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DeVore

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[54] **LITHOGRAPHIC PLATE BENDING ARRANGEMENT**

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[52] **U.S. Cl.** **72/319**

[51] **Int. Cl.²** **B21D 11/04**

[58] **Field of Search** 72/319, 306, 380, 384, 72/387, 406, 411, 460

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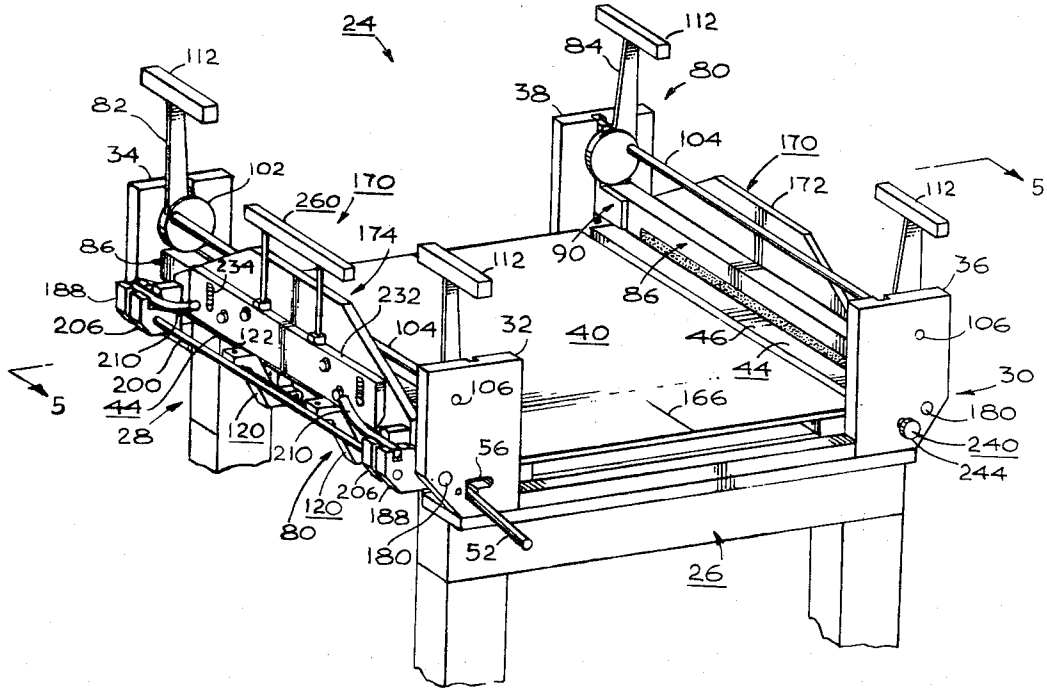
Attorney, Agent, or Firm—Don B. Finkelstein

[57] **ABSTRACT**

A bending jig for lithographic plates to provide precise bends in the leading edge and trailing edge thereof. The lithographic plate to be bent is supported on a plate support mounted in a support frame and a leading edge anvil and a trailing edge anvil are provided adjacent opposite ends of the plate support. Positioning means are provided for accurately positioning each lithographic plate in the jig in order that the bends may be made accurately and repetitively in lithographic plates. Bending bars are provided for moving in lithographic plate bending relationship to the leading edge anvil and trailing edge anvil to provide the bends in the plate required for mounting the plate accurately in the cylinder of an offset press.

