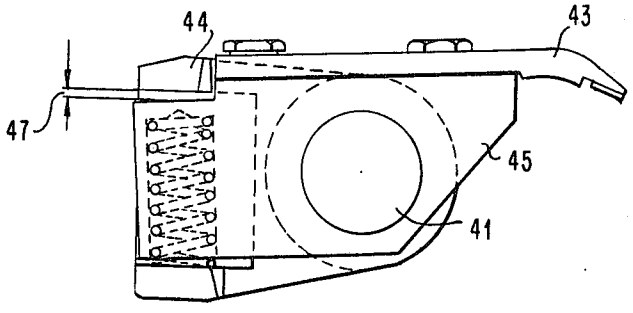
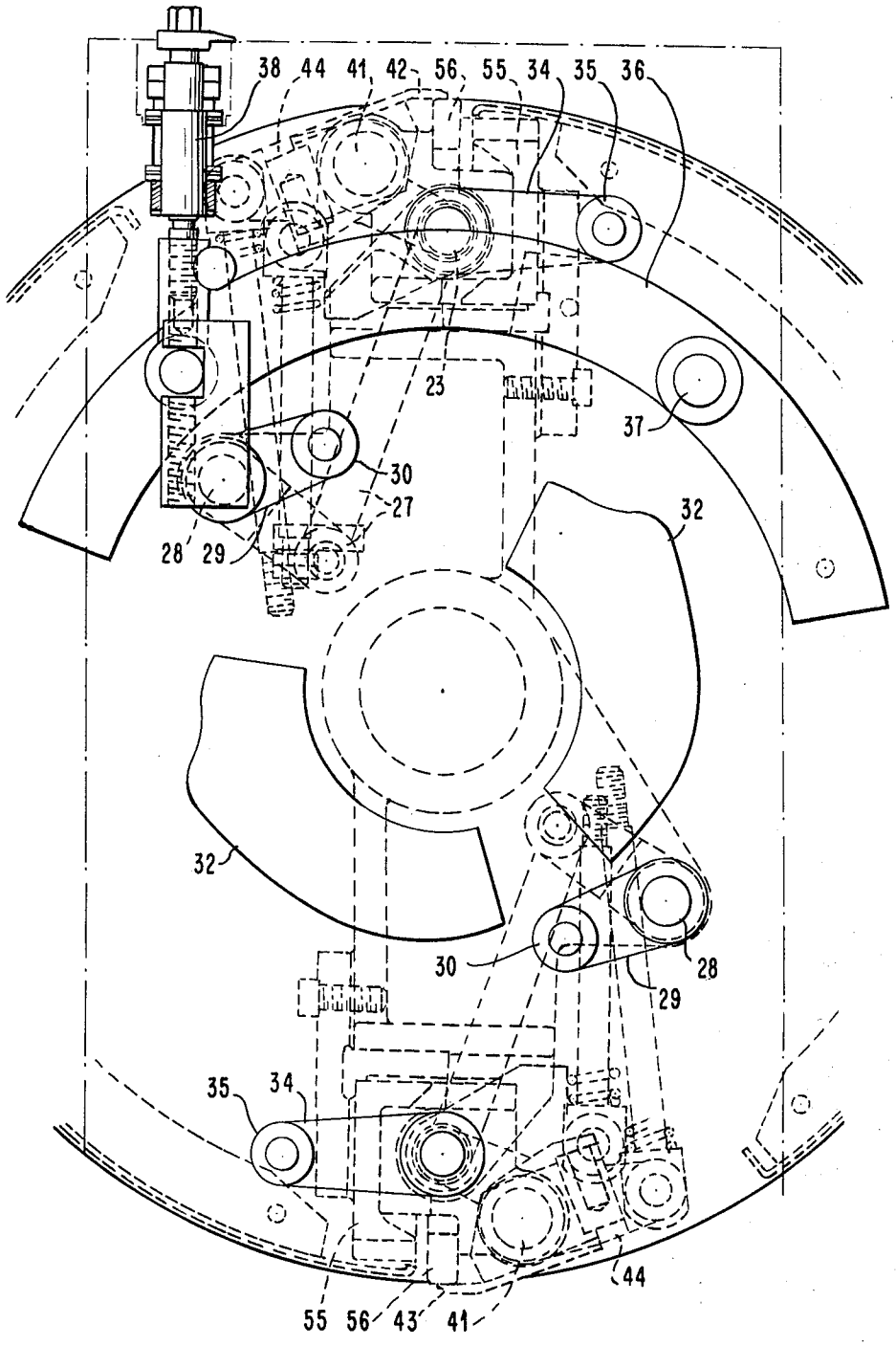


