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Leeds, England
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 [33] **Great Britain**
 [31] **16888/67**

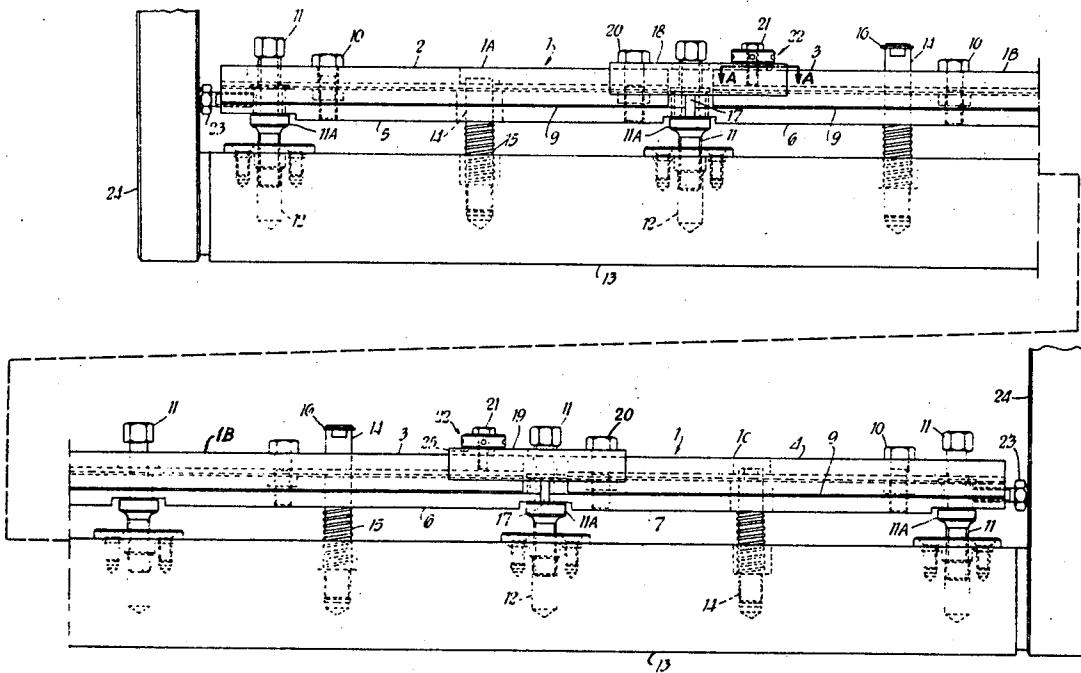
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[54] **PRINTING PLATE CLAMPING MEANS**
12 Claims, 8 Drawing Figs.

[52] U.S. Cl. **101/415.1,**
101/426
 [51] Int. Cl. **B41f 27/12**
 [50] Field of Search. **101/382,**
383, 415.1, 426

ABSTRACT: A printing plate clamp in which a clamping element is composed of at least two plate-clamping parts which are arranged end to end with a clearance between them. A printing plate extends across the clearance between the parts and the parts are relatively displaceable to decrease the size of the clearance so that a clamped printing plate is deformed thereby to distort the image thereon and compensate for deformation of the material being printed.