22 Claims, 16 Drawing Figures



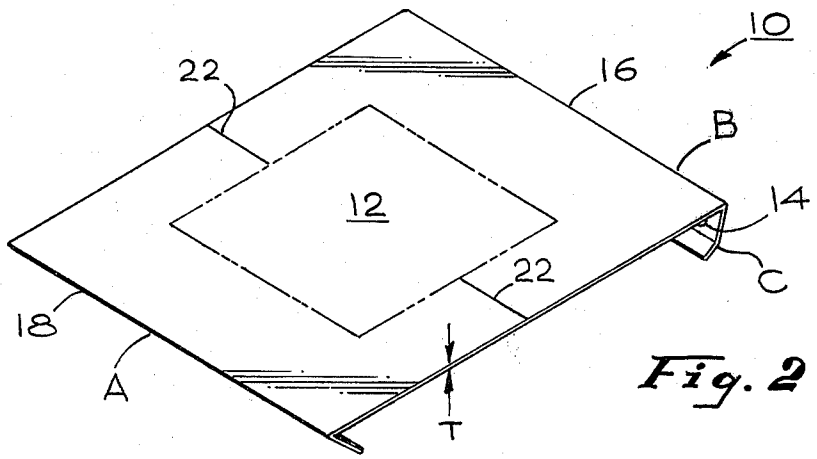


Fig. 2

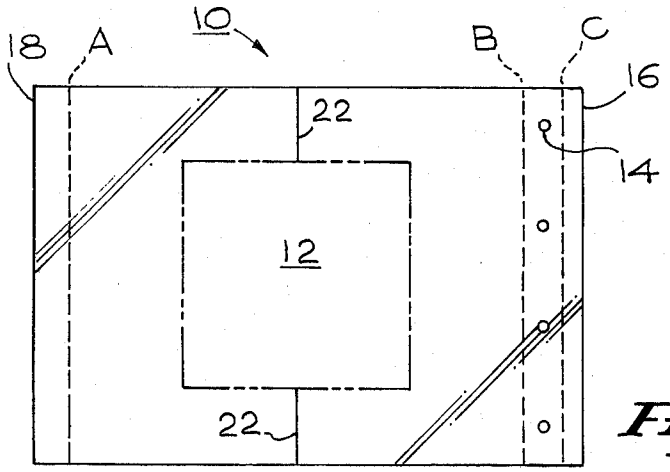


Fig. 1

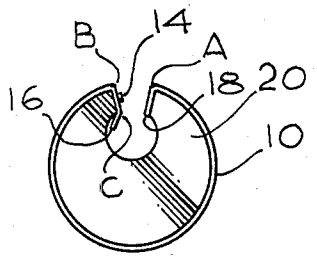


Fig. 3

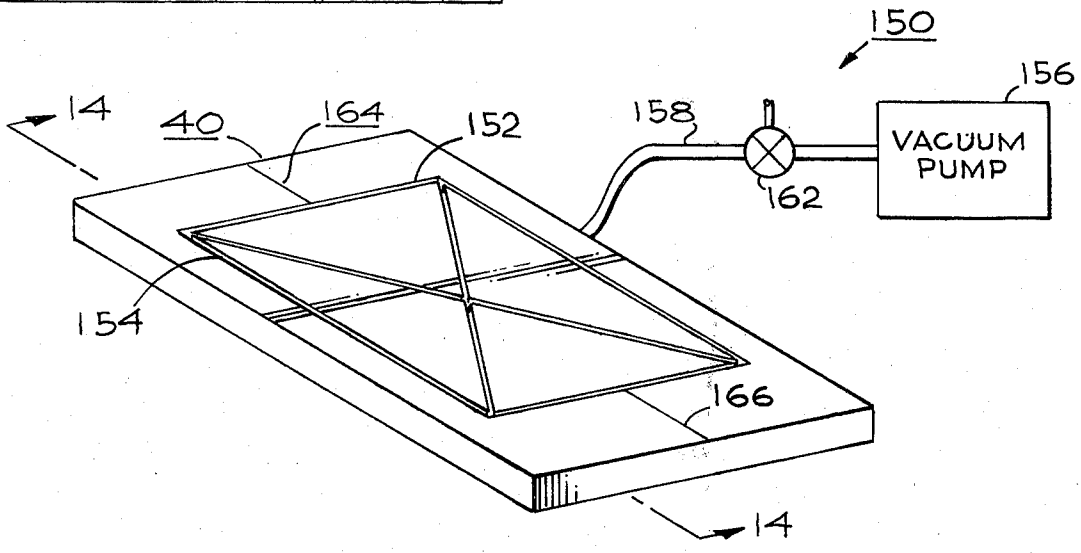


Fig. 13

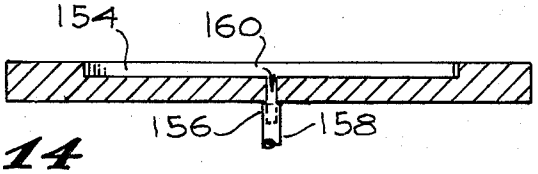


Fig. 14

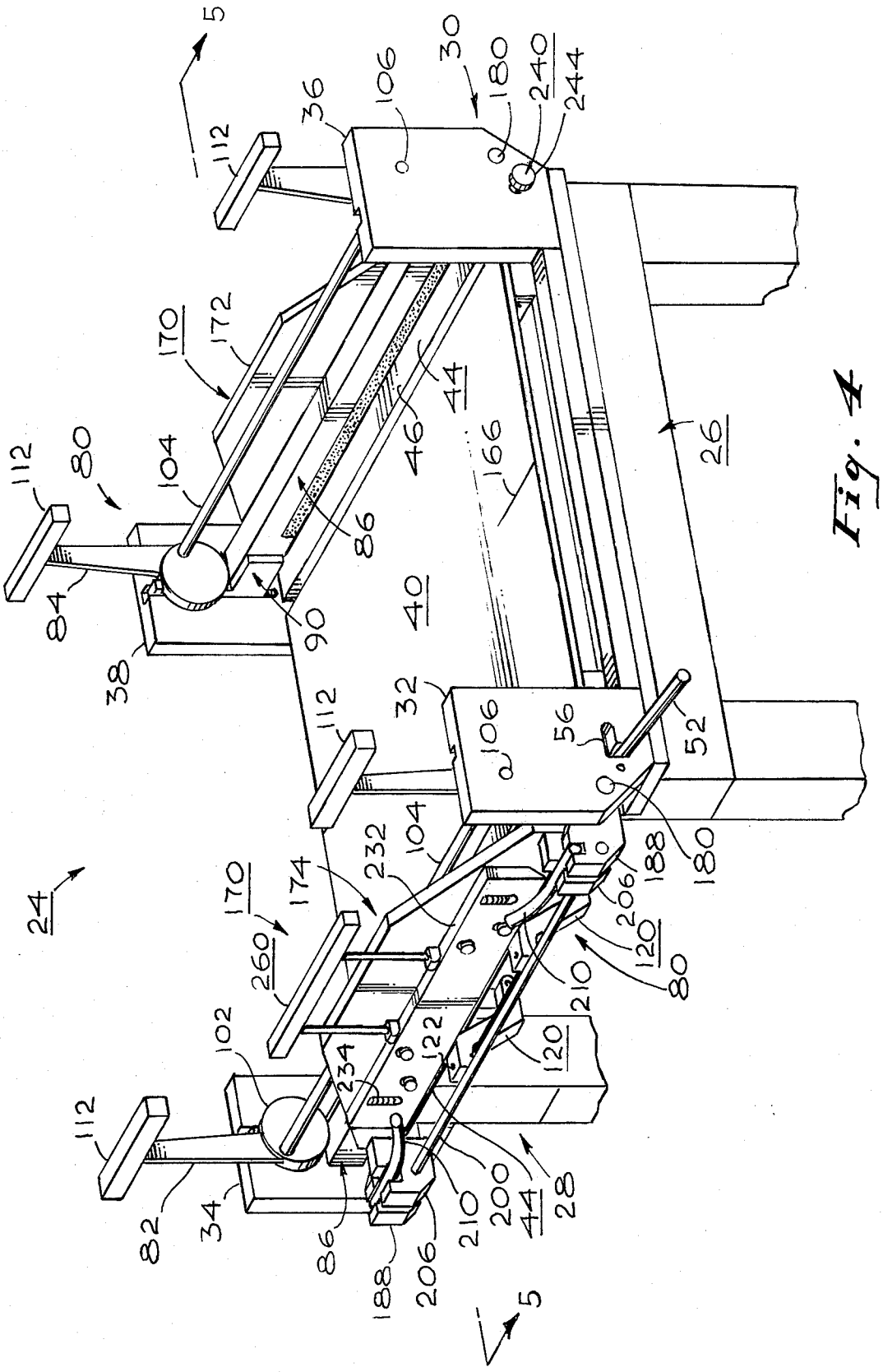

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Fig. 4

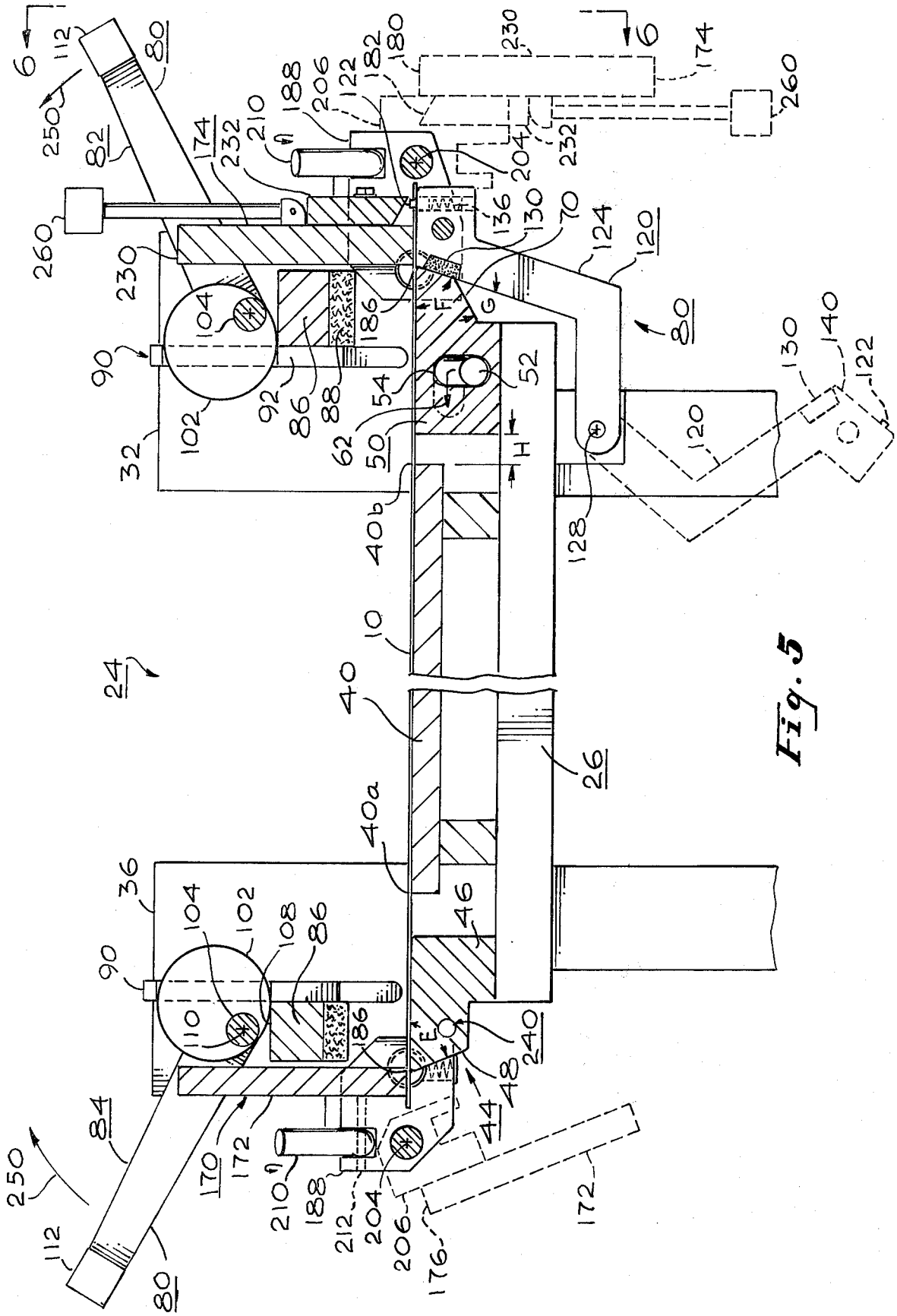
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Fig. 5