FIG. 7

FIG. 3


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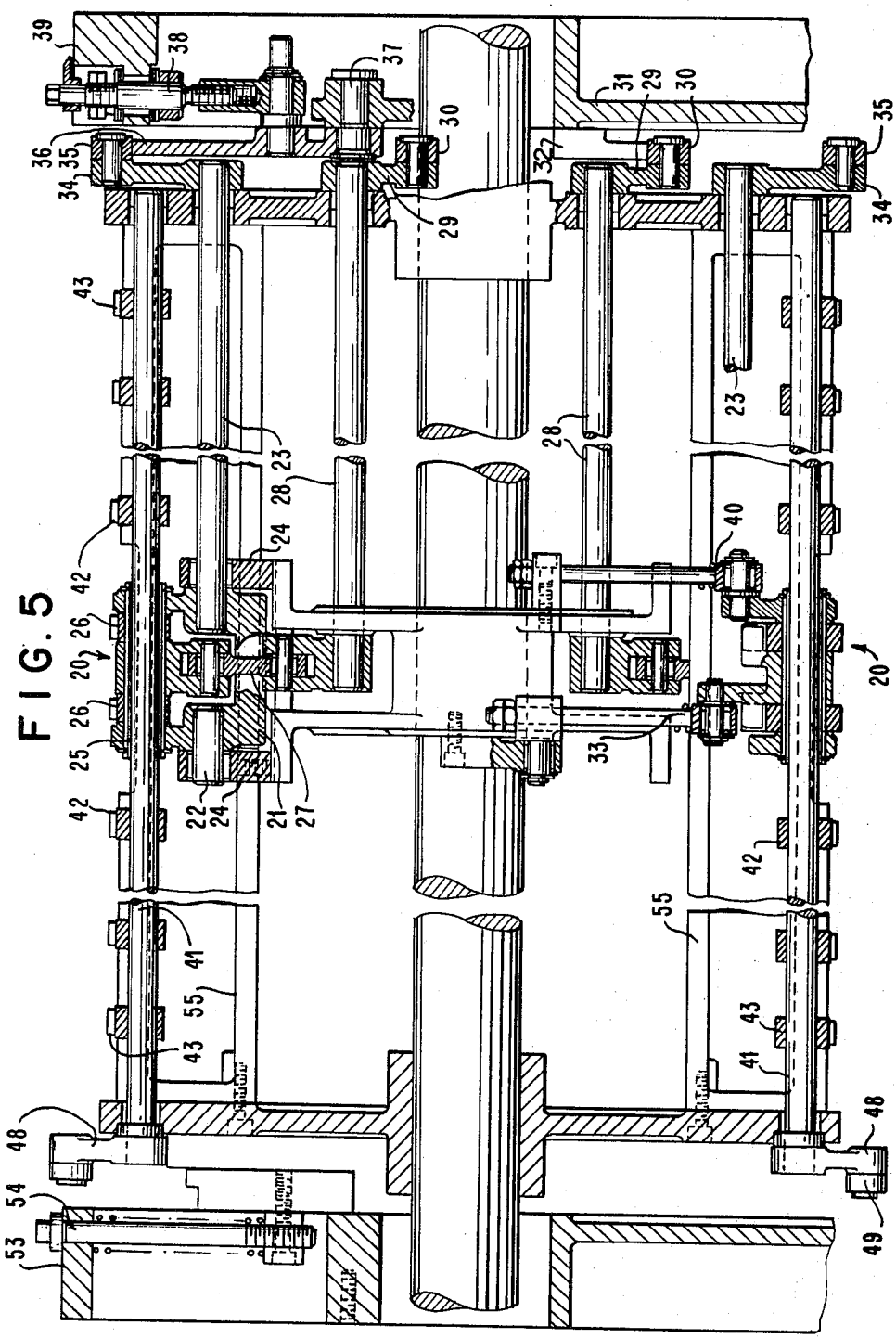

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FIG. 5

COLOR PRINTING ROTARY PRESS WITH A MATCH CORRECTION DEVICE IN A TRANSFER DRUM

My invention relates to color printing rotary presses in which the grippers of a transfer drum seize the leading edge of the sheet for transferring it from one to the next printing unit.

