United States Patent

Barthel

[15] **3,682,472**

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[54] **GRIPPER BRIDGE FOR TRANSFER CYLINDER IN ROTARY PRINTING PRESS HAVING A SHEET REGISTERING CORRECTING DEVICES**

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[52] **U.S. Cl.**.....**271/53**

[51] **Int. Cl.**.....**B65h 9/04**

[58] **Field of Search**.....271/53, 51, 80, 82; 101/408, 101/409, 410

[56] **References Cited**

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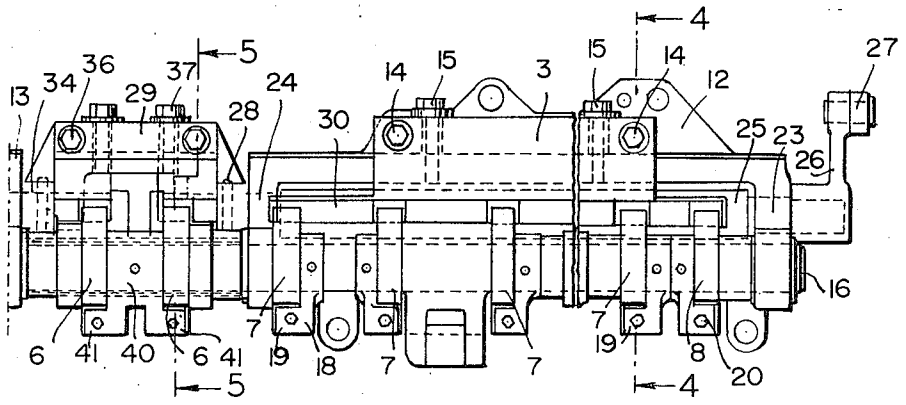
[57] **ABSTRACT**

In a transfer cylinder of a rotary printing press, a combination of a device for correcting registry of a sheet being printed by deforming the leading edge of the sheet, a gripper bridge including three gripper pad bars disposed end-to-end over the length of the bridge, each of the pad bars being individually adjustable in elevation and having a plurality of grippers associated therewith, and an adjusting member carrying the middle gripper pad bar and the grippers associated therewith and being adjustable along the path of feed of the sheet for deforming the leading edge of the sheet, and means effective during operation of the correcting device for closing all of the grippers associated with the middle gripper pad bar and only the outer endmost grippers of the grippers associated with the outer gripper pad bars, and releasing locking pressure of the remaining grippers associated with the outer gripper pad bars and located between the closed outer endmost grippers thereof and the closed grippers associated with the middle gripper pad bar.