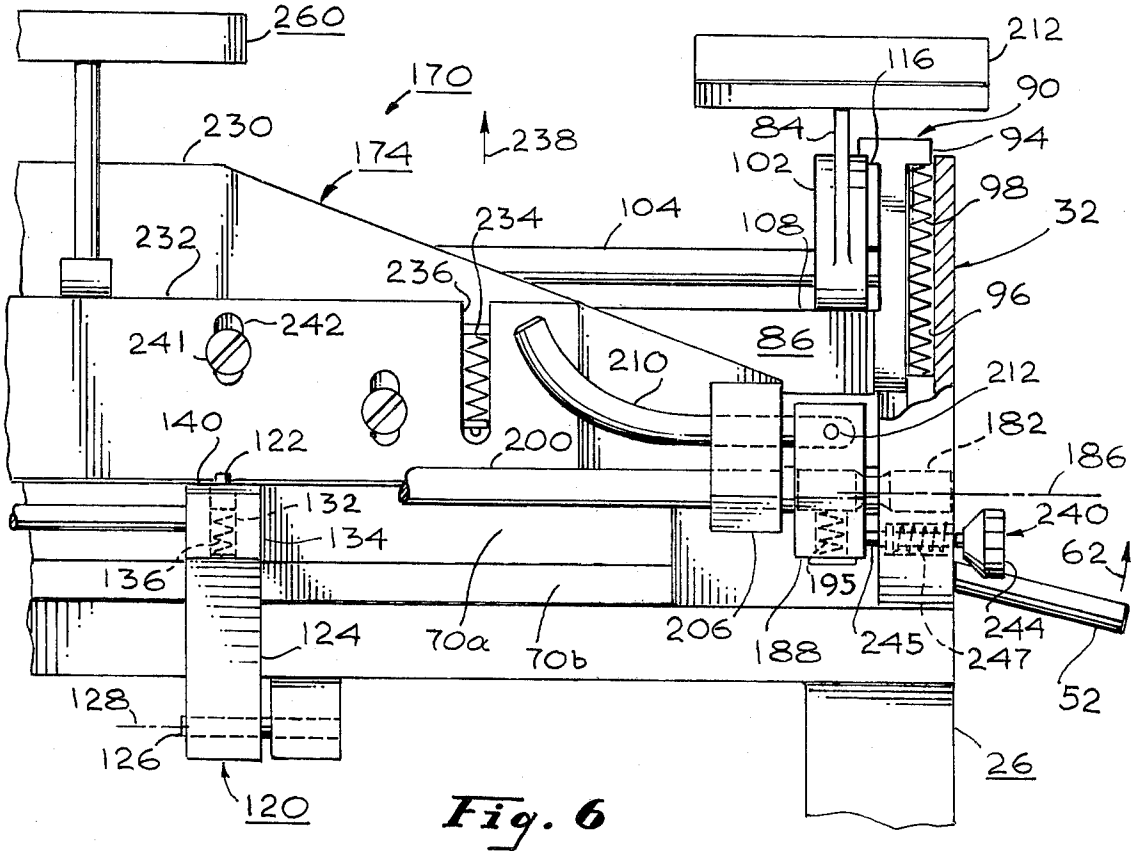

Fig. 6

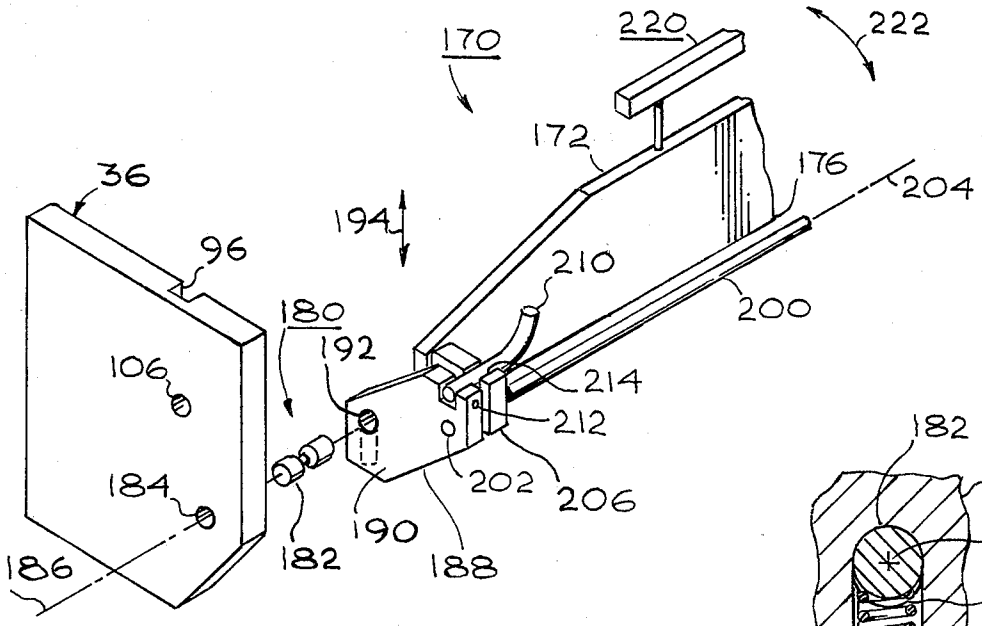

Fig. 15

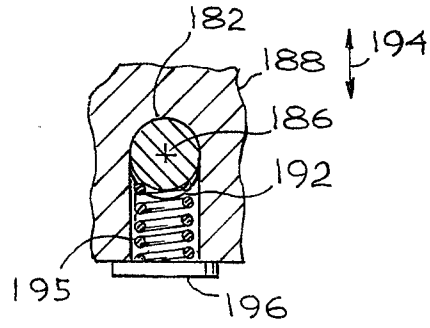

Fig. 16

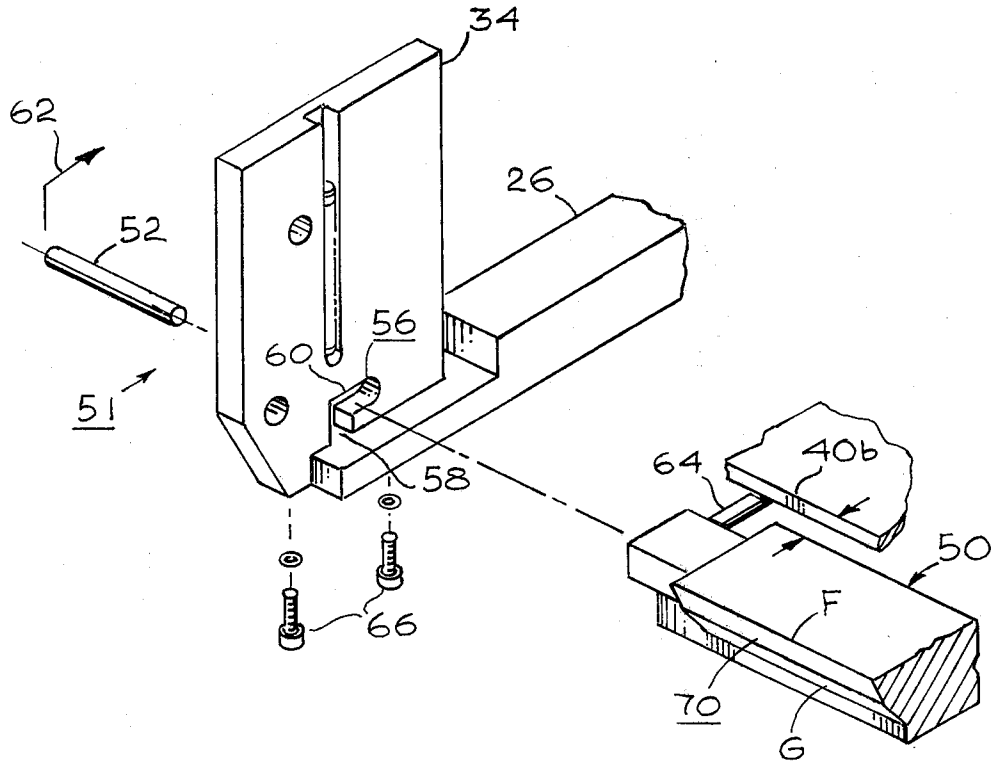
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Fig. 7

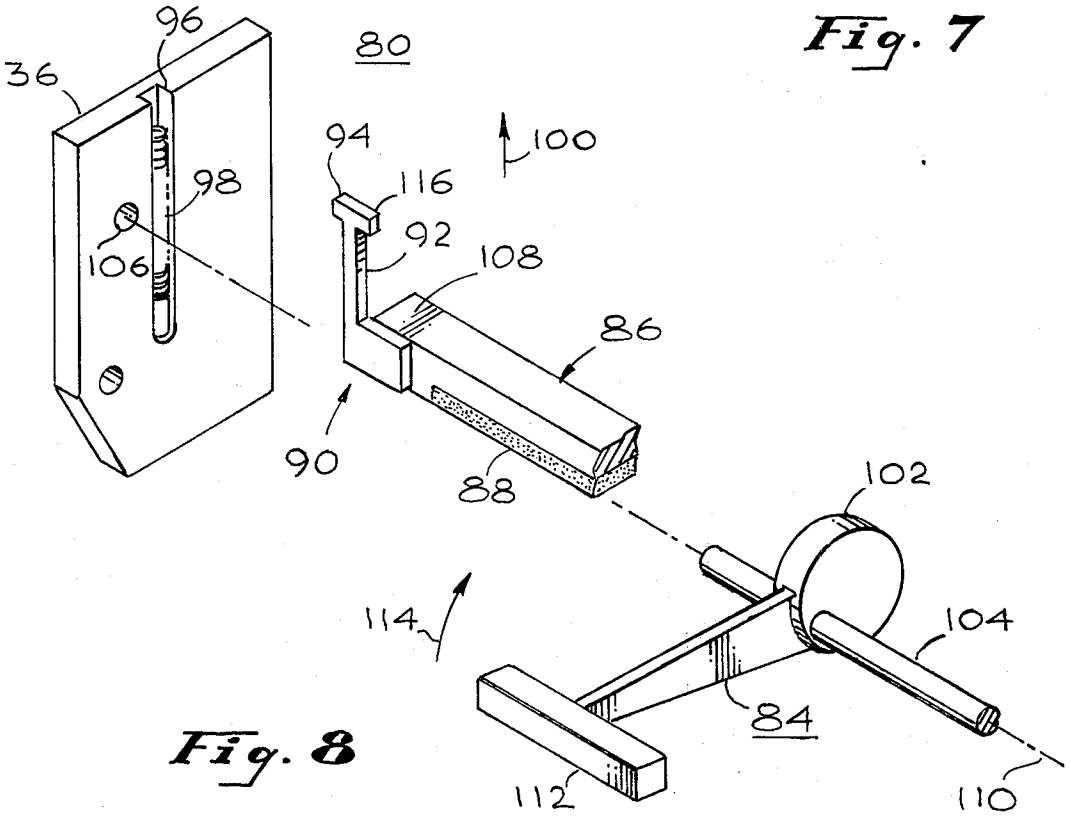
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Fig. 8

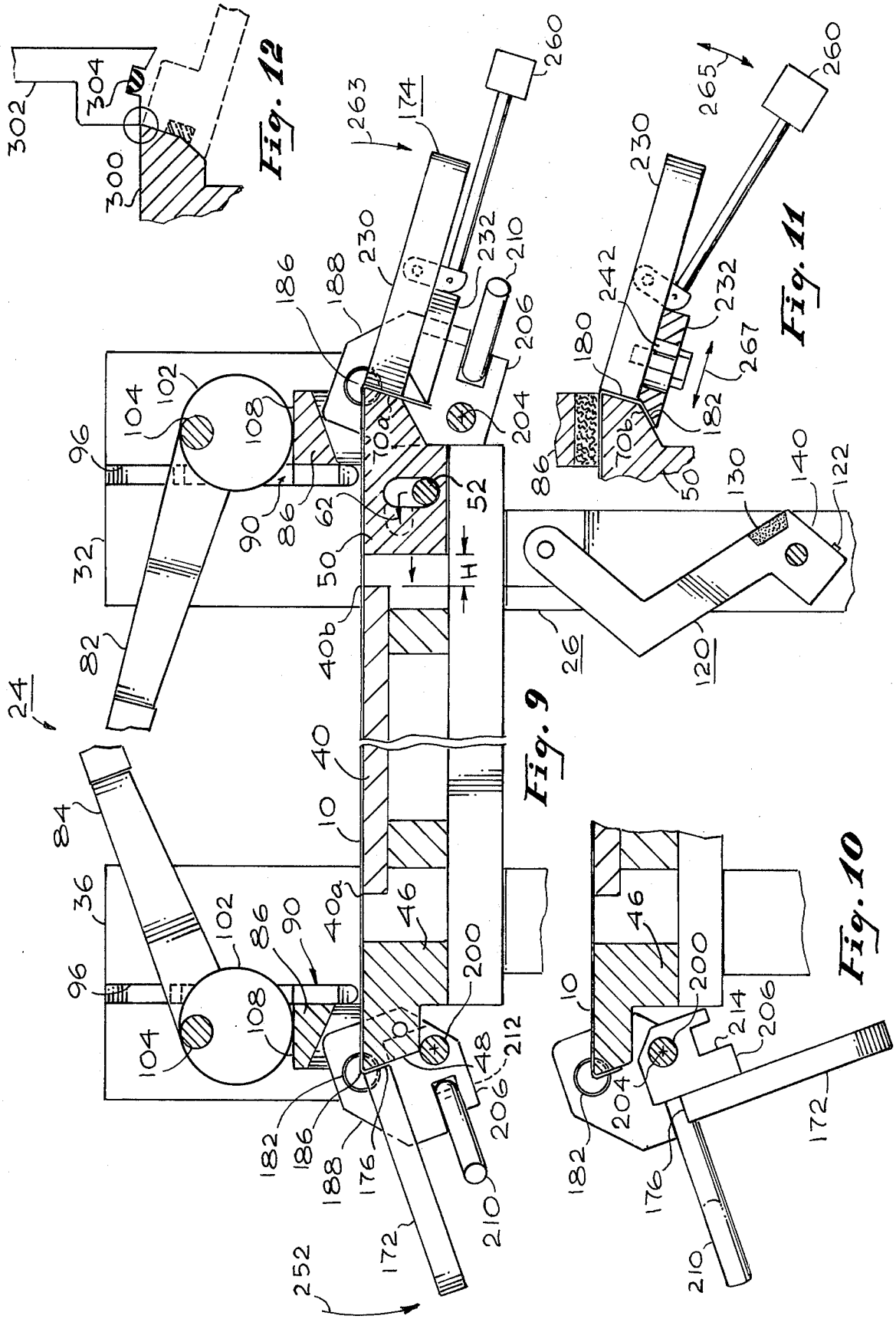
Fig. 9
Fig. 10
Fig. 11
Fig. 12

LITHOGRAPHIC PLATE BENDING ARRANGEMENT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to bending jigs and, more particularly, to lithographic plate bending jigs having leading end and trailing end bending sections for conforming the leading and trailing ends, respectively, of the lithographic plate to the bend requirements of the plate cylinder of an offset printing press.