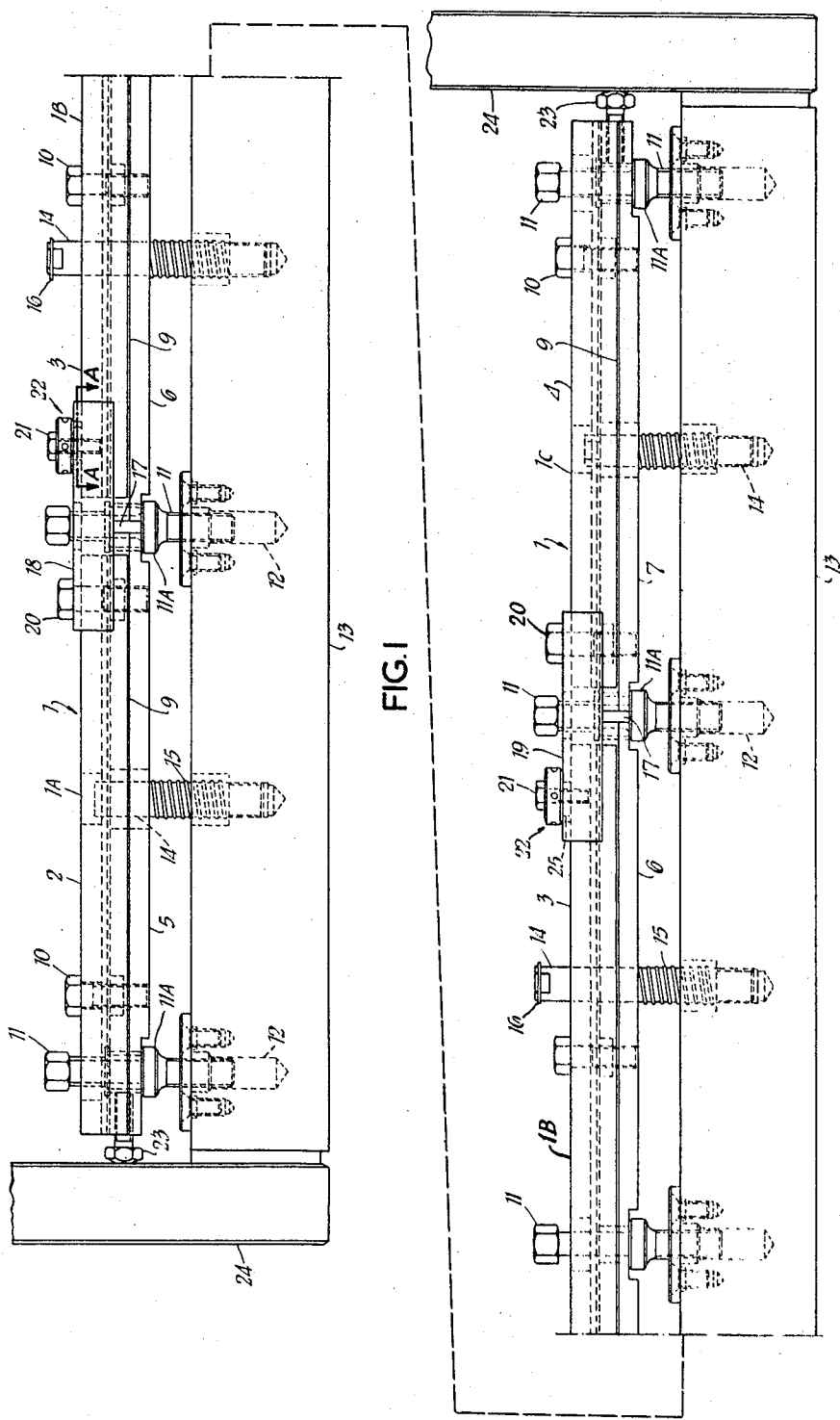


FIG. 1A

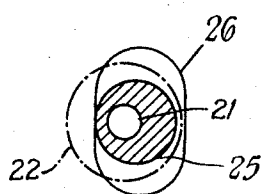


FIG. 2

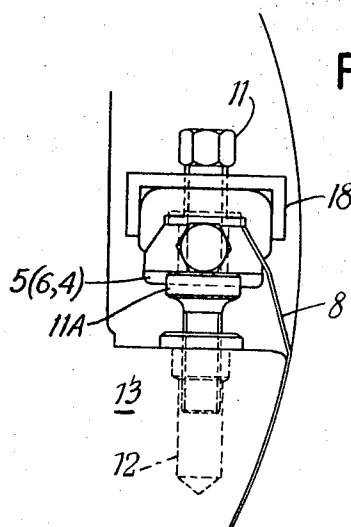


FIG. 3

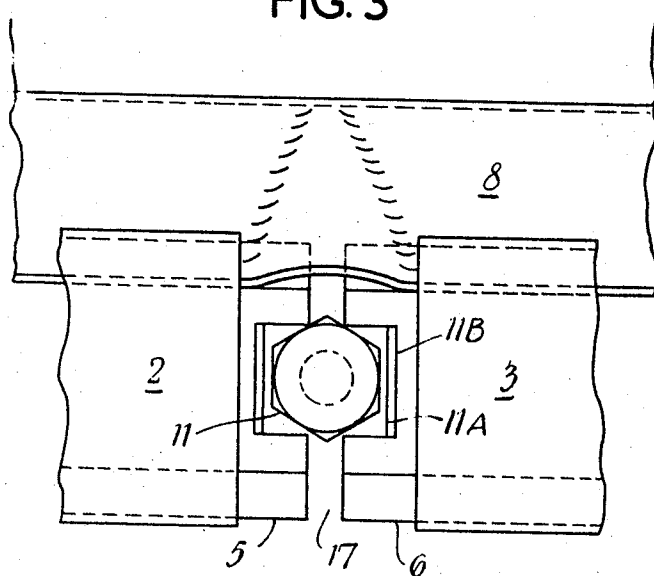


FIG. 4

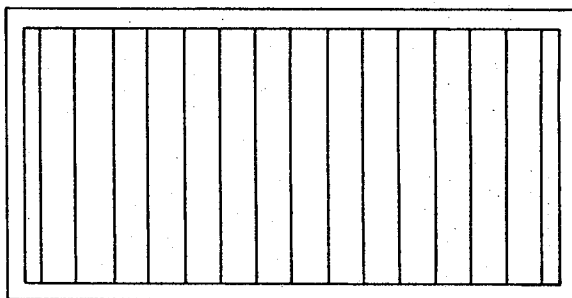


FIG. 5

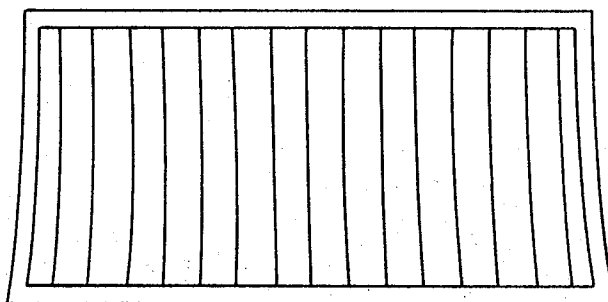


FIG. 6

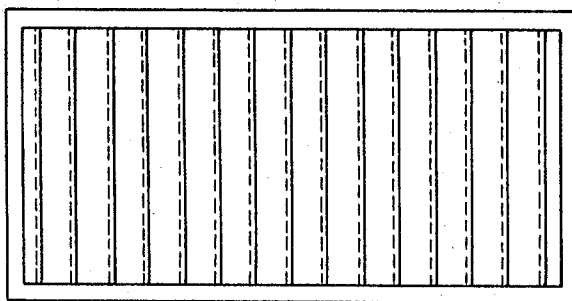
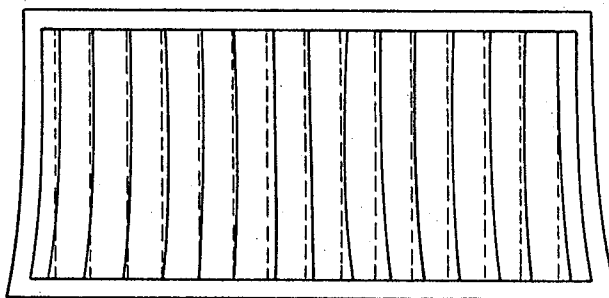


FIG. 7



PRINTING PLATE CLAMPING MEANS

BACKGROUND OF THE INVENTION

This invention relates to printing cylinders and to printing plate clamping means therefor.

In multicolor printing, a sheet or web of material to be printed is passed through successive printing couples in order to receive a multiplicity of colors or designs which in total produce the desired design.

In some printing processes, notably the lithographic process, the design or image is transferred to the sheet or web by means of a printing plate carrying the required design upon its surface. This printing plate is secured to a cylinder known as the plate cylinder, and is sufficiently flexible to be bent around the printing surface of the cylinder. The plate is secured in position by transverse clamps located at both transverse extremities of the printing surface of the plate cylinder. The clamps may comprise a plurality of individual clamping elements positioned transversely at said extremities of the printing surface or may comprise a single clamping element at each extremity of the printing surface of the cylinder.

When a multicolor design is desired, a printing plate for each color is required and each is fitted to the plate cylinder of one of the printing couples of a series of printing couples. To obtain an acceptable result, the individual designs produced by each successive printing couple must be in register with one another.

Some materials to be printed are unstable for various reasons, during or immediately after the printing process. One such reason may be that the material is hygroscopic.