2 Claims, 7 Drawing Figures



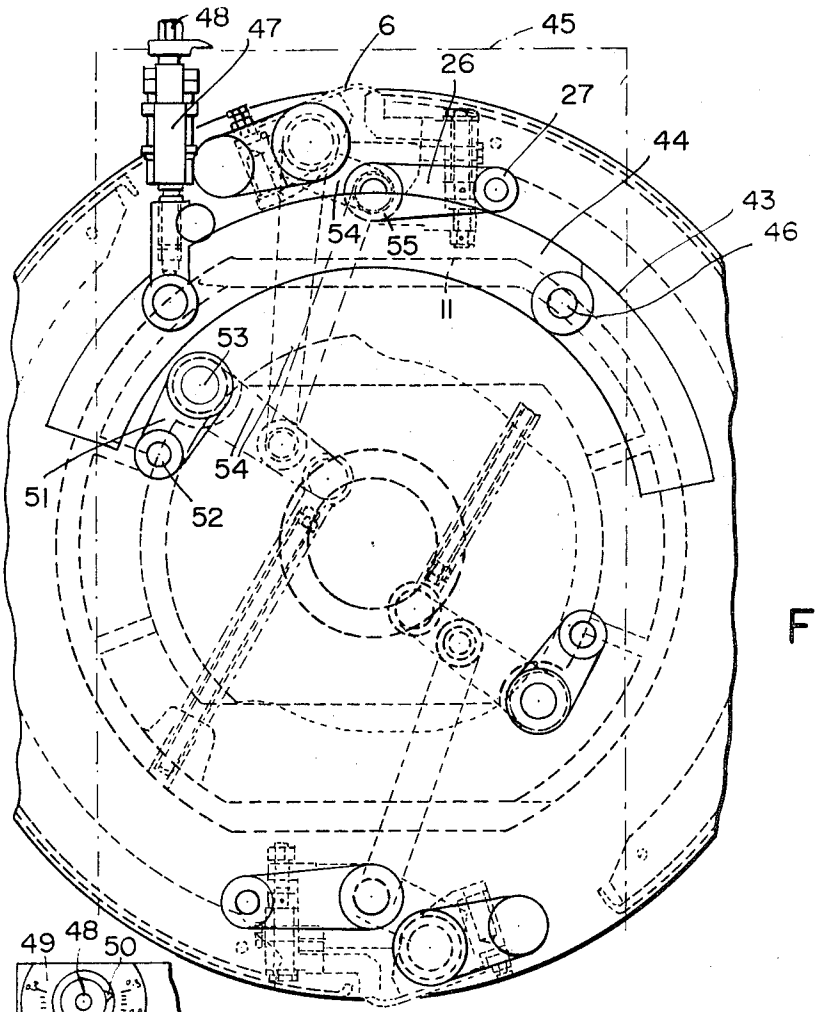


FIG. 6

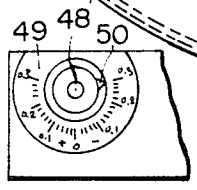


FIG. 7

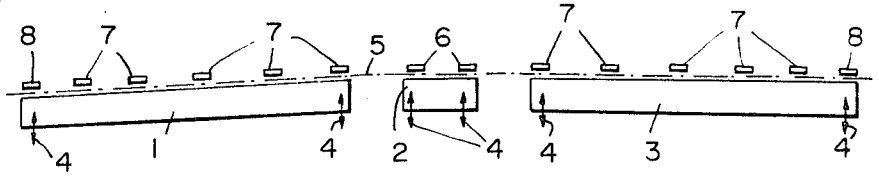


FIG. 1

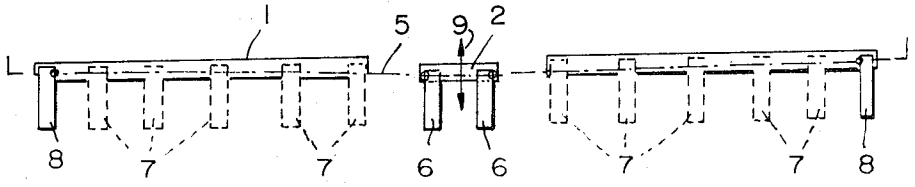


FIG. 2

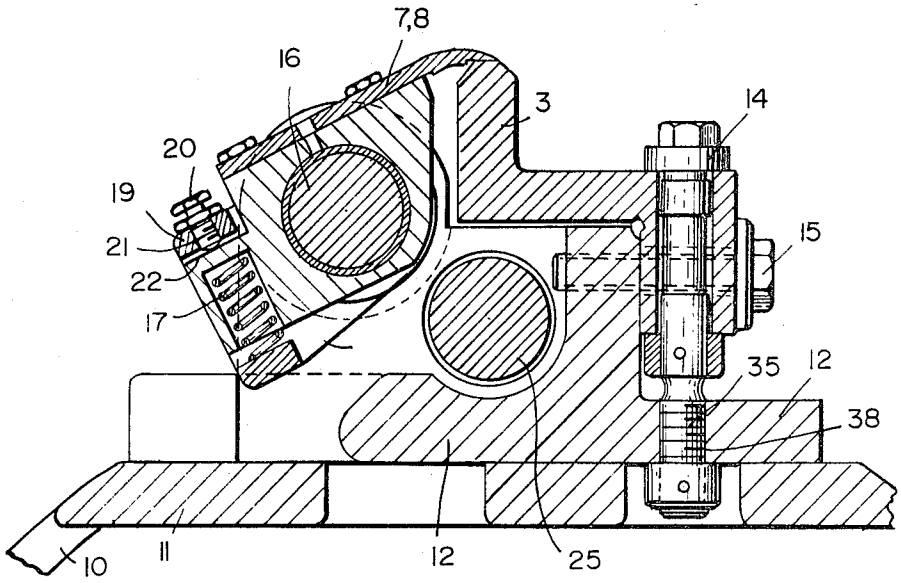


FIG. 4

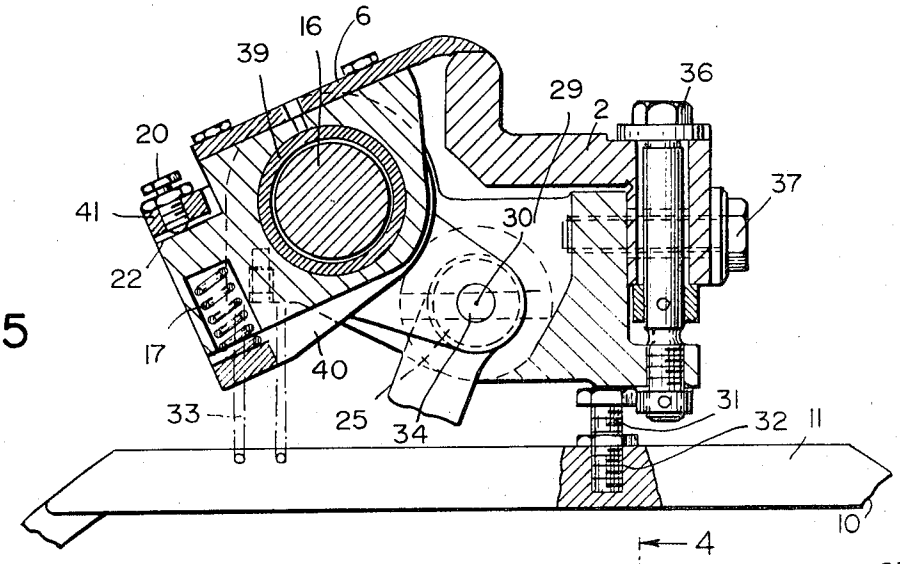


FIG. 5

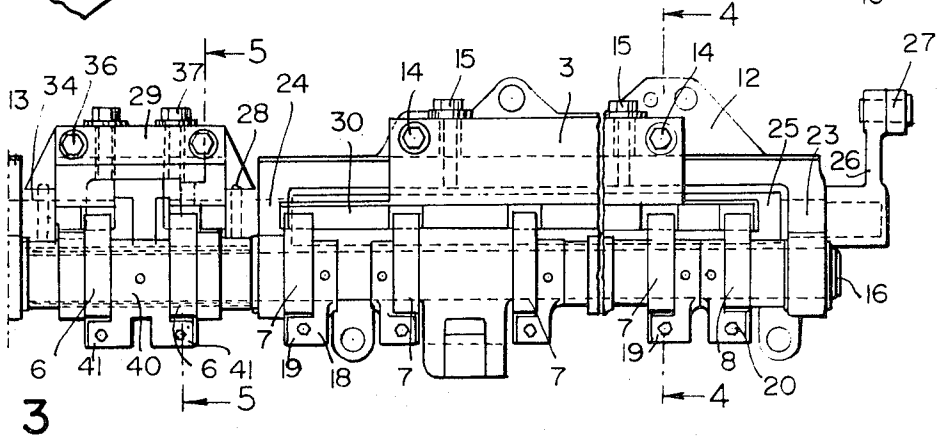


FIG. 3

GRIPPER BRIDGE FOR TRANSFER CYLINDER IN ROTARY PRINTING PRESS HAVING A SHEET REGISTERING CORRECTING DEVICES

My invention relates to gripper bridge for transfer cylinder in rotary printing press having a sheet registering correcting device, and more particularly, wherein the registry correcting device deforms the leading edge of the sheet either in the sheet feeding direction or in directions opposite or transverse thereto by means of grippers and gripper abutment surface members adjustable by mechanical control means.

In rotary printing presses, particularly for multicolor printing, each sheet experiences a slight change in size at each impression. This phenomenon occurs especially for offset machines due to the moistening process associated therewith. The dimension in the changing size is dependent on the one hand upon the quality of the paper being imprinted and, on the other hand, upon the size of the sheet and the amount of moistening.

To correct the changing size, the heretofore known control devices are provided between the printing units of the printing press in gripper bridges of the transfer cylinders thereof, which suitably correct the imprinted zone by deforming the leading edge of the sheet in the sheet feed direction or in a direction opposite thereto. For relatively large sheet sizes the deformation of the sheet increasing with each impression or printing can assume such dimensions that the necessary deformation of the leading edge of the sheet causes misalignments or loss of registry in the middle region of the sheet. The imprinted sheet, in spite of corrective measures in the printing material, becomes visibly worsened and eventually unusable because the maintenance of alignment or registry in the trailing region of the sheet can only be compensated by alignment errors in the leading or forward zone of the sheet even if only slight.