2. Description of the Prior Art

The thickness of the lithographic plates employed in the printing industry may vary from comparatively thin plates having a cross-sectional dimension of for example **0.006** inch to thicker plates having cross-sectional dimensions of for example **0.020** inch. Known prior art bending jigs have generally been designed to provide lithographic plate bending when used for bending lithographic plates of one specified thickness. As a consequence, it if were desired to have a capability of bending lithographic plates of different thicknesses, a separate bending jig was required for each thickness. Otherwise, if lithographic plates having a thickness in excess of the specific design thickness for the particular bending jig were utilized, such thicker plates were severely stressed during the bending process, resulting in early fatigue failure in the plate as well as distortion of the image area thereon. If a thinner plate than the specific design thickness for the particular bending jig were utilized, the bends in such thinner plates were not accurately completed and the plates would be misaligned on the press resulting in improper registration.

Moreover, with many of the bending jigs heretofore in use, the plates were further stressed at the completion of the bending cycle, since it was necessary to flex the plate outwardly at the locus of the bend in order to remove the plate from the jig.

Further, many prior art bending jigs for lithographic plates did not clamp the plates securely during the bending operation which also resulted in plate misalignment when the plates were installed in the cylinder of **16** in the press.

Other prior art benders did not allow for rapid, accurate and repetitive positioning of the sequential plates, which often resulted in misregistration of images during the printing operation, since a plurality of such plates having the same basic images thereon are utilized to produce multi-colored prints.

Since the cylinders in different presses may require different types of bends in the lithographic plates, it is also desirable, from the standpoint of the manufacturer of the bending jigs, to incorporate a basic design of a bending jig requiring only minimum changes to the jig to provide different shaped bends.

In view of the limitations of the prior art bending jigs, it would of course, be advantageous to provide a single lithographic plate bending jig which would automatically adjust to and bend a plate having any thickness desired without additional stress and which would permit removal of the bent plate from the jig without reverse flexing of the plate at the locus of the bend. In addition, it would be advantageous to provide a simplified locating system for rapidly, accurately and repetitively positioning lithographic plates in the bending jig prior to commencing the bending cycle on each plate.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an improved lithographic plate bending jig arrangement.

It is another object of the present invention to provide a bending jig capable of making bends in lithographic plates of various thicknesses without image distortion or overstress thereto.

It is another object of the present invention to provide a lithographic plate bending jig in which the lithographic plate may be quickly and easily removed after bending without overstressing.

It is yet another object of the present invention to provide a lithographic plate bending jig in which lithographic plates may be accurately, rapidly, and repetitively positioned for bending.

It is another object of the present invention to provide a lithographic plate bending jig that may be rapidly and economically modified to accommodate different shaped bends.

The above and other objects are achieved in a preferred embodiment of the invention by providing a bending jig having leading and trailing bending sections for conforming the leading and traiiing ends respectively, of a lithographic plate to the bend requirements of the plate cylinder of an offset printing press.

The jig comprises a plate support mouned on a support frame. A first or leading edge anvil having a leading end bend portion is disposed adjacent to a forward edge of the plate support and a second or trailing end anvil having a trailing end bend section comprised of primary and secondary bend portions is disposed adjacent to rear edge of the plate support. At least one of the anvils for example, the second anvil, is movable with respect to the plate support between an outer, plate bending position and an inner, plate removal position.

The lithographic plate in which the bends are to be made is placed on the plate support with the leading edge overlying the first or leading edge anvil and the trailing edge overlying the second or trailing edge anvil.

Positioning means are provided to allow accurate, rapid and repetitive positioning of lithographic plates in the jig to provide identical bends in a plurality of plates. The positioning means may comprise a plurality of upstanding positioning pins movably mounted on the frame with respect to the plate support and adjacent one of the anvils, for example the second or trailing edge anvil. The pins are insertable into pre-punched pin apertures in the lithographic plate and the pins are movable from a first or aligning position during which the plate is being positioned and a second or retracted position during which the plate is bent and removed from the jig. The positioning means may also comprise one or more clamp means for releasably clamping the lithographic plate to the plate support during bending, vacuum holding means for holding the plate to the plate support during bending, and/or scribed guide lines on the plate support for alignment with corresponding lines on the plate.

Bending bar means are movably mounted on the support frame for movement in plate bending relationship to the first and second anvils to provide the desired bends in the plate. The bending bar means comprises a leading edge bender bar for forming the leading edge bends in the lithographic plate and a trailing edge

bender bar for making the trailing edge bends. Each of the bender bars are releasably securable in a first or bending position to main journal blocks. Mounting means support the main journal blocks on the support frame and the mounting means allows both resilient, rectilinear movement of the main journal blocks with respect to the support frame, to allow accommodation of lithographic plates of different thicknesses, as well as pivotal motion thereof about a main pivot pin having a main pivot axis during plate bending.

The main pivot pin is mounted on the support frame and the main journal blocks are pivotally mounted thereon and movable from a first position during plate insertion and removal to a second position at the completion of the bend.

The initial movement of the trailing edge bender bar adjacent the trailing edge anvil contacts the positioning pins and frees them from the plate for pivotal movement of the pin to the retracted position so they do not interfere with the plate bending operation.

After the bend is made, the bender bars may be released from the bending condition on the main journal blocks for pivotal movement independently of the main journal blocks away from the anvil on a secondary pivot pin about a secondary axis to a plate release position to allow removal of the plate from the jig. The secondary pivot pin is mounted on the main journal blocks in outwardly spaced relationship from the main pivot pin and the bender bars are pivotally mounted on the secondary pivot pin.

Clamp means and/or vacuum holding means are then released and the second anvil moved to the inner or plate removal position. The bent plate may then be easily removed from the jig.

After the plate is removed, the bender bars are rotated about the secondary axis and releasably secured to the main journal blocks which are then rotated to the first position and releasably secured in the first position to the support frame.

When it is desired to insert another plate, the second anvil is moved to the other or plate insertion position, the positioning pins are moved into the first or aligning position from the second or retracted position.

The bender bars are released from the journal blocks for pivotal movement about the secondary pivot pins to move the bender bars away from the anvils to a plate insertion position during plate insertion while leaving the journal blocks in the first position. The plate is then positioned in the jig by the positioning means, as above described.

The bender bars are then pivoted about the secondary pivot pins and releasably secured to the journal blocks, the mounting means of the journal blocks allowing rectilinear movement thereof to permit the bender bars to be properly positioned on the plate regardless of plate thickness.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other embodiments of the present invention may be more fully understood from the following detailed description taken together with the accompanying drawings wherein similar reference characters refer to similar elements throughout and in which:

FIG. **1** and **2** illustrate a lithographic plate that may be bent on the bending jig of the present invention;

FIG. **3** illustrates the installation of a lithographic plate bent on a bending jig in accordance with the principals of the present invention on the cylinder of an offset press.

FIG. **4** is a perpective view of a preferred embodiment of the present invention;

FIG. **5** is a sectional view of the embodiment shown in FIG. **4**;

FIG. **6** is an end view of the embodiment shown in FIG. **4**;

FIG. **7** is an exploded view illustrating certain aspects of the present invention;

FIG. **8** is an exploded view illustrating other aspects of the present invention;

FIGS. **9, 10,** and **11,** are views illustrating the operation of the embodiment shown in FIG. **4**;

FIG. **12** illustrates another embodiment of the present invention;

FIGS. **13** and **14** illustrate other aspects of the preferred embodiment of the present invention; and

FIGS. **15** and **16** illustrate other aspects of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings there is illustrated in FIGS. **1** and **2** a lithographic plate **10.** FIG. **1** illustrates a plan view of the lithographic plate **10** prior to bending in the bending jig of the present arrangement. The lithographic plate **10** has an image **12** thereon and is prepunched with a plurality of pin receiving apertures **14** therethrough adjacent a trailing edge thereof. The location of the apertures **14** is precise and they are positioned to be in register with the holding pins in the cylinder of the offset press, as described below.

In the plate **10** shown in FIGS. **1** and **2** the pin receiving apertures **14** are adjacent to trailing edge **16.** It will be appreciated that the pin receiving apertures could also be positioned adjacent the leading edge **18,** depending upon the location of the pins in the cylinder of the press. Alternatively, other means for aligning the lithographic plate **10** on the cylinder of the press maybe provided. The operation of the bending jig of the present invention may be satisfactorily accomplished regardless of the particular type of registration system utilized.

In order to secure the lithographic plate **10** to the cylinder of the offset press, it is desired to provide bend lines as indicated by the dotted lines A, B and C. In this embodiment shown in FIGS. **1** and **2** of the lithographic plate **10,** it is desired to make a single bend adjacent the leading edge **18** along the line A and two bends adjacent the trailing edge **16** along the lines B and C. However, as described below in greater detail, any number of bends maybe provided in accordance with the principles of the present invention adjacent either the leading edge **18** or trailing edge **16.** The terms leading edge and trailing edge are utilized herein for convenience of nomenclature and are not intended to be interpreted in a limiting sense on the principles of the present invention.

FIG. **2** illustrates the lithographic plate **10** after it has been bent along the lines A, B and C in the bending jig of the present invention. After the lithographic plate **10** has been formed with the bends shown in FIG. **2** it may be carefully installed on the cylinder of the press. FIG. **3** illustrates the lithographic plate **10** is installed on the cylinder **20** of an offset press. Since it is necessary to utilize a plurality of lithographic plates to provide a

multicolored printed image, registration of each of the lithographic plates on the cylinder **20** must be precisely accomplished. Accordingly, both the bend lines A, B and C as well as the location of the pin receiving apertures **14** must be as precise as possible in order to avoid off-registration during the printing operation when utilizing, sequentially, different lithographic plates to form a given multicolored image.