In a more particular aspect my invention relates to color printing rotary presses with a device for correcting the imprint-carrying sheet, as it passes from one to the next unit, by imposing a corresponding deformation upon the leading edge of the sheet.

Color printing, especially by the offset method, poses the problem that the impression produced on the sheets will vary because of changes in paper tension or due to increasing absorption of moisture, depending upon the number of printing units traversed by the sheet. It has been attempted to eliminate the resulting matching faults by attaching pieces of paper or cardboard upon the pads of the grippers which seize the leading edge of the sheet as it travels on the transfer drum from one to the next printing unit, thus applying a bulging distortion to the sheet leading edge. This varies the lagging edge or lateral edges of the sheet in the sense required for compensating the expansion or shrinkage of the impression on the sheet. Attaching of paper or cardboard in this manner is complicated and time consuming.

It has also become known to provide devices which produce the desired bulge in the sheet leading edge by a so-called impression regulator flap. The flap raises the sheet from below in its middle as the sheet is placed onto, or passes by, the layon roller of the printing unit. The lifting effect imposed upon the beginning or end of the sheet, has the result of somewhat shortening the width of the sheet. A regulation of this type, therefore, must be performed with the grippers kept open, but this impairs the registering accuracy in color printing. For that reason a regulator flap has been applicable only with single-color machines.

Further known is a color rotary printing press with an assembly of grippers, a gripper pad and a gripper control shaft, this machine being subdivided along the sheet leading edge into several sections. Displaceable sliders are disposed at the butt junctions between the sections and form the bearings for the gripper control shaft and the gripper pad. With the aid of the slider displacement the sheet leading edge is to be expanded for the purpose of the desired correction.

The subdivision of the gripper sets into section requires articulated junctions with inevitable clearances in the bearings. The correction of matching differences involves no more than a few hundredths of millimeters. Consequently, such clearance in the bearings is detrimental because, after elimination of match differences, there may occur an additional and noncontrollable variation in the sheet leading edge on account of play due to bearing clearances.

It is also disadvantageous that the expansion of the sheet leading edge is effected with continuously closed grippers. This, when the needed correction is relatively large, may cause the paper to wrinkle or fold which affects the subsequent printing operation and requires much time to be remedied.

It is an object of my invention to devise a color printing rotary press which affords obtaining the desired correction of the above-mentioned inaccuracies by imposing a controlled deformation upon the sheet leading edge, without entailing the drawbacks and deficiencies of the machines and devices heretofore available for such purposes.

More specifically, it is an object of my invention to achieve the desired result without the necessity of raising or lowering the gripper pad faces by attaching pieces of paper or cardboard on top of the pads, or to perform any other adjusting operations demanding equally much time.

Another, more specific object of the invention is to secure the desired correction without subdividing the gripper control shaft and the appertaining bearings, or introducing any additional bearing clearances into the equipment.

A further object of my invention, akin to those mentioned above, is to provide a correction apparatus in rotary color-printing presses wherein the desired corrective deformation of the sheet leading edge is secured while reliably gripping this edge only in its center portion and at its extremities, leaving the edge free at the intermediate portions, thus promoting the correcting performance while preventing the occurrence of wrinkling for folding.

To achieve these objects and in accordance with a feature of my invention I provide the transfer drum with a centrally located correction device which has gripper means for seizing the center portion of the sheet leading edge and which, during transfer operation, is displaced in the forward or reverse direction relative to the transfer travel, the amount and direction of displacement being controlled in accordance with an adjusted setting and occurring while the lateral grippers on the transfer drum are released, with the exception of those located at the extremities of the sheet leading edge. As a result, only the outermost grippers of the transfer drum keep gripping the sheet leading edge during the corrective displacement imposed upon the center portion of the edge.