Correcting devices are also heretofore known in multicolor rotary printing presses which correct size change occurring in the trailing or rearward part of the sheet by bending the leading edge of the sheet perpendicularly to the direction of feed of the sheet. However, even in these devices alignment errors occur, after a specific bending of the leading edge of the sheet, in the leading or forward outer region of the sheet because the outer edges of the sheet are drawn inwardly during the registry correcting operation. This elevational adjustment of the gripper abutment surface members for bending the sheet convexly upwardly or downwardly, when considered with respect to the sheet by the grippers from one cylinder to another in the printing press, is limited only to a few tenths of a millimeter because otherwise, when transferring the sheet from one gripper system to another, the leading edge of the sheet would be torn. Greater changes in size for relatively large sheets can thus not always be effectively prevented by these means alone.

It is accordingly an object of my invention to provide gripper bridge for transfer cylinder in rotary printing press having a sheet registering correcting device, which would avoid such possible changes in size of a sheet of specific size to be imprinted one, two or more times, without permitting the occurrence of alignment or registry differences in the leading or forward region of the sheet, which would render the sheet unusable.

With the foregoing and other object in view, I provide in accordance with my invention, in a transfer cylinder of a rotary printing press, in combination, a device for correcting registry of a sheet being printed by deforming the leading edge of the sheet, a gripper bridge comprising three gripper pad bars disposed end-to-end over the length of the bridge, each of the pad bars being individually adjustable in elevation and having a plurality of grippers associated therewith, and an adjusting member carrying the middle gripper pad bar and the grippers associated therewith and being adjustable along the path of feed of the sheet for deforming the leading edge of the sheet, and means effective during operation of the sheet registry correcting device for closing all of the grippers associated with the middle gripper pad bar and only the outer endmost grippers of the grippers associated with the outer gripper pad bars, and releasing locking pressure of the remaining grippers associated with the outer gripper pad bars and located between the closed outer endmost grippers thereof and the closed grippers associated with the middle gripper pad bar.

With such a device as that of my invention, by preselected elevational adjustment of the gripper pad bars, the leading edge of each newly transferred sheet can be easily bent so that a part of the changing size has thereby been canceled. Thus, the bending of the leading edge of the sheet never has to assume such dimensions that, due to tearing of the leading edge of the sheet, difficulties will arise in the transfer of the sheet from one cylinder to the next one or that misalignments or inaccuracies in registry arise in the vicinity of the leading corners of the sheet because the remainder of the size change is balanced out by deforming the leading edge of the sheet in the travel direction of the sheet with the aid of the adjusting member while the printing press is in operation.

It has been found that this combined sheet correction so advantageously affects size changes of relatively large sheets with the imprinted impression thereon that the alignment or registry accuracy is maintained over the entire sheet.

Other features which are considered as characteristic for the invention are set forth in the appended claims.

Although the invention is illustrated and described herein as embodied in gripper bridge for transfer cylinder in rotary printing press having a sheet registering correcting device, it is nevertheless not intended to be limited to the details shown, since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a schematic front elevational view of a gripper bridge according to my invention;

FIG. 2 is a schematic plan view of FIG. 1;

FIG. 3 is a plan view of the right hand half of an actual gripper bridge constructed in accordance with my invention;

FIGS. 4 and 5 are cross-sectional views of FIG. 3 taken respectively along the lines IV—IV and V—V;

FIG. 6 is a schematic end view of a transfer cylinder in which a gripper bridge is installed according to my invention; and

FIG. 7 is a fragmentary top plan view of FIG. 6 showing a scale for adjusting the gripper bridge.