The thickness T of the lithographic plate **10** may vary, for example, between **0.006** inches to **0.020** inches. This is the comparatively standard range of lithographic plates. Therefore, in order to avoid misregistration the bending jig must make the bends A, B and C precisely in the same location and with the same angularity in plates of these varying thicknesses. In prior art jigs of conventional design, they were usually designed to accommodate a single thickness of lithographic plate. If thinner plate were bent on such a prior art bending jig the bends A, B and C would not be precisely made and consequently misalignment and misregistration of the image area **12** would occur after installation on the cylinder **20** of the offset press. Alternatively, if a thicker plate than the design thickness were installed, the lighographic plate **10** would be stressed causing fatigue failure in the plate and, in some instances, distortation of the image area **12** and consequent misregistration of the image when sequential printing operations occurred with different plates.

As a visual aid in providing alignment of the plate **10** scribe lines **22** extending laterally outwardly from for example, the image area **12** maybe provided for purposes as hereinafter described.

Referring now to FIG. **4** there is illustrated an embodiment **24** of a bending jig for lithographic plates in accordance with the principles of the present invention. The bending jig **24** is generally comprised of a support frame **26** having a trailing end **28** and a leading end **30.** The support frame **26** is also provided with a first pair of upstanding support plates **32** and **34** adjacent the trailing end **28** and a second pair of upstanding support plates **36** and **38** adjacent the leading end of the support frame **26.**

A plate support **40** is coupled to the support frame **26** and has a leading end **40***a* and **40***b*, as shown in FIG. **5.**

Anvil means, generally designated **44** are mounted on the support frame **26** adjacent the plate support **40.** The anvil means **44** generally comprises a leading edge anvil **46** adjacent the leading edge **40***a* of the plate support means **40** and spaced therefrom by the leading edge mounting block **40***a'* which is utilized to support the plate support **40** on the support frame **26.** In this embodiment of the invention the leading edge anvil **46** is rigidly mounted on the support frame with respect to the plate support **40.** Leading edge anvil **46** has a bend portion **48** having a predetermined bend shape. As shown on FIG. **5** the predetermined bend shape for the trailing edge anvil **46** is indicated by the letter E and is an acute angle. However, the angle E may be any angle required for bending the lithographic plate **10** to match the installation requirements in the cylinder **20** of an offset press.

The anvil means **44** also comprises a trailing edge anvil **50** adjacent the trailing end **40***b* of the plate support **40.** In this embodiment of the invention the trailing edge anvil **50** is slidably mounted on the support frame **26** for rectilinear movement towards and away from the trailing end **40***b* of the plate support **40.** Thus, FIG. **5** shows the trailing edge anvil **50** in a plate bending position wherein the lithographic plate **10** may be bent, as is more fully described hereinafter. The trailing edge anvil **50** is movable from the plate bending position shown in FIG. **5** through a plate removable position by moving the distance H towards the trailing end **40***b* of the plate support **40.**

FIG. **7** is an exploded view illustrating the structure utilized in the preferred embodiment of the present invention for moving the trailing edge anvil **50** from the plate bending position to the plate removal position. As shown in FIG. **7,** there is an anvil detente means **51** comprising a handle means **52** mounted in a slot **54** (shown in FIG. **5**) in the anvil means **50** and the slot **54** is vertically aligned. An "L" shaped slot **56** is provided in the upstanding end plate **34** having a vertically aligned portion **58** and a horizontally aligned portion **60** spaced upwardly therefrom. When the handle **52** is in the vertically downwardly portion of the slot **54** in the anvil **50** it is positioned in the vertically aligned portion of the slot **58** of the end plate **34** and rigidly retained therein and thereby holding the anvil **50** in the plate bending position. When the handle **52** is raised upwardly as indicated by the arrow **62** in FIG. **5** it moves upwardly in both the slot **54** and the slot **56** until it is aligned with the horizontally extending portion **60** of the slot in the upstanding end plate **34.** The handle is then moved in the direction indicated by the arrow **62** towards the plate support **40** the distance H thereby moving the anvil **50** upon suppor ways **64** the same distance. As shown on FIG. **7,** the upstanding end plate **34** is coupled to the support frame **26** by the pair of screw assemblies **66.**

The trailing edge anvil **50** has a bend portion therein generally designated **70** having preselected bend shapes. In this embodiment of the present invention the preselected bend shapes comprise a first bend having an acute angle indicated by the letter F and a second bend having an angle G.

It will be appreciated that any desired bend shapes may be provided in the leading edge anvil **44** and trailing edge anvil **50** as desired. It is only necessary to contour the anvil to the correct shape required by the particular offset press for which the lithographic plate **10** is to be bent. Therefore, the manufacturer of the bending jig according to the principals of the present invention may conveniently and easily change anvils to provide any desired bend shape.

It will be appreciated that the upstanding plate **32** is similarly provided for the above described anvil detent means for releasably securing the trailing edge anvil **50** in the plate bending position and allowing movement thereof towards the plate support **40** into the plate removal position.

Positioning means generally, designated **80** are also provided on the support frame **26** for positioning and releasably clamping the lithographic plate **10** in a predetermined location with respect to the leading edge anvil **44** and trailing edge anvil **50.** The positioning means **80** is comprised of clamping means **82** at the trailing end **28** of the jig **24** and clamping means **84** adjacent to the leading end **30** of the bending jig **24.** In this embodiment of the present invention the clamping means **80** is movably mounted on the support frame **26** and releasably clamps a lithographic plate **10** on the plate support **40** during the plate bending operation.

FIG. 8 is an exploded diagramatic view of the plate clamping means 80 utilized in the preferred embodiment 24 of the present invention. As shown on FIG. 8, which illustrates the mounting of the clamping means 84 in the upstanding support 36 adjacent the leading end 40 of the bending jig 24, which mounting, it will be appreciated, is the same as in the upstanding plate 38. The clamping means 82 adjacent the trailing end 28 of the bending jig 24 is similarly mounted in upstanding supports 32 and 34. The clamping means 84 generally comprises a shoe means 86 extending substantially the entire transverse width of the lithographic plate 10 to be bent as mounted between the plates 36 and 38 adjacent the leading edge anvil 46. Both FIG. 8 and FIG. 5 show the clamping means 84 in the retracted position. The shoe means 86 may be provided with a resilient pad 88 such as felt or the like, to provide the clamping surface thereof for engagement with the lithographic plate 10 in order to prevent damage thereto. Shoe mounting means generally designated 90 is comprised of T section 92 coupled to shoe means 86 and the T section 92 has an engaging portion 94 riding in slot means 96 in the upstanding plate 36. A shoe spring means 98 is mounted in the slot 96 and engages the upstanding plate 36 and the spring engaging portion 94 for yieldingly urging the shoe means 86 upwardly in the direction indicated by the arrow 100 away from the lithographic plate to be bent.

The clamping means 84 also comprises a cam means 102 mounted on cam shaft 104. Cam shaft 104 is journalled in bearings 106 in the end plate 36 to allow the cam means 102 to rotate. The cam 102 engages a cam engaging portion 108 on the shoe means 86 for moving the shoe means toward the lithographic plate 10, for clamping thereof to plate support 40, during rotation of the cam means 102 about the cam axis 110. Thus, as the cam handle 112 is rotated in the direction indicated by the arrow 114 the cam 102 engages the cam engaging portion 108 of the shoe means 86 to move the shoe means 86 to the plate clamping position thereof against the tension of the shoe spring means 98. The pad 88 engages the lithographic plate and firmly retains the lithographic plate 10 on the plate support 40 during the plate bending operation. When the plate bending operation is finished, the cam means may be rotated in a direction opposite to the direction indicated by the arrow 114 about the axis 110 and the cam means 102 engages the cam engaging portion 116 of the T section 92 to move the shoe means 86 upwardly in the direction indicated by the arrow 100 away from the lithographic plate to be bent and aided by the force of the shoe spring means 98.

The positioning means 80 also comprises a positioning pin means, generally designated 120, pivotally mounted on the support frame 26, as shown in FIG. 5, adjacent the trailing edge anvil 50. The positioning pin means 120 has positioning pins 122 in spaced apart relationship extending transversely across pin holder means 124 and accurately positioned for insertion in the pin receiving apertures 14 of the lithographic plate 10 in order to provide an accurate alignment of the lithographic plate 10 in the bending jig 24 prior to actuation of the clamping means 80 for clamping the plate 10 in position and prior to the bending operation, as described below, for providing the bends, A, B, and C in the lithographic plate 10. The positioning pin means 120 is pivotally movable from the alignment position shown in solid lines in FIG. 5 to a retracted position shown in dotted lines in FIG. 5 about positioning pin pivot means 126 having positioning pin axis 128. Positioning pin attachment means 130 which, for example, may comprise a magnet, is provided for releasably securing the positioning pin means 120 in the alighment position thereof shown in solid lines in FIG. 5.

The positioning pins 122 are mounted in pin recesses 132 in positioning pin holder means 134 and are urged in an upward position by positioning pin spring means 136. The positioning pin spring means is preferably made comparatively light so that the lithographic plate 10 may be slid over the pins without damage during insertion of the lithographic plate 10 in the jig 24 and the positioning pins 122 will then automatically pop up into the pin receiving apertures 14 of the lithographic plate 10 when the lithographic plate 10 is properly aligned therewith.

The positioning pin means 120 is also provided with an engagement portion 140 which, as hereinafter more fully described, is engaged during the initial operation providing the bends in the lithographic plate 10, with a force sufficient to overcome the magnetic attraction of the magnet 130 and allow the positioning pin means 120 to swing from the alignment position shown in solid lines on FIG. 5 to the retracted position shown in dotted lines on FIG. 5 under the force of gravity.

The positioning means 80 also comprises, in those embodiments of the present invention wherein it is desired, a vacuum holding means for providing additional force in releasably holding the lithograhic plate 10 on the plate support 40. FIGS. 13 and 14 illustrate a vacuum holding means 150 useful in the practice of the present invention to achieve this purpose. The vacuum means 150 generally comprises walls 152 in the plate support 140 defining vacuum grooves 154 therein. A vacuum generating means such as a vacuum pump 156 is connected by hose means 158 to the vacuum groove 154 at connection 156. When a vacuum is desired the vacuum pump may be operated and air is drawn through the vacuum grooves 154 in the direction of the arrow 160 thereby generating a lower pressure on the underside of the lithographic plate 10 to provide additional clamping action of the lithographic plate 10 to the plate support means 40. A vacuum relief valve 162 is also provided to release the vacuum at the end of the bending operation.