According to another, more specific feature of my invention, I provide the transfer drum with a gripper pad rail structure which extends along substantially the entire active length of the drum in parallel relation to the drum axis, and I provide this pad structure with a recess in the center region and dispose the above-mentioned correction device in the center recess.

According to still another feature of my invention the lateral grippers, which are to be released during the operation of the centrally located correction device, are controlled by a cam mechanism whose control cam is fixedly mounted on the machine frame structure. The cam cooperates with a follower, preferably inform of a roller journaled on a pivotally mounted arm, which rotates a control shaft that opens and closes the lateral grippers.

In an offset press the described correcting operation must commence only after the maximal sheet area to be impressed has passed between the rubber blanket cylinder and the impression cylinder, and the correction must be terminated before the sheet is issued to the cylinders of the next following gripper assembly. Consequently, the correction operation is best performed by employing a transfer drum whose diameter is twice as large as that of the impression cylinders.

The above-mentioned and further objects, advantages and features of my invention, said features being set forth with particularity in the claims annexed hereto, will be apparent from, and will be described in, the following with reference to an embodiment of the invention designed as a rotary offset press with two color printing units and illustrated by way of example on the accompanying drawings in which:

FIG. 1 is a schematic diagram of the two offset printing units and an intermediate transfer drum with two correcting devices according to the invention.

FIG. 2 shows separately one of the cam mechanisms for controlling two through shafts which form part of the gripper assemblies in the transfer drum shown in FIGS. 1 and 3.

FIG. 3 is a lateral view of the transfer drum assembly in conjunction with appertaining control components mounted on a lateral wall of the machine frame structure.

FIG. 4 shows the manual portion of an adjusting device with a scale of indicia for setting the amount and direction of the correction in the illustrated machine.

FIG. 5 is an axial section through the transfer drum and the two adjacent lateral walls of the machine frame structure.

FIG. 6 shows separately one of the lateral grippers of the transfer drum; and

FIG. 7 illustrates one of the two outermost grippers of the transfer drum.

Referring to FIG. 1, the sheet stock to be imprinted is supplied to the layon drum 1 of the first printing unit. The drum 1 passes the sheet to the impression cylinder 2 where the imprint is produced with the aid of the rubber blanket cylinder 3

cooperating with the plate cylinder 15 which in turn coacts with the rollers of a dampening mechanism 16 and the rollers of an inking mechanism 17. A turnabout drum 4 takes the imprinted sheet 5 from the impression roller 2 to the transfer drum 6. The drum 6 has twice the diameter of the turnabout drum 4 and for that reason is equipped with two diametrically opposite gripper assemblies 7 and 8. Each of these gripper assemblies forms a row which extends at the peripheral surface in a direction parallel to the drum axis and is provided with a device for correcting the leading edge of the sheet.

The transfer drum 6 forwards the sheet until it is taken over by the turnabout drum 9 of the second printing unit. During takeover the sheet travels through the "correction distance" 10 which begins when a sheet of the largest format to be processed leaves the gap between impression cylinder 2 and rubber cylinder 3. At this moment the beginning of the imprint on the sheet 5 has passed through the transfer distance 11. The correction distance 10 terminates shortly before the corrected sheet 5 commences to pass onto the turnabout drum 9 of the second printing unit. The drum 9 issues the sheet 5 to the second impression cylinder 12 which engages a rubber blanket cylinder 13 coacting with a plate cylinder 18 dampened by a mechanism 19 and inked by a mechanism 19'. The sheet upon receiving the second impression in the second printing unit reaches the layoff drum 14. It will be noted that, aside from layon drum 1 and layoff drum 14, the two printing units, inclusive of all of the appertaining drums, cylinders and rollers, are arranged in mirror-symmetrical relation to each other on opposite sides of an axial center plane of the transfer drum 6.