Referring now to the drawings and first, particularly to FIG. 1 thereof, there is shown schematically in elevational view a gripper bridge according to my invention which includes three gripper pad bars 1, 2 and 3 which are adjustable in elevation. As indicated by the double-headed arrow 4, elevational adjustment of the gripper pad bars 1, 2 and 3 is effected by adjusting means not shown in FIG. 1. A sheet having a leading edge 5 represented by a dot-dash line is pressed against the gripper pad bars 1, 2 and 3 by three groups 6, 7 and 8 of grippers. The middle gripper pad bar 2 is adjusted to a higher elevation than both outer bars 1 and 3 on opposite sides thereof. The outer bars 1 and 3 are inclined relative to the horizontal or to the non-illustrated axis of the transfer cylinder of a printing press on which the gripper bridge of my invention is installed, so that the leading edge 5 of the sheet is given a slightly convex shape upwardly. If no correction of sheet alignment or registry is necessary, the gripper pad bars 1 to 3 are adjusted so that they are parallel to one another in elevation. The adjustment in elevation of the gripper pad bars 1 to 3 is always carried out when the printing press is inoperative.

From the schematic view of the gripper bridge in FIG. 2, it can be observed that both outer gripper pad bars 1 and 3, as seen in sheet feed direction, i.e. vertically downward in FIG. 2, are rigidly mounted, whereas the middle gripper pad bar 2 together with the grippers 6 are adjustable in the sheet feed direction, as indicated by the double-headed arrow 9. The leading edge 5 of the sheet in the adjusted position thereof, shown in FIG. 2 is held by the middle grippers 6 and the respective outermost grippers 8, whereas the grippers 7, shown in phantom, i.e. in dot-dash lines, have been raised from their respective pad bars 1 and 3 or at least have been freed of terminal locking pressure. The leading edge 5 of the sheet is thereby induced to follow freely the adjusting movement of the middle gripper pad bar 2 and the respective grippers 6, which are kept closed. Distortions in the leading edge 5 of the sheet, which would otherwise occur if all the grippers were kept closed during the alignment correction operation, are thereby avoided.

FIGS. 3 to 5 show the structure of a gripper bridge according to my invention in detail. A transfer cylinder 10 (FIGS. 4 to 6) of a printing press, such as a multicolor rotary printing machine, is formed with a flattened portion 11, corresponding to a secant intersecting the periphery of the transfer cylinder 10. The flattened portion 11 provides a base for mounting the gripper bridge of my invention thereon by means of a pair of brackets 12 and 13 which are screwed to the flattened portion 11 and carry all of the parts of the gripper bridge. In FIG. 3, only the right-hand half of the gripper bridge of my invention is illustrated, the non-illustrated left-hand half thereof being merely a mirror-image of the illustrated half and consequently being omitted from the drawing. The gripper pad bar 3 is mounted on the bracket 12 so that it is adjustable in vertical direction. The elevational adjustment is provided by two set screws 14 having respective threaded portions 35 screwed into internally threaded bores 38 of the bracket 12. The set screws 14 are located respectively at each end of the gripper pad bar 3. The elevational adjustment is effected after tension screws 15 have been loosened. By tightening these tension screws 15, the gripper pad bar 3 is rigidly connected to the bracket 12.

The grippers 7 and 8 cooperate with the gripper pad bar 3. They are loosely rotatably mounted on a gripper shaft 16. Through a compression spring 17, they are braced against an entrainer member 18 having an entrainer portion 19 formed with a bore through which a stop screw 20 extends. The stop screw 20 has a free end 21 which is adjustable relative to an abutment surface 22 of the grippers 7 and 8, respectively. In two bearings 23 and 24 of the bracket 12, there is mounted an adjusting shaft 25 having a free end projecting out of the bearing 23. A roller lever 26 is secured to the free end of the adjusting shaft 25 and carries a cam roller or follower 27. A journal of the adjusting shaft 25 projecting through the bearing 24 is rigidly connected to an adjusting member 29 by means of a pin 28.

The shape of the adjusting member 29 is more clearly apparent from FIG. 5. The adjusting member 29 is pivotable about the axis 30 of the adjusting shaft 25. The basic attitude or position of the adjusting member 29 is provided by an adjusting screw 31 which is threadedly received in a threaded bore 32 formed in the flat portion 11 of the transfer cylinder 10. Helical springs 33, located between the adjusting member 29 and the flat portion 11 of the cylinder 10, bias the adjusting member 29 clockwise, as viewed in FIG. 5, toward the adjusting screw 31. The adjusting member 29 is pivotally mounted on a pin 34 (FIG. 3) at a side of the adjusting member 29 facing away from the adjusting shaft 25.

The gripper pad bar 2 is provided at the adjusting member 29. The rail 2 is adjustable in elevation by means of the set or adjusting screws 36 after the tension screws 37 have been loosened. Both grippers 6 are loosely mounted on a hollow shaft 39, coaxially through which the gripper shaft 16 extends. The inner diameter of the hollow shaft 39 and the outer diameter of the gripper shaft 16 differ at least by about 2 mm. On the hollow shaft 39, between both grippers 6, a double entrainer member 40 having two similar entrainer parts 41 is secured. In both entrainer parts 41, stop screws 20 are threaded, which press against the abutment surfaces 22 of the gripper 6 when the grippers 6 are raised. Both grippers 6 are continuously biased by a respective compression spring 17 clockwise in direction toward the gripper pad bar 2. Thus, all of the grippers are individually sprung.

The disposition of the adjusting member 29 and the components located thereon in the transfer cylinder 10 is especially apparent from FIG. 6. In particular, one can determine from FIG. 6, the control means for turning the adjusting shaft 25, and thus the manner in which the adjusting member 29 is pivoted about the pivot axis thereof for corrective purposes.

The aforementioned cam roller of follower 27 engages a cam surface path 43 of a cam lever 44 for each rotation of the transfer cylinder 10 during the corrective action and thereafter until the sheet is removed from the cylinder 10. This cam lever 44 is mounted so

as to be adjustably pivotable about a pin **46** in the frame wall **45** of a rotary printing press such as of the multicolor type. The free end of the cam lever **44** is articulatingly connected to an adjusting device **47** which is also mounted in the frame wall **45**. The adjusting device **47** includes an adjusting screw **48** which extends out of a scale **49**, as is evident, in particular, from FIG. **7**. With the aid of an indicator **50** mounted at the adjusting screw **48**, a reading can be obtained on the scale **49** of the distance the leading edge **5** of the sheet is drawn in the direction of sheet travel or feed or in opposite direction thereto for corrective purposes. Turning of the adjusting screw **48** effects a lower or higher positioning of the cam lever **44**.

Besides the control components for the adjusting member **29**, FIG. **6** also shows the control means for the middle grippers **6** mounted on the adjusting member **29**. At one end wall of the cylinder **10**, a roller lever **51** carrying a cam roller or follower **52**, is provided, and cooperates with a cam surface path located in the frame wall **45**. The roller lever **51** transmits the pivoting movement thereof through a shaft **53** and a control linkage **54** to the hollow shaft **39**. The pivot bearing **55** of the control linkage **54** that is directly connected to the hollow shaft **39** is disposed so that the rotary axis thereof is coincident with the pivot axis **30** of the adjusting member **29**, whereby the position of the grippers **6** with respect to the gripper pad bar **2** thereof remains unaffected when the adjusting member **29** pivots during the corrective action.

The operation of the aforedescribed gripper bridge of my invention is as follows.

In order to bend the leading edge of a sheet upwardly convex so that part of the fanning-out thereof, caused by moisture absorption and fulling of the paper, is compensated for, the tension screws **37** of the adjusting member **29**, are loosened and the gripper pad bar **2** is raised by means of the adjusting or set screws **36**. After the adjustment is made, the tension screws **37** are again tightened. Such an adjustment in elevation is always only of an order of magnitude of fractions of a millimeter. To prevent damage of the sheet due to the varying elevational adjustment of the gripper pad bars **1**, **2** and **3**, the tension screws **15** for the gripper pad bars **1** and **3** must be loosened, and the adjusting screws **14** must be suitably actuated so that the farthest inwardly located abutment surfaces of the gripper pad bars **1** and **3** are located nearly at the same elevation as that of the gripper pad bar **2**. The gripper pad bars **1** and **3** thus are disposed slightly inclined to the longitudinal axis of the transfer cylinder **10**. This basic adjusted orientation of the gripper pad bars of a gripper bridge remains constant during the printing of one typeface or edition. It is effected while making ready the printing work when the printing press is shut down and, the extent of inclination of the outer gripper pad bars **1** and **3** to the middle bar **2** is so chosen that no misalignment of sheet-to-type occurs in the corner region of the leading edge of the sheet in spite of the upwardly convex bend formed in the sheet.

If there should then occur, however, a specific fanning-out of the sheet in a trailing portion thereof so that, for example, the third or fourth printing is not in alignment with the first two printings, the cam lever **44** can be additionally adjusted through the adjusting device **47** so that, after the sheet is gripped, the adjusting shaft **25** is slightly turned by means of the cam roller or follower **27** and the roller lever **26** for each rotation of the transfer cylinder **10**, whereby the adjusting member **29**, shown in FIG. **5**, is pivoted counterclockwise about the axis **30** and in a direction opposing the pressure exerted by the helical spring **33**. The pivoting motion of the adjusting member **29** causes, for example, a pulling of the leading edge of the sheet, in the middle region thereon, as is apparent in FIG. **2**. But before the leading edge of the sheet, in the middle region thereof, is drawn or pulled in the sheet travel direction due to the pivoting of the adjusting member, a slight rotation of the gripper shaft **16** releases the locking pressure from all the grippers **7** on both sides of the middle grippers **6** or, in fact, actually lifts the grippers **7** from the sheet.

The outer grippers **8** of the gripper bridge continue to hold the outer ends of the sheet **5** firmly, however. This different operation of the grippers **7** and **8**, respectively, located on one and the same gripper shaft **16**, permits the varying adjustment of the stop screws **20** relative to the abutment surfaces **22** of the grippers **7** and **8**, respectively and, in fact, the spacing between the points of the stop screws **20** and the abutment surfaces **22** for the grippers **7** is smaller than for the grippers **8**. Consequently, when the gripper shaft **16** is rotated counterclockwise, the grippers **7** are entrained sooner than the grippers **8**.

The adjusting member **29** is pivoted only so slightly that the sheet is drawn or pulled only fractions of a millimeter, at the middle region of the leading edge thereof, in the sheet feeding direction. The deformation of the leading edge of the sheet is so minimal that no differences in alignment occur in the forward or leading sheet areas. The position to which the adjusting member **29** has been pivoted, is maintained during the rotation of the cylinder **10** until the braced sheet has been transferred to the respective gripper unit. This control of the middle gripper group **6** is carried out during operation of the printing machine and, moreover, at each transfer cylinder between the individual printing mechanisms of multicolor printing presses, for example.

The combination of elevational adjustment of the gripper pad bars **1**, **2** and **3** with control of the middle gripper group **6**, after releasing the locking pressure of both gripper groups **7**, permits a deformation of the leading edge of the sheet which assures printing alignment accuracy over the entire sheet.

I claim:

1. In a transfer cylinder of a rotary printing press, in combination, a device for correcting registry of a sheet being printed by deforming the leading edge of the sheet, a gripper bridge comprising three gripper pad bars disposed end-to-end over the length of the bridge, each of said bars being individually adjustable in elevation alternatively parallel to and inclined with respect to the axis of the transfer cylinder and having a plurality of grippers associated therewith, and an adjusting member carrying the middle gripper pad bar and the grippers associated therewith and being adjustable along the path of feed of the sheet for deforming the leading edge of the sheet, and means effective during operation of said sheet registry correcting device for

closing all of the grippers associated with said middle gripper pad bar and only the outer endmost grippers of the grippers associated with the outer gripper pad bars, and releasing locking pressure of the remaining grippers associated with said outer gripper pad bars and located between the closed outer endmost grippers thereof and the closed grippers associated with said middle gripper pad bar.

2. Gripper bridge for a transfer cylinder in a multicolor rotary printing press having a device for correcting registry of a sheet being printed by deforming the leading edge of the sheet in the feeding direction of the sheet or in direction opposite or transverse thereto with mechanical control means, the gripper bridge comprising three gripper pad bars disposed end-to-end over the length of the bridge, each of said pad bars being individually adjustable in elevation alternatively parallel and inclined with respect to the axis of the transfer cylinder and having a plurality of grippers associated therewith, and an adjusting member carrying the middle gripper bar and the grippers associated therewith and being adjustable along the feed path of the sheet for deforming the leading edge of the sheet, all of the grippers associated with said middle gripper pad bar and only the outer endmost grippers of the grippers associated with the outer gripper pad bars being closable and the locking pressure of the remaining grippers associated with said outer gripper pad bars and located between the closed outer endmost grippers thereof and the closed grippers associated with said middle gripper pad bar being releasable during operation of the sheet registry correcting device.

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