The positioning means 80 may also comprise a visual alignment means generally designated 164 which, in the embodiment 24 of the present invention comprises scribed lines 166 on the plate support 40, as shown in FIGS. 13 and 14, which, when the lithographic plate 10 is properly aligned on the plate support 40 are aligned with the lines 22 in the lithographic plate 10. This allows rapid positioning of the lithographic plate 10 to allow the positioning pin means 122 to extend upwardly through the pin receiving apertures 14 in the lithographic plate 10.

The bends A, B, and C in the lithographic plate 10 are provided by action of bending bar means, generally designated 170, that are pivotally mounted on support frame 26. The bending bar means 170 is generally comprised of a leading edge bender bar 172 and a trailing edge bending bar 174. The leading edge bending bar 172 has a bend forming surface 176 that passes a lithographic plate 10 bending relationship to the bend portion 48 of the leading edge anvil 44 during the bending

operation. Similarly the trailing edge bending bar **174** has bend portions **180** and **182** for passing in lithographic plate bending relationship to bend faces **70***a* and **70***b* of trailing edge anvil **50** to provide the bends B and C in the lithographic plate **10.**

Mounting means are provided for movably supporting both the leading edge bender bar **172** and the trailing edge bender bar **174** on the support frame **26** and the mounting means are generally designated **180.** In accordance with the principals of the present invention, each of the leading edge bendar bar **172** and trailing edge bender bar **174** have limited resilient rectilinear movement towards and away from the lithographic plage **10** during the bending operation thereof. This limited resilient rectilinear movement allows the jig **24** to make accurate and precise bends in lithographic plates of different thicknesses without requiring a separate jig for each different thickness of lithographic plate to be bent. The mounting means **180** also allows for pivotal movement of the bending bar means **170** on the support frame **26** to provide the bends A, B, and C as well as allowing removal of the lithographic plate **10** at the completion of the bending operation from the jig **24** and insertion of the next plate **10.**

FIG. **15** is an exploded view illustrating the mounting structure utilized in preferred embodiments of the present invention to provide the above described mounting of the bending bar means **170.** FIG. **15** illustrates the mounting of one end of leading edge bender bar **172** on the support frame **26.** It will be appreciated that both ends of the leading end bending bar **172** and trailing end bending bar **174** are similarly mounted on the upstanding plates **36** and **38,** and **32** and **34,** respectively.

As shown in FIG. **15** there is a main pivot pin means **182** mounted in pivot pin receiving aperture **184** of the upstanding plate **136** and having a main pivot pin axis **186.** Main journal block means **188** has walls **190** defining a main pivot pin receiving aperture **192** therein for accepting the main pivot pin **182.** The pin receiving aperture **192** is slightly larger than the main pivot pin means **82** to allow limited rectilinear movement of the main journal block means **188** with respect to the main pivot pin means **182** in the direction indicated by the arrow **194** towards and away from the lithographic plate **10.** The main journal block means **188** also pivots about the main pivot pin axis **186.**

As shown more clearly in FIG. **16** a main spring means **194** is inserted in the main pivot pin receiving aperture **192** of the main journal block **188** and is retained therein by closure plate **196.** The main spring means **194** yieldingly urges the main journal block means **188** downwardly in the rectilinear direction indicated by the arrow **194** towards the lithographic plate **10** to be bent by bearing against the main pivot pin **182.** This position is shown in FIG. **16.** Thus, the limited resilient rectilinear movement above described is provided by the main spring means **194** for accommodating lithographic plates of different thicknesses. Therefore, the limited resilient rectilinear movement described herein refers to the movement of the main journal block means **188** and, as described below in greater detail, bending bar means **170,** towards and awary from the lithographic plate to be bent a distance of, for example, **0.014** inch to accommodate lithographic plates having various thicknesses between **0.006** inch to **0.020** inch in thickness. It will be appreciated that these values are for example only and any desire of amount of limited rectilinear movement can be provided in accordance with the principals of the present invention.

A secondary pivot pin means **200** is mounted in secondary pivot pin receiving aperture **202** in the main journal block means **188.** The secondary pivot pin means **200** is spaced outwardly from the main pivot pin means **182** and has a secondary pivot axis **204.** Secondary journal block means **206** are rotatably mounted on the secondary pivot pin means **200** for rotation about the secondary pivot axis **204** with respect to the main journal block means **188** as well as the leading edge anvil **46.** The leading edge bender bar **172** is coupled to the secondary journal block means **206.**

Bender bar holding means are provided for releasably securing the secondary journal block means **206** to the main journal block means **188** in order to allow selective rotation of the leading edge bender bar **172** about the main pivot axis **186.** The bender bar holding means generally comprises a bender bar handle means **210** pivotally mounted on the main journal block **188** by handle pivot pin **212.** The secondary journal block means **206** is provided with aperture **214** for receiving the handle **210,** as shown in FIG. **15.** Therefore, with the handle means **210** releasably holding the secondary journal block means **206** to the main journal block means **188,** the leading edge bender bar **172** rotates about the main pivot axis **186** and the bending surface **176** thereof passes in lithographic plate bending relationship to the bend portion **48** of the leading edge anvil **46** to bend the lithographic plate **10** thereon and provides bend A therein. The main spring **194** provides the limited resilitent rectilinear movement of the leading edge bender bar **172** to accommodate lithographic plates of different thicknesses between the bend surface **176** of the bender bar **172** and the bend portion **48** of the leading edge anvil **46.** If desired, a handle means **220** may be coupled to the leading edge bender bar **17** for convenient gripping to allow rotation thereof about the main pivot axis **186** in the directions by the arrow **222.**

As noted above, the trailing edge bender bar **174** must provide both the bends B and C in the lithographic plates **10** to be bent. Accordingly, FIG. **6** illustrates the mounting of the trailing edge bender bar **174** which, as described above, is identical to the mounting of the leading edge bending bar **172** for limited rectilinear movement towards and away from the plate to be bent as well as pivotal motion about its main pivot axis **186.**

The trailing edge bender bar **174** comprises a primary bender bar **230** and a secondary bender bar **232** slidably mounted on the primary bender bar **230.** Bender bar spring means **234** are mounted in slots **236** of the secondary bender bar **232** for yieldingly urging secondary bender bar **232** in the direction of the arrow **238** into a retracted position as shown in FIG. **6.** Bolts **240** are utilized to mount the secondary bender bar **232** on the primary bender bar **230** and ride in slots **242** during movement of the secondary bender bar **232** with respect to the primary bender bar **230.** Thus, the secondary bender bar **232** has the retracted position as shown in FIG. **6** and is slidably movable therefrom on the primary bender bar **230** into a plate bending position. The primary bender bar **230** has the bending surface **180** and the secondary bender bar **232** has the bending surface **182** thereon.

Referring more particularly to FIGS. **5, 9, 10** and **11**, the operation of applicant's improved bending jig **24** may be clearly understood. As shown thereon in FIG. **9**, the clamping means **82** and **84** have been moved into the clamping position thereof for clamping the lithographic plate **10** on the plate support **40.** The main journal blocks **188** are secured to the secondary journal blocks **206** by handles **210** and the main jounral blocks **188** are secured by main journal block detente means **240** to the support frame **26** in a first position thereof. The main journal block detent means **240** is illustrated in FIG. **6** and comprises the main journal block detent handle **244** having a shaft **245,** biased by spring **247,** extending through support plate **32** and into the main journal block **188.** Each of the leading edge bending bar means **172** and trailing edge bender bar means **174** may be so retained by appropriate detent means, which have been omitted from FIGS. **15** and **16** for clarity.

The lithographic plate **10** is positioned on the plate support **40** utilizing the alignment guides such as the lines **22** in the plate **10** aligned with the scribed lines **166** in the plate support **40.** The positioning pins **140** of the positioning pin means **120** extend through the apertures **14** in the lithographic plate **10** and the positioning pin means **120** is in the alignment position thereof. This condition of the bending jig **24** is illustrated in FIG. **5.** When it is desired to make the bends in the lithographic plate **10** the clamping means are rotated in the directions indicated by the arrows **250** from the position shown in FIG. **5** to the position shown in FIG. **9,** thus clamping the lithographic plate **10** along the transverse width thereof to the lithographic plate support **40.** The main journal block detent means **244** are released to allow rotation of the main journal block means **188** about the main pivot axis **186.** The main spring means **194** yieldingly urge the bending bars **172** and **174** towards the lithographic plate **10** resistingly allowing spacing from the anvils **46** and **50** to accommodate the thickness of the lithographic plate **10** by movement of the main journal blocks rectilinearly on the main pivot pins **182** under the urging of spring means **194.** The leading edge bender bar **172** may be grasped and rotated in the direction indicated by the arrow **252** to rotate the leading edge bender bar **172** about the main pivot axis **186** with the bending surface **176** thereof passing in lithographic plate bending relationship to the bend portion **48** of the leading edge anvil **46** until it reaches the position as shown in FIG. **9.** At this point, the bend A has been completed. The handled **210** may then be rotated about the pivot pin **212** and removed from the slot **214** in the secondary journal blocks **206.** The secondary journal blocks **206,** to which the leading edge bender bar **172** is coupled, rotates on secondary pivot pin **200** about secondary pivot axis **204** to the position shown in FIG. **10** whereby the secondary bender bar **172** is spaced outwardly and free of contact with the lithographic plate **10.**

Similarly, the trailing edge bender bar **174** is clamped by handle means **210** to the main journal block means **188** and is rotated from the position shown in FIG. **5** in the direction indicated by the arrow **253.** During such rotation the bending surface **180** thereof passes in lithographic plate bending relationship to the lithographic plate **10** to form the bend A therein against the bending surface **70***a* in the trailing edge anvil **50.** This is the position shown in FIG. **9** at the completion of the bend B. The handle means **260** is pivotally mounted on the primary bender bar **230** of the trailing edge bending bar **174** and bears against the secondary bending bar **232.** After the completion of the bend B as shown in FIG. **9,** the handle **260** may be rotated in the direction indicated by arrow **263** to the position shown in FIG. **11.** During such rotation the handle means **260** bears against the secondary bender bar **232** to move it on the primary bender bar **230** in the direction indicated by the arrow **265** to provide the bend C. This movement is against the spring tension provided by the springs **234.** The bending surface **182** of the secondary bender bar **232** is forced into lithographic plate relationship to the bend portions **70***b* of the trailing edge anvil **50** to form the bend C therein. After the bend C has been formed the handle **260** is released and the springs **234** return the secondary bender bar **232** and handle **260** from the position shown in FIG. **11** to the position shown in FIG. **9.**

As noted above, the positioning pin means **120** has an engagement portion **140** thereon. As the trailing edge bender bar **174** commences rotation it engages the engagement portion **140** and the force thereof is sufficient to overcome the magnetic attraction between the magnet **130** and the anvil **50** thereby releasing the positioning pin means **120** so it may swing from the alignment position shown as solid lines in FIG. **5** to the retracted position shown in dotted lines in FIG. **5.** The limited amount of motion is preferably on the order of **1** to **2°.** Therefore, the positioning pin means **120** pivots completely away from the lithographic plate **10** once the bending operation has commenced and does not interfere with making the proper bends in the lithographic plate **10.**

At the completion of the bend C by the trailing edge bender bar **174** the handles **210** may be rotated to release the secondary journal blocks **206** from the positions shown in FIGS. **5, 6,** and **9** and the trailing edge bender bar **174** rotates on the secondary pivot axis **204** of the secondary pivot pin **200** and swings away from the lithographic plate to be bent in a manner similar to that described above for the leading edge bending bar **172** illustrated in FIG. **10.**

The bends in the lithographic plate have now been completed and the vacuum means **150,** if utilized, may be relieved. The trailing edge anvil **152** may be raised upwardly in the direction indicated by the arrow **62** for movement of the trailing edge anvil means **50** from the plate bending position the distance H towards the trailing edge **40***b* of the plate support means **40** into the retracted position thereof. The lithographic plate may then be easily removed from the bending jig **24** without distortion to the plate or damaging the bends A, B, and C that have been fabricated therein.

After removal of the lithographic plate **10** the main journal blocks **188** may be rotated about the main pivot pin axis **186** to return the main journal blocks **188** to the first position thereof and the detents **240** may be suitably engaged to retain the main journal blocks **188** in this position. Since the handles **210** had not been rotated to engage secondary journal blocks **206,** the leading edge and bender bar **172** and trailing edge bender bar **174** are rotated downwardly about the secondary pivot pin axis **204** and are in the position shown in dotted lines in FIG. **5.**

The positioning pin means **120** may be rotated upwardly from the dotted line position shown in FIG. **5** to the solid line position shown in FIG. **5** and another

lithographic plate **10** may be properly aligned and installed in the jig **24** as described above. The leading edge bending bar **172** may then be rotated about the secondary pivot axis **204** and the handles **210** rotated to engage a secondary journal blocks **206** to the main journal blocks **188.** Similarly, the trailing edge bender bar **174** may be rotated about the secondary pivot pin axis **204** and the handles **210** thereof rotated to engage the secondary journal blocks **206** thereof with the main journal block **188** thereof. The bending jig **24** is then in a position to make bends in the next lithographic plate **10** as shown in solid lines in FIG. **5.**

FIG. **12** illustrates an alternative arrangement for providing the second bend C in the lithographic plate **10.** As shown, there is an anvil **300** adjacent to which a bending bar **302** is pivotally mounted. The bending bar **302** rotates from the position shown in solid lines in FIG. **12** to the position shown in dotted lines in FIG. **12.** A resilient block means **304** is provided in the bender bar **302** at the location of the second bend and as the bender bar **302** rotates into plate bending relationship with the anvil **300,** the resilient block **304** engages the lithographic plate at the second bend area to form the second bend therein.

This concludes the description of the preferred embodiments of the present invention. As can be seen from the attached drawings and the above description, applicant has provided an improved bending jig for bending lithographic plates of varying thicknesses with precise alignment and registration thereof in order that the lithographic plates may be properly aligned and positioned in a cylinder of an offset press.

The appended claims are intended to cover all raiations and adaptations of the present invention falling within the true scope and spirit thereof.

I claim:

1. An improved lithographic plate bending jig arrangement comprising, in combination:

a support frame;

a plate support means mounted on said support frame and having a leading end and a trailing end;

anvil means having bend portions with preselected bend shapes and mounted on said support frame adjacent said plate support;

positioning means mounted on said support frame for positioning and releasably clamping lithographic plates to be bent thereon in a predetermined location with respect to said anvil means;

bending bar means moveably mounted on said support frame and having bender bars for passing in lithographic plate bending relationship to said anvil means, and said bending bar means further comprising mounting means for providing limited rectilinear movement of said bender bars towards and away from the lithographic plate to be bent; and

said limited rectilinear movement of said bender bars is resilient rectilinear movement and said mounting means further comprises main spring means for yieldingly urging said bender bars toward the lithographic plate to be bent to provide said limited resilient rectilinear movement thereof.

2. The arrangement defined in claim **1** wherein said mounting means further comprises:

main pivot pin means mounted on said support frame and having main pivot axis;

main journal block means having walls defining main pivot pin receiving apertures therein for accepting said main pivot pin means;

said main spring means positioned between said main journal block means and said main pivot pin means for yieldingly urging said main journal block means towards the lithographic plate to be bent to provide said limited resilent rectilinear movement, and said main journal block means rotateably mounted on said main pivot pin means for rotation about said main pivot axis to provide said movement in said lithographic plate bending relationship to said anvil means; and

bender bar support means for supporting said bender bars on said main journal block means.

3. Arrangement defining claim **2** wherein said bender bar support means further comprises;

secondary pivot pin means mounted on said main journal block means and spaced outwardly from said main pivot pin means and having a secondary pivot axis;

secondary journal block means rotatable mounted on said secondary pivot pin means for rotation about said secondary axis with respect to said main journal block means and said anvil means;

said bender bars coupled to said secondary journal block means; and,

bender bar holding means for releaseably securing said secondary journal block means to said main journal block means for selectively providing rotation of said bender bars and said secondary journal block means with said main journal block means on said main pivot pin means about said main pivot axis.

4. The arrangement defined in claim **3** wherein said mounting means further comprises:

main journal block detent means for releaseably securing said main major whole block means in a first position with respect to said support frame means.

5. An improved lithographic plate bending jig arrangement comprising, in combination:

a support frame;

a plate support means mounted on said support frame and having a leading end and a trailing end;

anvil means having bend portions with preselected bend shapes and mounted on said support frame adjacent said plate support, and said anvil means further comprises:

a leading edge anvil adjacent said leading end of said plate support means; and

a trailing edge anvil adjacent said trailing end of said plate support means, and at least one of said leading edge and trailing edge anvils is moveable towards and away from said plate support means between a plate bending position wherein said bender bar passes in lithographic plate bending relationship thereto and a plate removal position wherein the bent lithographic plate may be removed from the plate support means;

positioning means mounted on said support frame for positioning and releasably clamping lithographic plates to be bent thereon in a predetermined location with respect to said anvil means;

bending bar means moveably mounted on said support frame and having bender bars for passing in lithographic plate bending relationship to said anvil means, and said bending bar means further com-

prising mounting means for providing limited rectilinear movement of said bender bars towards and away from the lithographic plate to be bent, and said bending bar means further comprises:

a leading edge bender bar adjacent said leading edge anvil for performing leading edge bends in the lithographic plate to be bent; and,

a trailing edge bender bar adjacent said trailing edge anvil for forming trailing edge bends in said lithographic plate to be bent.

6. Arrangement defined in claim **5** and further comprising:

anvil detent means for releaseable securing said at least one anvil in said plate bending position.

7. Arrangement defined in claim **6** wherein:

said predetermined bend shape of said at least one anvil comprises a plurality of bends in the lithographic plate to be bent.

8. Arrangement defined in claim **7** wherein:

said bender bar adjacent said at least one anvil further comprises:

a primary bender bar for performing a first of said plurality of bends in the lithographic plate to bent;

at least one secondary bender bar slideably mounted on said primary bender bar for performing at least one other of said plurality of bends in the lithographic plate to be bent.

9. Arrangement defined in claim **8** wherein:

said secondary bender bar is slideably moveable from a first retracted position to a second plate bending position on said primary bender bar;

and further comprising:

secondary bender bar spring means for yieldingly urging said secondary bender bar into said retracted position.

10. An improved lithographic plate bending jig arrangement wherein the lithographic plate to be bent has walls defining pin receiving aperture means therethrough adjacent one end thereof and comprising:

a support frame;

a plate support means mounted on said support frame and having a leading end and a trailing end;

anvil means having bend portions with preselected bend shapes and mounted on said support frame adjacent said plate support;

positioning means mounted on said support frame for positioning and releasably clamping lithographic plates to be bent thereon in a predetermined location with respect to said anvil means, and said positioning means further comprising:

a positioning pin means pivotally mounted on said support frame adjacent said anvil means and said positioning pin means having positioning pins thereon insertable in the pin receiving apertures of the lithographic plate to be bent for the condition of the lithographic plate to be bent in an alignment position, for aligning the lithographic plate on said plate support means, and said positioning pin means pivotally moveable from said alignment position to a retracted position free of contact with the lithographic plate for the condition of said lithographic plate being bent; and

bending bar means moveably mounted on said support frame and having bender bars for passing in lithographic plate bending relationship to said anvil means, and said bending bar means further comprising mounting means for providing limited rectilinear movement of said bender bars towards and away from the lithographic plate to be bent.

11. The arrangement defined in claim **10** wherein said positioning means further comprises:

plate clamping means moveably mounted on said support frame for releaseable clamping the lithographic plate to be bent on said plate support means.

12. The arrangement defined in claim **10** wherein:

said positioning means further comprises:

walls defining vacuum grooves in said plate support means;

vacuum providing means coupled to said vacuum grooves for applying a predetermined vacuum to the lithographic plate to be bent for holding the lithographic plate on said plate support means; and

means for relieving said vacuum.

13. The arrangement defined in claim **10** wherein said positioning pin means further comprises:

a pin holder means having a plurality of positioning pin recesses therein, and said positioning pins in said pin recesses;

pin spring means between said positioning pins and said pin holder means for yieldingly urging said positioning pins outwardly therefrom;

positioning pin pivot means mounted on said frame means;

said pin holder means pivotally mounted on said positioning pin pivot means for said pivotal rotation thereof; and

positioning pin attachment means for releaseably securing said positioning pin holder means in said alignment position thereof.

14. The arrangement defined in claim **13** wherein:

said pin holder means has an engagement portion thereon for engagement with said bending bar means at a first predetermined portion of said movement thereof, and said positioning pin attachment means releasing said positioning pin holder means to allow said positioning pin holder means to move from said alignment position to said retracted position for the condition of engagement of said positioning pin holder means with said bending bar means.

15. The arrangement defined in claim **11** wherein:

said plate pipe clamping means further comprises:

shoe means adjacent said anvil means and extending substantially the tranverse width of the lithographic plate to be bent;

shoe mounting means for resiliently mounting said shoe means on said support frame for movement towards and away from said lithographic plate to be bent, and said shoe mounting means comprising shoe spring means for yieldingly urging said shoe spring means away from said lithographic plate to be bent; and

cam means rotatably mounted on said support frame for moving said shoe means into lithographic plate clamping engagement with the lithographic plate to be bent for clamping thereof to said plate support means.

16. An improved lithographic plate bending jig arrangement comprising, in combination:

a support frame;

a plate support means mounted on said support frame having a leading end and a trailing end;
anvil means comprising:
a leading edge anvil adjacent said leading end of said plate support means; and
a trailing edge anvil adjacent said trailing edge of said plate support means; and
each of said leading edge anvil and said trailing edge anvil have bend portions therein having preselected bend shapes;
positioning means on said support frame for positioning and releasably clamping lithographic plates to be bent thereon in a predetermined location with respect to said leading edge anvil and said trailing edge anvil;
bending bar means pivotably mounted on said support frame, and said bending bar means further comprising:
a leading edge bender bar for passing in lithographic plate bending relationship to said leading edge anvil for providing leading edge bends in said lithographic plate to be bent conforming to said preselected bend shape of said leading edge anvil; and
a trailing edge bender bar for passing in lithographic plate bending relationship to said trailing edge anvil for providing trailing edge bends in said lithographic plate to be bent conforming to said preselected bend shape in said trailing edge anvil;
mounting means for movably supporting said leading edge bender bar and said trailing edge bending bar on said support frame, and said mounting
means further comprising:
main spring means for yieldingly urging said leading edge bender bar and said trailing edge bender bar towards the lithographic plate to be bent to provide limited resilient rectilinear movement of said leading edge bender bar and said trailing edge bender bar towards and away from the lithographic plate to be bent.

17. The arrangement defined in claim **16** wherein:
said mounting means further comprises:
main pivot pin means mounted on said support frame and having main pivot axis;
main journal block means having walls defining main pivot pin receiving apertures therein for accepting said main pivot pin means;
said main spring means between said main journal block means and said main pivot pin means for yieldingly urging said main journal block means towards the lithographic plate to be bent, and said main journal block means rotatably mounted on said main pivot pin means for rotation about said main pivot axis;
bender bar support means for supporting said bender bars on said main journal block means and comprising:
secondary pivot pin means mounted on said main journal block means and spaced outwardly from said main pivot pin means, and having a secondary pivot axis;
secondary journal block means rotatably mounted on said secondary pivot pin means for rototation about said secondary axis with respect to said main journal block means and said anvil means;
said leading edge bender bar and said trailing edge bender bar coupled to said secondary journal block means;
bender bar holding means for releasably securing said secondary journal block means to said main journal block means for selectively providing rotation of said leading edge bender bar and said trailing edge bender bar and said secondary journal block means about said main pivot axis; and
main journal block detent means for releasably securing said main journal block means in a first position with respect to said support frame means.

18. The arrangement defined in claim **17** wherein:
at least one of said leading edge and trailing edge anvils is movable towards and away from said plate support means between a plate bending position wherein said bender bar passes in lithographic plate bending relationship thereto and a plate removal position wherein the bent lithographic plate may be removed from the plate support means;
and further comprising:
anvil detent means for releasably securing said at least one anvil means in said plate bending position;
said predetermined bend shape of said at least one anvil comprises a plurality of bends in the lithographic plate to be bent; and
said bender bar adjacent said at least one anvil further comprises:
a primary bender bar for forming a first of said plurality of bends, and at least one secondary bender bar slidably mounted on said primary bender bar to form at least one other of said plurality of bends, and said secondary bender bar movable from a first retracted position into a second plate bending position on said primary bender bar; and
secondary bender bar spring means between said primary bender bar and said secondary bender bar for yieldingly urging said secondary bender bar into said retracted position.

19. The arrangement defined in claim **16** wherein the lithographic plate to be bent has walls defining pin receiving aperture means therethrough adjacent one end thereof, and said positioning means further comprises:
a positioning pin means pivotally mounted on said support frame adjacent said anvil means and said positioning pin means having positioning pins thereon insertable in the pin receiving apertures of the lithographic plate to be bent for the condition of the lithographic plate to be bent in an alignment position for aligning the lithographic plate on said plate support means, and said positioning pin means pivotally movable from said alignment position to a retracted position free of contact with the lithographic plate for the condition of said lithographic plate being bent;
plate clamping means movably mounted on said support frame for releasably clamping the lithographic plate to be bent on said plate support means;
said plate clamping means further comprising:
shoe means adjacent said anvil means and extending substantially the transverse width of the lithographic plate to be bent;
shoe mounting means for resiliently mounting said shoe means on said support frame for movement

towards and away from said lithographic plate to be bent and said shoe mounting means comprising shoe spring means for yieldingly urging said shoe spring means away from said lithographic plate to be bent; and

cam means rotatably mounted on said support frame for moving said shoe means into lithographic plate clamping engagement with a lithographic plate to be bent for clamping thereof to said plate support means.

20. The arrangement defined in claim **19** wherein said positioning pin means further comprises:

a pin holder means having a plurality of positioning pin recesses therein, and said positioning pins in said pin recesses;

pin spring means between said positioning pins and said pin holder means for yieldingly urging said positioning pins outwardly therefrom;

positioning pin pivot means mounted on said frame means;

said pin holder means pivotally mounted on said positioning pin pivot means for said pivotal rotation thereof;

positioning pin attachment means for releasably securing said positioning pin holder means in said alignment position thereof; and

said pin holder means having an engagement portion thereon for engagement with said bending bar means at a first predetermined portion of said movement thereof, and said positioning pin attachment means releasing said positioning pin holder means to allow said positioning pin holder means to move from said alignment position to said retracted position for the condition of engagement of said positioning pin holder means with said bending bar means.

21. The arrangement defined in claim **16** wherein the lithographic plate to be bent has walls defining pin receiving aperture means therethrough adjacent one end thereof and said positioning means further comprises:

a positioning pin means pivotally mounted on said support frame adjacent said anvil means and said positioning pin means having positioning pins thereon insertable in the pin receiving apertures of the lithographic plate to be bent for the condition of the lithographic plate to be bent in an alignment position for aligning the lithographic plate on said plate support means, and said positioning pin means pivotally moveable from said alignment position to a retracted position free of contact with the lithographic plate for the condition of said lithographic plate being bent;

and said positioning pin means further comprises:

a pin holder means having a plurality of positioning pin recesses therein, and said positioning pins in said pin recesses;

pin spring means between said positioning pins and said pin holder means for yieldingly urging said positioning pins outwardly therefrom;

positioning pin pivot means mounted on said frame means;

said pin holder means pivotally mounted on said positioning pin pivot means for said pivotal rotation thereof;

positioning pin attachment means for releaseably securing said positioning pin holder means in said alignment position thereof; and

said pin holder means has an engagement portion thereon for engagement with said bending bar means at a first predetermined portion of said movement thereof; and

said positioning pin attachment means releasing said positioning pin holder means to allow said positioning pin holder means to move from said alignment position to said retracted position for the condition of engagement of said positioning pin holder means with said bending bar means.

22. The arrangement defined in claim **18** wherein the lithographic plate to be bent has walls as defining pin receiving aperture means therethrough adjacent one end thereof and said positioning means further comprises:

a positioning pin means pivotally mounted on said support frame adjacent said anvil means and said positioning pin means having positioning pins thereon insertable in the pin receiving apertures of the lithographic plate to be bent for the condition of the lithographic plate to be bent in an alignment position for aligning the lithographic plate on said plate support means, and said positioning pin means pivotally moveable from said alignment position to a retracted position free of contact with the lithographic plate for the condition of said lithographic plate being bent;

plate clamping means moveably mounted on said support frame for releasably clamping the lithographic plate to be bent on said plate support means, and said plate clamping means further comprises:

shoe means adjacent said anvil means and extending substantially the transverse width of the lithographic plate to be bent;

shoe mounting means for resiliently mounting said shoe means on said support frame for movement towards and away from said lithographic plate to be bent and said shoe mounting means comprising shoe spring means for yieldingly urging said shoe means away from said lithographic plate to be bent; and

cam means rotatably mounted on said support frame for moving said shoe means into lithographic plate clamping engagement with a lithographic plate to be bent for clamping thereof to said plate support means;

walls defining vacuum grooves in said plate support means;

vacuum providing means coupled to said vacuum grooves for applying a predetermined vacuum to the lithographic plate to be bent for holding the lithographic plate on said plate support means; and,

means for relieving said vacuum; and,

said positioning pin means further comprises:

a pin holder means having a plurality of positioning pin recesses therein, and said positioning pins in said pin recesses;

pin spring means between said positioning pins and said pin holder means for yieldingly urging said positioning pins outwardly therefrom;

positioning pin pivot means mounted on said frame means;

said pin holder means pivotally mounted on said positioning pin pivot means for said pivotal rotation thereof;

positioning pin attachment means for releasably securing said positioning pin holder means in said alignment position thereof; and,

said pin holder means has an engagement portion thereon for engagement with said bending bar means at a first predetermined portion of said movement thereof, and said positioning pin attachment means releasing said positioning pin holder means to allow said positioning pin holder means to move from said alignment position to said retracted position for the condition of engagement of said positioning pin holder means with said bending bar means.

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