The correction device 20 (FIG. 5) for each gripper assembly 7, 8 is located in the middle region of the gripper row. Each correction device comprises displacement control means including a generally U-shaped lever 21 whose two legs are coaxially pivoted near the U-base on a pivot pin 22 and on one end of a control shaft 23 (FIGS. 5, 3) respectively. The end of the control shaft 23 and the coaxial pivot pin 22 are journaled in respective bearing blocks 24 mounted in the transfer drum 6 and fixed relative to the drum shaft and drum body structure. The common axis of pivot pin 22 and control shaft 23 is parallel to the rotational axis of the transfer drum 6. The pivot pin 22 and the corresponding end of control shaft 23 are located precisely below a gripper pad 56 (FIG. 3) whose top face lies substantially flush with the peripheral surface of the transfer drum and serves as an abutment or anvil member for a gripper finger 42 or 43 (FIGS. 3, 5, 6, 7) of the gripper assembly 7 or 8. That is, the leading edge of the paper sheet entering upon the top face of the pad 56 can be held against the pad by one of the gripper fingers 42 or 43 as will be further explained hereinafter.

The lever 21 carries near its leg ends a hollow shaft 25 to which two grippers 26 (FIG. 5) are fastened. The two grippers 26 are actuated through a linkage 27 (FIGS. 5, 3) a control shaft 28, a lever 29 and a roller 30 journaled on the lever 29. The actuation of the grippers 26 is controlled by a cam 32 fastened to a lateral wall 31 of the machine frame structure and engaged by the roller 30. A spring arrangement 33 (FIG. 5) tends to retain the grippers 26 and the components 27 to 32 of the correcting device 20 in the normal position in which the grippers are closed, as are all of the other grippers of the same gripper row.

The above-mentioned displacement control means including the control shaft 23, which has one end firmly connected with the lever 21, has its other end joined with an arm 34 (FIGS. 3, 5) whose extremity carries a roller 35 (FIGS. 1, 3, 5) coacting as a follower with a cam plate 36. The cam plate 36 is pivotally mounted by a bearing pin 37 (FIGS. 3, 5) on the lateral wall 31 (FIG. 5) of the machine frame structure. A setting device 38 (FIGS. 5, 4) likewise mounted on the lateral wall 31 permits adjusting the cam plate 36 to a desired angular position in accordance with a scale of indicia 39. A spring arrangement 40 (FIG. 5) normally retains the correction unit 20 in a given center (null) position.

The hollow shaft 25 of the correction device 20 is coaxially traversed by a through shaft 41 which forms part of the gripper assembly 7 or 8. The diameter of the gripper shaft 41 is about 2 mm. smaller than the inner diameter of the hollow shaft 25. Gripper fingers 42 (FIGS. 3, 5, 6) are fastened to the gripper shaft 41 in the middle region thereof, the design of the gripper fingers and their mounting being apparent from FIG. 6. The grippers 43 located at the respective ends of the gripper shaft 41 are separately shown in FIG. 7. The two gripper designs differ only in that a larger or smaller lifting clearance is provided between an entrainer 44 and a mounting block 45. The entrainer 44 is rigidly fastened to the control shaft 41. The mounting block 45 carries the gripper finger 42 (FIG. 6) or 43 (FIG. 7) and is rotatable on the shaft 41 but braced against the entrainer 44 by a helical compression spring. The relative travel between entrainer 44 and block 45 is limited, depending upon the amount of clearance indicated at 46 (FIG. 6) and 47 (FIG. 7). The only difference between the lateral grippers according to FIG. 6 and the outermost grippers according to FIG. 7 relates to the idling clearance. The clearance 46 for the lateral grippers 42 is about 0.8 mm. The corresponding idle clearance 47 for the outermost grippers 43 is about 1.5 mm. The grippers may also be given a design which permits adjusting the size of the clearance. The difference in idling clearance affords a simple yet reliable way of controlling the lateral as well as the outermost grippers by one and the same control shaft in such a selective manner that either all of them will open and close, or only the lateral but not the outermost grippers will open.

One end of the gripper control shaft 41 carries an arm 48 to which there is journaled a roller 49 to act as a follower in coaction with control cams 50, 51 and a lifting cam 52. The three cams 50, 51 and 52 are mounted on or in the lateral wall 53 (FIG. 5) of the machine frame structure. The lifting cam 52 is provided with an adjusting device 54 which permits displacing this cam between an inactive and an active position (FIGS. 2, 5). A gripper pad structure or rail 55 extends all the way lengthwise of the transfer drum in parallel relation to the gripper control shaft 41 and has a recess of such a size within the region of the correcting device 20 that a gripper pad 56 for the grippers 26 can be movably accommodated in the recess.