Hence, it is known that a sheet of paper to be printed can become deformed during the printing process. Such deformation may occur whilst an image is being applied to the sheet. The deformed sheet receives an image and, after passage through that one of the printing couples, the sheet usually returns, at least partly, to its undeformed shape, with a corresponding deformation of the image. On its passage through the next printing couple, a sheet is quite frequently deformed differently from the manner in which it was deformed by the preceding printing couple and a further image is received by the sheet at least a part of which image is out of register with the first image. This gives rise to a blurred design.

Hitherto, efforts to overcome the above difficulty have been directed towards deformation of the sheet of material, prior to passage through a printing couple, the predeformation being in a direction opposite to that produced by the passage of the sheet through the printing couple, in an endeavor to cancel out the image distortion existing in certain circumstances. This predeformation has been applied to the leading edge of the sheet and as the greatest deformation normally exists at the trailing edge of the sheet after passage through a printing couple, the predeformation of the sheet may be considered of value in some cases only, and ineffective if the deformation were encountered on relatively thick paper or carton. With thicker materials deformation of the leading edge of the sheet may produce little or no deformation at the trailing edge. Also with thinner material, considerable creasing of the sheet can occur.

SUMMARY OF THE INVENTION

According to the present invention there is provided a printing plate clamping means comprising a clamping element composed of plate clamping parts which are arranged end to end with a clearance between adjacent ends, each clamping part including relatively displaceable portions which cooperate with one another to clamp a section of one end of a printing plate and locate said one end of the printing plate with respect to a printing cylinder, and adjusting means for displacing said parts relatively to one another to reduce said clearance, the arrangement being such that in use the clamped plate extends across said clearance and movement of said parts towards one another reduces the width of the plate in the

region of the clamping element thereby to distort the image on the plate and compensate for deformation of material being printed.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the invention and to show how the same may be carried into effect reference will now be made, by way of example, to the accompanying drawings, in which:

FIG. 1 is an elevational view of a plate cylinder clamping device,

FIG. 1A is a view of a detail of FIG. 1, taken along line A-A of Figure 1,

FIG. 2 is an end view of the clamping device,

FIG. 3 is a plan view, to an enlarged scale, of a part of the device shown in FIGS. 1 and 2, certain elements of the device being omitted for the sake of clarity, and

FIGS. 4 to 7 are views showing deformed and nondeformed sheets of material.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring firstly to FIGS. 1 and 2 of the drawings, there is shown a plate clamping device adapted to be mounted in a plate cylinder 13 at one end of the printing surface of the cylinder and being arranged to secure and tension a flexible printing plate about the periphery of the cylinder.

The clamping device comprises a clamping bar or element generally indicated at 1 and which is composed of an inner part 1B and two outer parts 1A and 1C. Each part of the bar has a main portion (referenced 2, 3 and 4) and a base portion (referenced 5, 6 and 7). Of course, if desired, more than two outer parts may be provided which will be mounted and arranged in similar manner to the two outer parts 1A and 1C and which will be described later. The rear or trailing end of a flexible printing plate 8 (FIG. 2) is taken through slots 9 defined between the base portions 5 to 7 and the main portions 2 to 4 and is clamped in position by means of screws 10 passed through bores in the bar 1. The bores in the main portions 2 and 4 are sufficiently large to allow the screws to turn freely, and the bores in the base portions 5 to 7 are threaded. The other end of the printing plate 8 is secured to a fixed abutment (not shown) of the plate cylinder, or may be received by another clamping device of the form shown and which is also mounted on the plate cylinder. The plate 8 may be tensioned about the periphery of the plate cylinder by adjustment of jacking screws 11 which are arranged throughout the length of the clamping bar 1 and extend through bores in the bar 1, the bores in the portions 2, 5 and 4, 7 being oversized. The screws 11 are received in bores 12 formed in the body of the cylinder 13. The screws 11 have collars 11A which bear on the underside of the base portions 5 to 7, against which the plate 8 is clamped, and urge the plate-clamping bar circumferentially away from the end of the printing surface, so tensioning the printing plate around the cylinder. Two of the screws 11 pass between the adjacent end of the parts 1A, 1B and 1B, 1C. This is best shown in FIG. 3 which is a plan view of the location at which the parts 2 and 3 adjoin. A bridging element (not yet described) has been omitted from this Figure. Each of these two screws 11 carries a block 11A which is entered in slots 11B in the ends of the portions 5, 6 and 7.

The three parts of the bar are guided by studs 14 which are screwed into the member 13 and are passed through elongated bores in the main and base portions. The bores in the parts 1A and 1C are oversized to permit limited transverse movement of the parts 1A, 1C. The studs 14 are surrounded by compression springs 15 which urge or tend to urge the bar 1 rearwardly and circumferentially, that is, away from the end of the printing surface of the cylinder. The springs 15 assist in tensioning the plate and also act to prevent the bar from moving when the press is run without a plate on the cylinder. The studs associated with the part 1B have circlips 16 at their extremities

to prevent the bar being displaced too far to the rear by the jacking screws 11.

The two outer parts 1A, 1C of the clamping bar are separated from the inner part 1B by clearances indicated at 17 and the outer parts are held in spaced relationship with respect to the inner part by bridging elements 18 and 19 which are secured to the outer parts by means of screws 20. However, the bridging elements 18 and 19 are connected to the inner part so as to be laterally adjustable by means of screws 21 and eccentric sleeves 22 as will be described.

The outer ends of the outer parts receive adjusting screws 23 which are adjustable so as to engage abutments 24 in the printing cylinder which abutments are connected to member 13. The screws 23 constitute compensating means which can impart lateral inward adjustment to the outer parts 1A, 1C with respect to the inner part 1B, but before this adjustment can be made the screws 21 and eccentric sleeves 22 must first be released, the screws 21 and sleeves 22 being resecured on completion of the adjustment. It will be evident that the oversized bores in the clamping bar for the outer screws 11 and studs 14 permit this adjustment of the outer parts 1A and 1C to be effected.

Each eccentric sleeve 22 surrounds its respective screw 21 and is rotatable relative thereto, and each sleeve 22 includes an eccentrically mounted spigot 25 (FIG. 1A) fixed thereto and arranged to displace the associated bridging element 18 or 19 to effect transverse movement of the outer parts 1A, 1C by engagement of the spigot 25 with the walls of a slot 26 formed in each element 18 and 19.

The eccentric sleeves 22 are locked in position by tightening the screws 21 such that its head moves down onto the sleeves 22. The screws 21 and eccentric sleeves 22 are operated when it is desired to return the outer parts 1A, 1C to the position they occupied before operation of screws 23.

In use of the clamping device, the flexible printing plate 4 is clamped in the clamping bar when the outer parts 1A, 1C are located in an outwardly extended position relative to the inner part 1B. Therefore, turning of the screws 23 to cause inward adjustment of the outer parts 1A, 1C towards the inner part 1B results in the trailing edge of the printing plate 4 being reduced in width. As will be seen in FIG. 3, this causes small flutes to be formed in the regions of the printing plate near clearances 17. This adjustment has the effect of reducing, by a small amount, the width of the image in the region of the trailing edge of the printing plate relative to the remaining part of the image so as to compensate for the deformation of the material which is being printed. Correspondingly, the image transmitted onto the sheet will be reduced by the same amount in the trailing edge region of the printing plate.

When it is desired to return the outer parts 1A, 1C to the positions which they occupied before adjustment of the screws 23 so as to permit the printing plate to be removed, the screws 23 are turned so that they are clear of the abutments 24 and the eccentric sleeves 22 are operated after release of the screws 21. The eccentric sleeves are operated by means of a tommy bar entered in appropriate holes in the eccentric sleeves so as to displace each bridging element 18 and 19 and the associated outer part.

It will be appreciated that the required amount of reduction in width in the region of the trailing edge of the plate is relatively small and usually the reduction is less than 0.020 inch at each clearance 17.

Referring now to the views of a sheet shown diagrammatically in FIGS. 4 to 7, FIG. 4 shows an undeformed sheet bearing a desired image. FIG. 5 shows a plan view of a sheet which has been deformed as a result of passage through a printing couple and it will be noted that the sheet is increasingly deformed laterally with increasing distance from the leading edge of the sheet. This causes a corresponding deformation of the image. FIG. 6 corresponds to FIG. 4 but shows a further image applied to the sheet in a desired manner. FIG. 7 corresponds to FIG. 5, but shows a further deformed image applied to the sheet.

With the clamping device described herein, it will be apparent that inward lateral deformation of the printing plate at its trailing edge region gives rise to a compensation for the normal deformation of the sheet. The image on the plate can be deformed inwardly to a degree equal and opposite to the deformation of the image caused by deformation of the sheet. Therefore, although the sheet itself will be deformed, the resulting image on the paper will not be deformed after contraction of the sheet, and will register correctly with successive images.

It will be apparent that the degree of adjustment of the compensating clamping device will depend on a number of factors, including the constitution of the sheet material.

The type of flexible printing plate 8 referred to herein may be of the type commonly used in the rotary lithographic process.

I claim:

1. A printing plate clamping means for a printing cylinder, including a distorting means for distorting the image on the plate by an amount sufficient to compensate for deformation of the material being printed, said distorting means comprising a clamping element composed of a plurality of plate-clamping parts arranged end to end with an axial clearance between adjacent ends, at least one of said parts being fixed axially relative to the printing cylinder and at least one other part adjacent the fixed part being movable axially relative to the printing cylinder, each clamping part including relatively displaceable portions which cooperate with one another to clamp sections of one end of a printing plate with respect to a printing cylinder, the plate clamped thereby extending across said axial clearance, and adjusting means operable when the clamping parts are holding said one edge of the printing plate for displacing said other part axially relative to the fixed part to reduce said axial clearance and thus also to reduce the width of the plate in the region of the clamping element to distort the image on the plate and compensate for deformation of the material being printed.

2. A printing plate clamping means according to claim 1, wherein said portions of each clamping part define therebetween a slot adapted to receive one end of said printing plate, there being screws for urging said portions towards one another to clamp a printing plate therebetween.

3. A printing plate clamping means according to claim 1, and including jacking screws for displacing the clamping element to enable a printing plate clamped thereby to be tensioned about the periphery of a printing cylinder.

4. A printing plate clamping means according to claim 1, wherein camming means are provided which act between said parts for urging said parts towards the relative positions which they occupied before operation of said adjusting means.

5. A printing plate clamping means according to claim 4, wherein said camming means includes an eccentric which is rotatably mounted on one of said parts and cooperates with a cam surface effectively fixed to the other of said parts.

6. A printing plate clamping means according to claim 5, wherein said parts are connected by a bridging element which is effectively fast with the other of said parts and which has a slot therein within which said eccentric is located, the eccentric cooperating with the boundary wall of the slot so that rotation of the eccentric causes the eccentric to act on said bridging element and urge said one part towards the position it occupied before operation of the adjusting means.

7. A printing plate clamping means according to claim 8, wherein said clamping element includes an inner clamping part and an outer clamping part on each side of said inner part, and wherein adjusting means are provided for displacing the outer parts towards and away from said inner part, there being a bridging element provided between each outer part and the inner part, each bridging element being effectively fast with its associated outer part.

8. A printing plate clamping means according to claim 1, wherein said clamping element includes a plurality of said axially movable plate-clamping parts arranged end to end with clearances between adjacent ends.

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9. A printing plate clamping means according to claim 8, wherein said clamping element includes an inner clamping part which is said fixed part and an outer clamping part on each side of said inner part, the outer parts being movable towards and away from said inner part.

10. A printing plate clamping means according to claim 1, wherein the adjusting means includes an adjusting screw acting between a fixed abutment and the said axially movable plate-clamping part to reduce said axial clearance.

11. A printing plate clamping means according to claim 10, wherein a head end of the adjusting screw bears on said fixed abutment and the screw is entered in a threaded bore of the movable clamping part so that rotation of the screw in one direction causes the clamping part to be urged away from said fixed abutment.

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12. A method of reducing distortion which occurs when an image is transferred from a plate held on a printing cylinder onto a sheet of material comprising the steps of: attaching to a printing cylinder an edge of a printing plate, which edge runs generally parallel to the axis of the printing cylinder, clamping the plate at a plurality of points along the edge with clamps which are arranged end to end and include clearance between them, and distorting the image on the plate by an amount sufficient to compensate for deformation of the material being printed by holding one of said clamps stationary with respect to said cylinder and moving at least another one of said clamps axially relative to said cylinder while said edge is clamped by said clamps.

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