The above described apparatus operates as follows:

At the moment when the beginning of an impression on a sheet 5 is to pass from the turnabout drum 4 onto the transfer drum 6 (FIG. 1), all of the grippers 26, 42 and 43 in the gripper assemblies 7, 8 are open, the gripper fingers having previously been lifted from the gripper pads 56. At the moment when the leading edge of the sheet enters onto the gripper pad rail 55, as well as upon the gripper pads 56, the grippers 26 close due to the action of control cam 32, and the grippers 42 and 43 also close under control by the respective cams 50 and 51 (FIGS. 3, 5).

All grippers of the row now seize the leading edge of the sheet so that the sheet is entrained by the transfer drum in a fixed position relative to its peripheral surface. When the leading edge has passed through the transfer distance 11 (FIG. 1), the trailing end of the sheet has left the gap between the impression cylinder 2 and the rubber cylinder 3 even with the largest printing format applicable. From this moment on, the starting edge of the impression on the sheet has entered into the correction distance 10 (FIG. 1) and the correction of the leading edge of the sheet can commence. Depending upon the setting of the cam plate 36 (FIGS. 1, 3) by means of the adjusting device 38 (FIG. 4), the lever 21 (FIG. 5) is turned a preset amount through the action of the roller arm 34 and the control shaft 23. At a previous moment, however, the cam roller 49 has entered upon the lifting cam 52, which forms therewith and with the arm 48 and control shaft 41 release control means, and has lifted all of the gripper fingers 42 an amount equal to maximum cardboard thickness, *i.e.* the clearance distance 46 in FIG. 6. This does not or need not lift the fingers off the pad rail but suffices to remove the closing pressure in the lateral grippers. However, since in the outer

grippers 43 the idle lifting clearance 47 between entrainer 44 and block 45 is larger, the grippers 43 remain closed and under gripping pressure. Consequently, as long as the lever 21 and the central grippers 26 on the hollow shaft 25, as well as the appertaining pads 56, are turned a given amount, the grippers 42 are relieved sufficiently for releasing the leading edge of the sheet, whereas the grippers 43 at the extremities of the edge continue to firmly grip the sheet.

The displacement of the correction unit 20 may be performed in the forward direction of the sheet travel or in the reverse direction, depending upon how the sheet dampened in the first printing unit has become distorted. The corrective displacement can be accurately set to hundredths of one millimeter, as is shown by the scale 39 in FIG. 4 and, depending upon the rotary direction in which the threaded setting device 38 is adjusted, the correction unit will be displaced in forward or reverse direction of sheet travel.

When the pivotal motion of the correction unit 20 and consequently the correction of the previously distorted impression is completed, the roller 49 leaves the lifting cam 52 (FIG. 2) and the lateral grippers 42 are closed. This terminates the correcting operation. Shortly thereafter the corrected sheet passes onto the turnabout drum 9. Thereafter the roller 35 leaves the cam plate 36, and the entire correcting device 20 is pivoted back to its starting position by the force of the spring arrangement 40. This performance of expanding the leading edge of the sheet is repeated with each sheet transfer in the same manner, depending upon the setting of the adjusting device 38 (FIG. 4).

If no sheet correction is desired, the adjusting device 38 is set to place the cam plate 36 to the inactive position indicated by O on the scale 39. Furthermore, the adjusting device 54 is set to shift the lifting cam 52 to an inactive position to obviate opening the grippers 42 when the sheet passes through the correction distance 10.

It will be understood from the embodiment described that with the aid of the correction device in coaction with the outermost grippers which cooperate with the correction device during the correcting performance, the leading edge of the imprinted sheet can be expanded to an arcuate shape within a given correction range without folding or wrinkling of the sheet, and that the amount and the direction of deformation are readily adjustable to the change to which the imprinted sheet will be subjected under the particular operating conditions. In contrast to the above-mentioned known device with a gripper device subdivided into sections, the gripper pad structure in apparatus according to the invention as well as the gripper control shaft are preferably designed as continuous through structures so that there is no additional clearance in bearings. Hence, after performance of the correcting operation, no matching differences due to changes in the gripper assembly or gripper control arrangement can occur.

I claim:

1. In a color printing rotary press having printing units and a rotatable transfer drum for passing imprinted sheets from one to the next unit, the combination of a gripper row extending on said transfer drum parallel to the drum axis for seizing the leading edge of a sheet to be transferred, said row having centrally located grippers and having lateral grippers and an outermost gripper on each side of the central grippers, said central grippers being displaceable in the peripheral direction of the drum relative to said lateral and outermost grippers, displacement control means connected to said central grippers for displacing them during sheet transfer; and release control means in connection with said lateral grippers for releasing them during displacement of said central grippers while said outermost grippers keep gripping the sheet leading edge.

2. In a color printing rotary press having printing units and a transfer drum rotatable between said units for passing imprinted sheets from one to the next unit, the combination of a correction device comprising a gripper pad structure extending in said transfer drum in parallel relation to the drum axis and having a recess centrally of its length, said correction device having gripper pad means and gripper fingers located in said recess, said pad means being normally aligned with said pad structure, said gripper fingers being closable upon said pad means for seizing the center portion of the leading edge of a sheet being transferred by said drum, said correction device having displacement control means for displacing said correction device during sheet transfer in direction from one to another of the printing units; lateral grippers and outermost gripper means located on opposite sides of said correction device and engagable with said pad structure for seizing said sheet leading edge; and release control means in connection with said lateral grippers to release them during displacement of the edge center portion while said outermost gripper means keep gripping the sheet leading edge.

3. In a printing press according to claim 2, said correction device being pivotally displaceable and having a pivot axis parallel to said drum axis.

4. In a printing press according to claim 3, said pivot axis of said correction device being situated between said pad means and said drum axis.

5. In a printing press according to claim 2, said press having a machine frame structure, said transfer drum being rotatably mounted on said frame structure, and said displacement control means and said release control means comprising cam means secured to said frame structure and cam-follower means mounted on said drum, whereby both said control means operate in positional dependence upon the drum rotation.

6. In a printing press according to claim 1, said transfer drum comprising a gripper shaft extending parallel to the drum axis, said lateral and outermost grippers being mounted on said shaft to be controlled by rotation thereof, a hollow shaft coaxially and rotatably seated on said gripper shaft centrally between said lateral grippers, said central grippers being mounted on said hollow shaft to be opened and closed by rotation of said hollow shaft.

7. In a printing press according to claim 2, said displacement control means having selector means for setting said correction device to forward, reverse and zero displacement respectively of the sheet leading edge.

8. In a printing press according to claim 2, said transfer drum comprising a gripper shaft extending parallel to the drum axis, said lateral and outermost grippers having respective fingers mounted on said shaft and grippingly engageable with and disengageable from said pad structure by rotation of said gripper shaft, said gripper shaft forming part of said release control means.

9. In a printing press according to claim 8, said gripper fingers having relative to said gripper shaft an idle clearance which is larger in said outermost grippers than in said lateral grippers, whereby a given amount of shaft rotation causes said lateral grippers to release the sheet while keeping the outermost grippers effective.

10. In a printing press according to claim 2, said correction device being pivotally displaceable and having a pivot axis extending in parallel relation to said drum axis between said pad means and said drum axis, a gripper shaft parallel to the drum axis, said lateral and outermost grippers being mounted on said shaft to be opened and closed by rotation thereof, a hollow shaft coaxially rotatable on said gripper shaft, said central grippers being mounted on said hollow shaft to be opened and closed by rotation of said hollow shaft, said press having a machine frame structure on which said drum is rotatably mounted, said displacement control means and said release control means comprising cam means secured to said frame structure and cam-follower means mounted on said drum, said cam means and cam-follower means of said release control means being connected with said gripper shaft and said cam means and cam-follower means of said displacement control means being connected with said hollow shaft, whereby both said control means operate in positional dependence upon the drum rotation.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,534,683 Dated October 20, 1970

Inventor(s) Karl Barthel

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

In the heading to the printed specification, the name of the assignee was omitted. It should read HEIDELBERGER DRUCKMASCHINEN AKTIENGESELLSCHAFT, Heidelberg, Germany.

Signed and sealed this 22nd day of June 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents