United States Patent [19]

Gazzola, deceased et al.

[11] **3,828,672**

[45] **Aug. 13, 1974**

[54] **APPARATUS FOR FITTING FLEXIBLE PRINTING PLATES AND RIGGING TO PRINTING PRESS CYLINDERS**

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[73] Assignee: **American Bank Note Company,** New York, N.Y.

[22] Filed: **Oct. 17, 1972**

[21] Appl. No.: **298,376**

[52] **U.S. Cl.**..... **101/247,** 38/49, 72/158, 72/213, 101/415.1, 271/51

[51] **Int. Cl.**..... **B41f 13/24,** B65h 37/00

[58] **Field of Search**..... 101/415.1, 247, 231; 271/51; 72/127, 149, 158, 212, 213, 232; 33/184.5; 38/44, 49, 55

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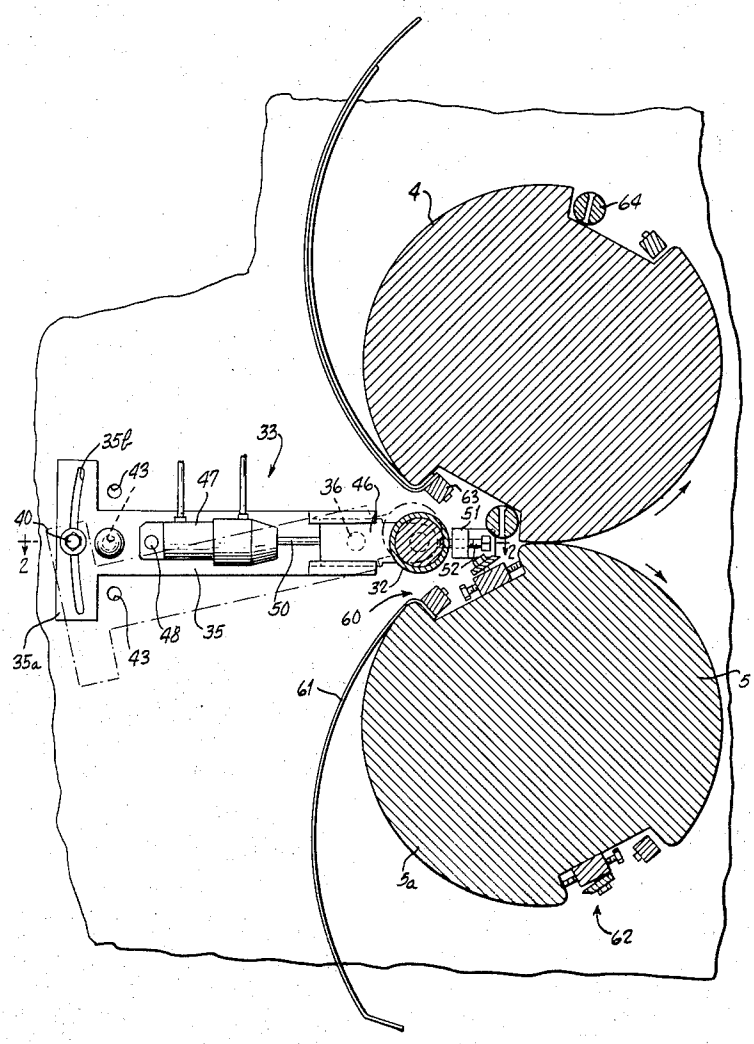
Primary Examiner—Clyde I. Coughenour
Attorney, Agent, or Firm—Cooper, Dunham, Clark, Griffin & Moran

[57] **ABSTRACT**

This printing press includes improved mechanism for clamping the edges of a flexible printing plate adjacent the leading and trailing edges of the saddle of a printing press cylinder. An auxiliary roll mechanism permits the flexible printing plate or rigging sheet to be held smooth and under tension during its installation on the cylinder.

7 Claims, 12 Drawing Figures



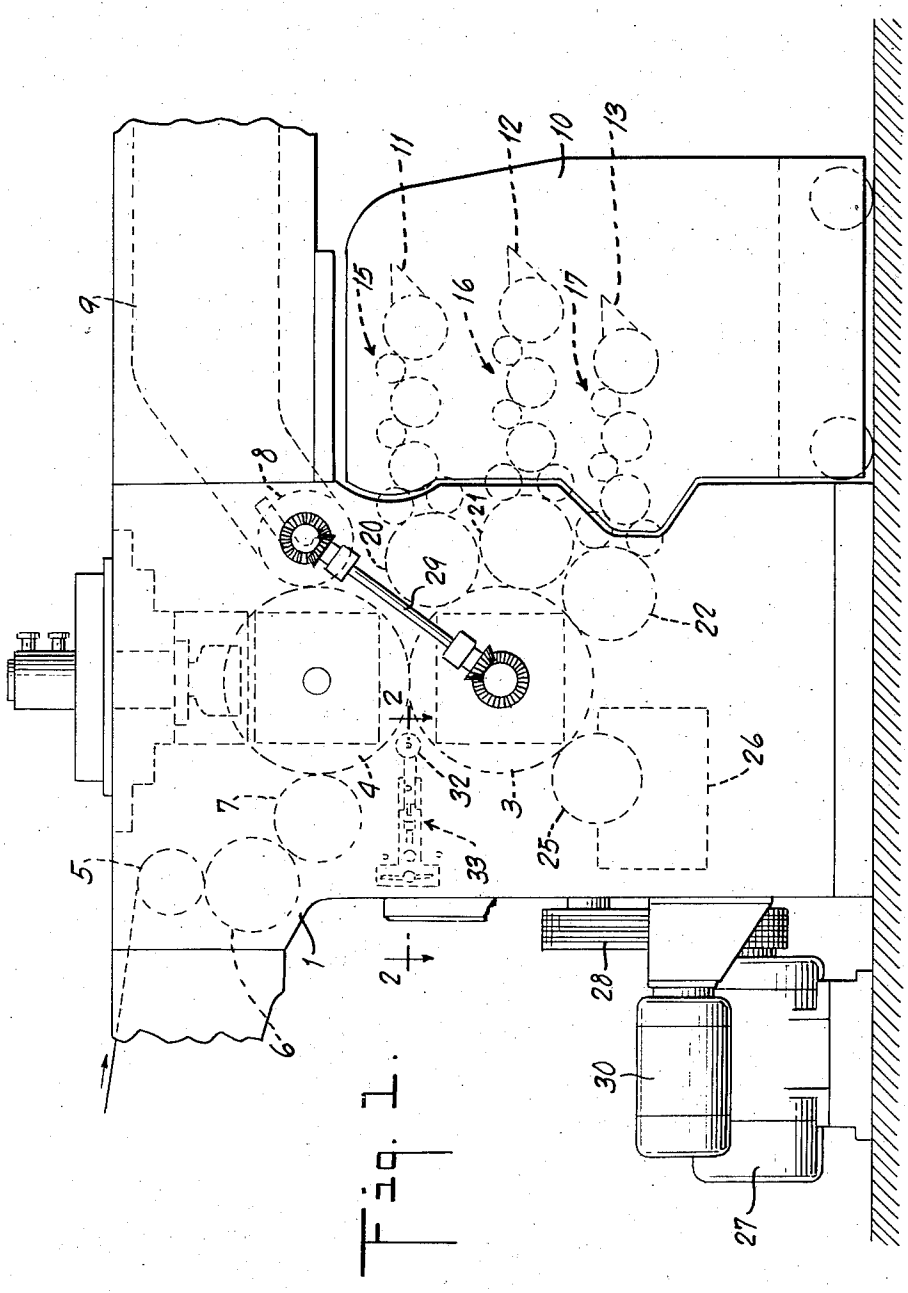


Fig. 1.

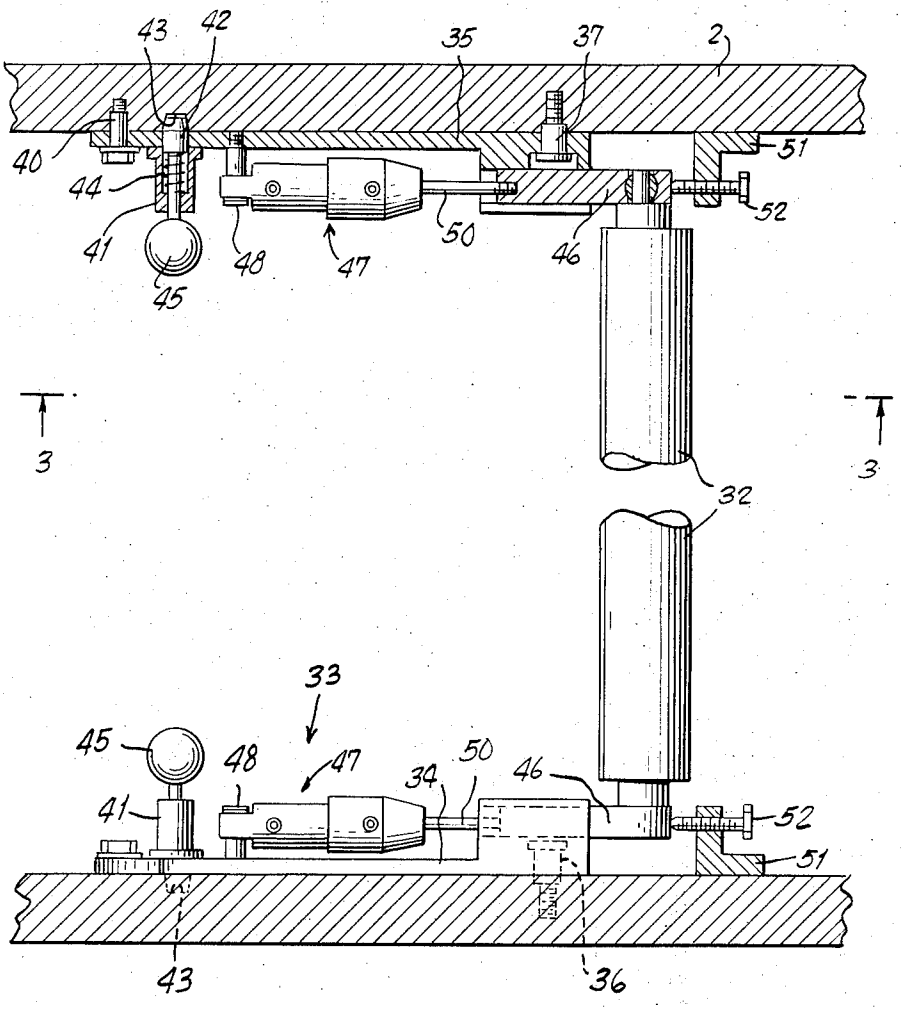

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Fig. 2.

Fig. 3.

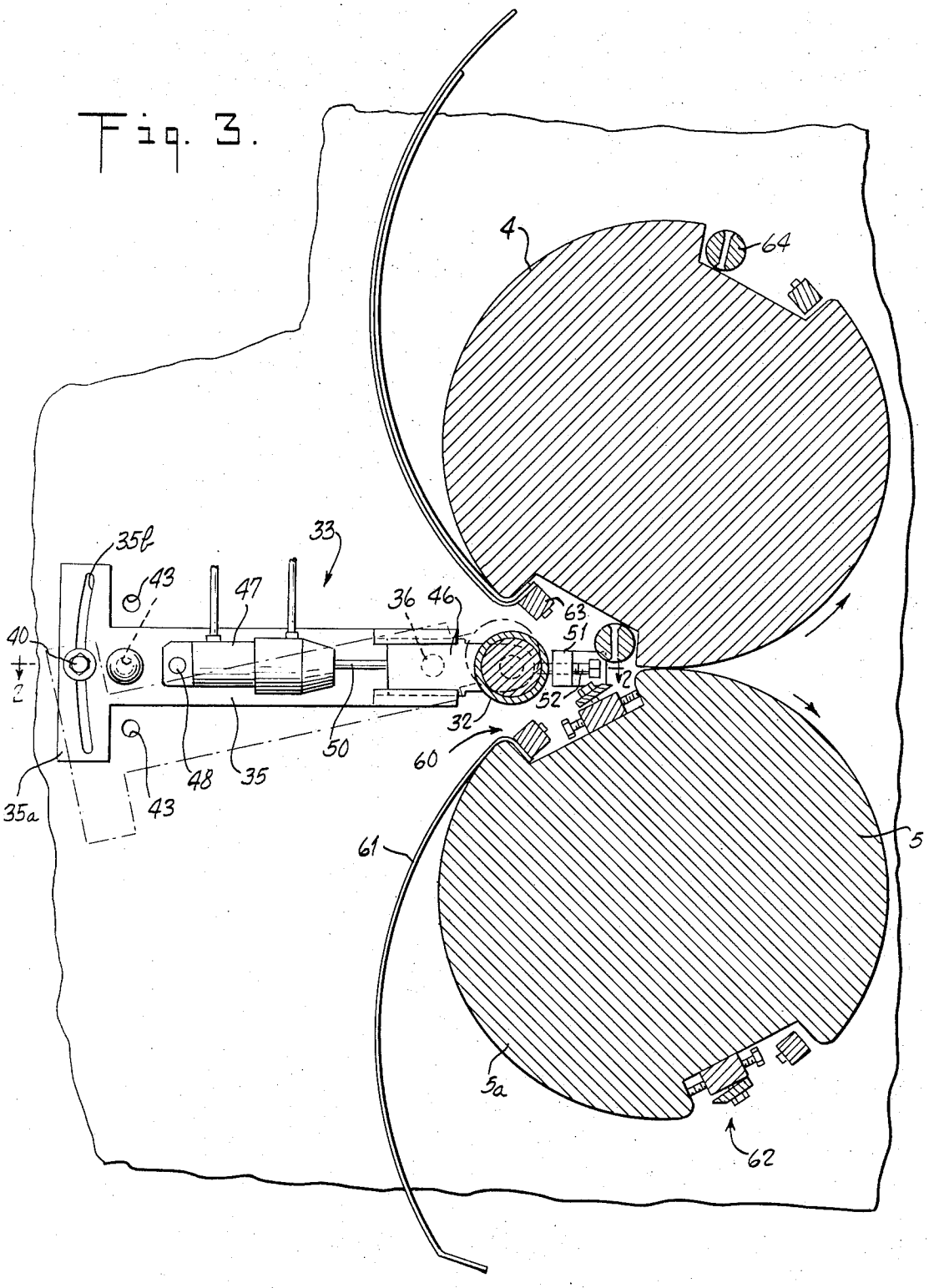

Fig. 4.

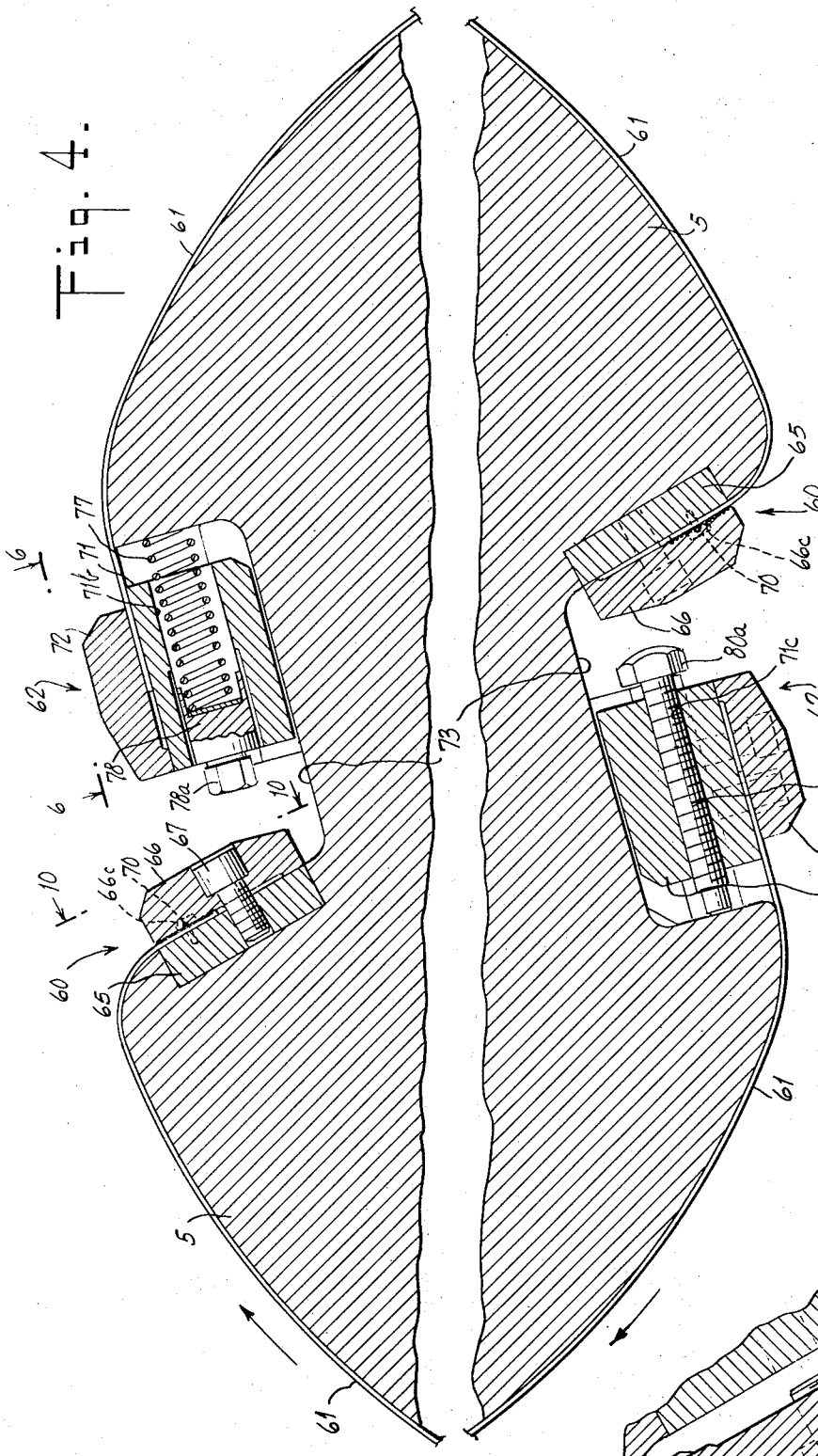
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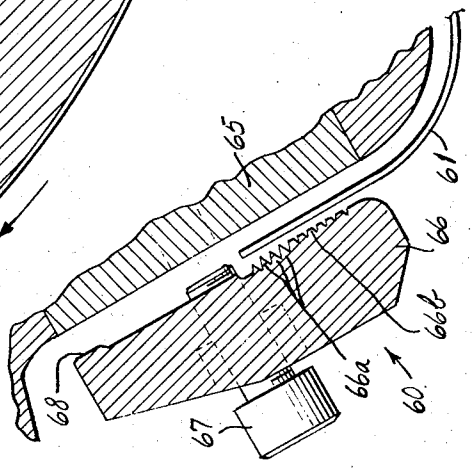
Fig. 5.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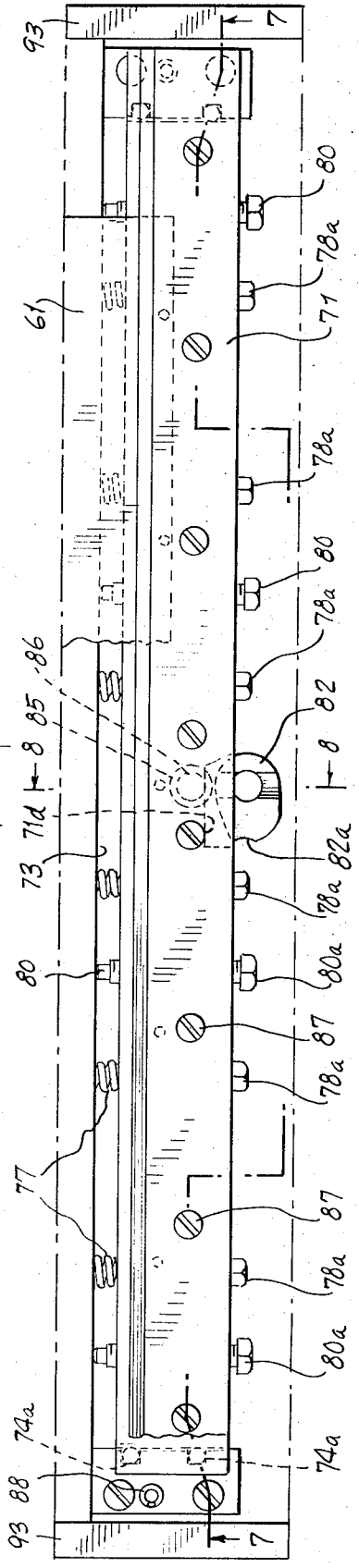
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Fig. 6.

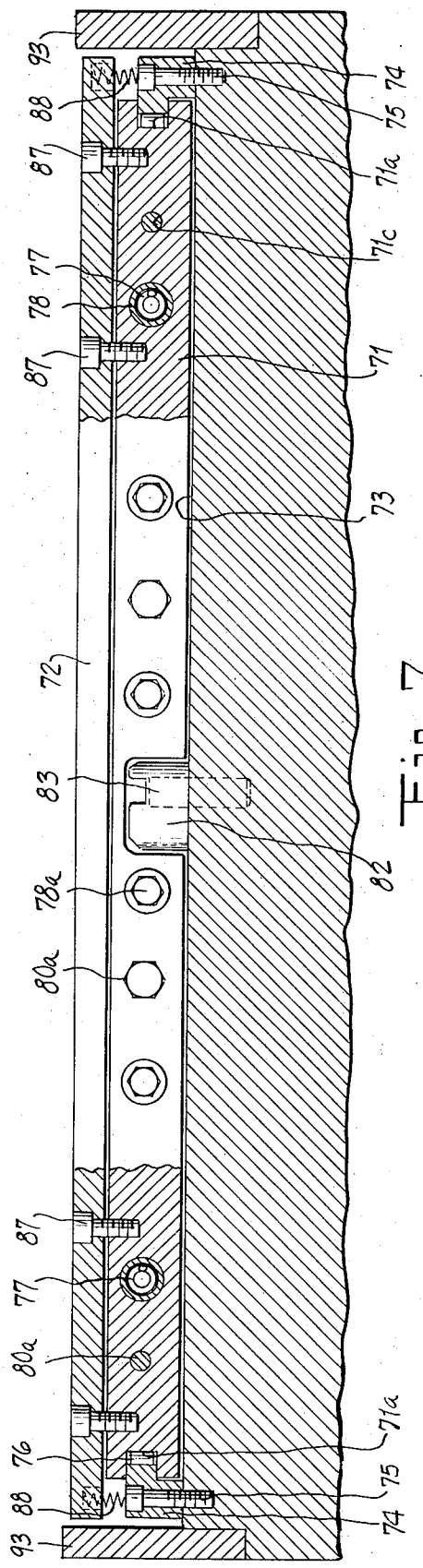
93
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Fig. 7.

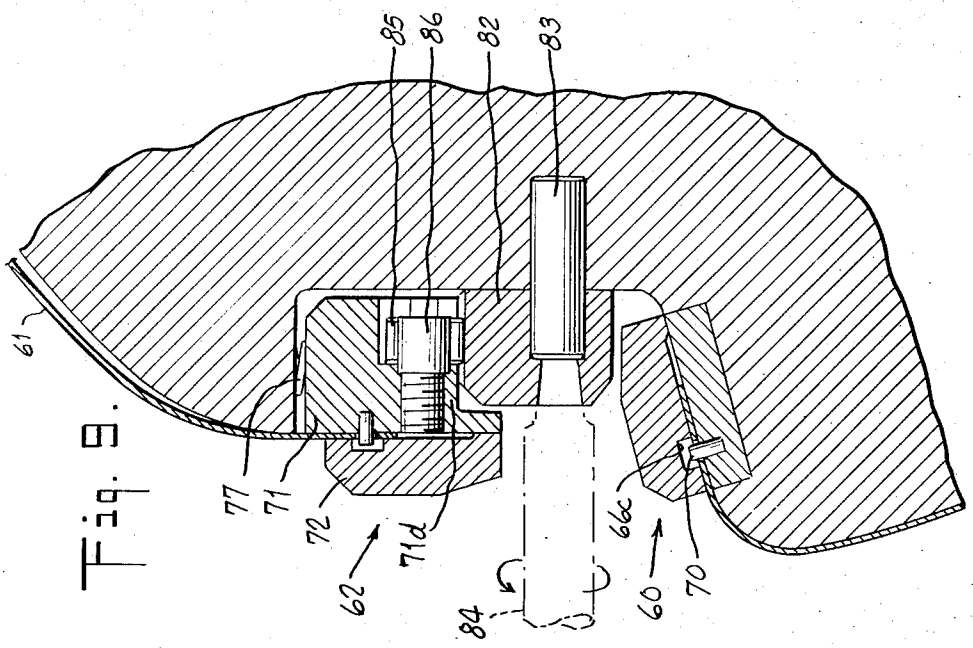
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Fig. 9.

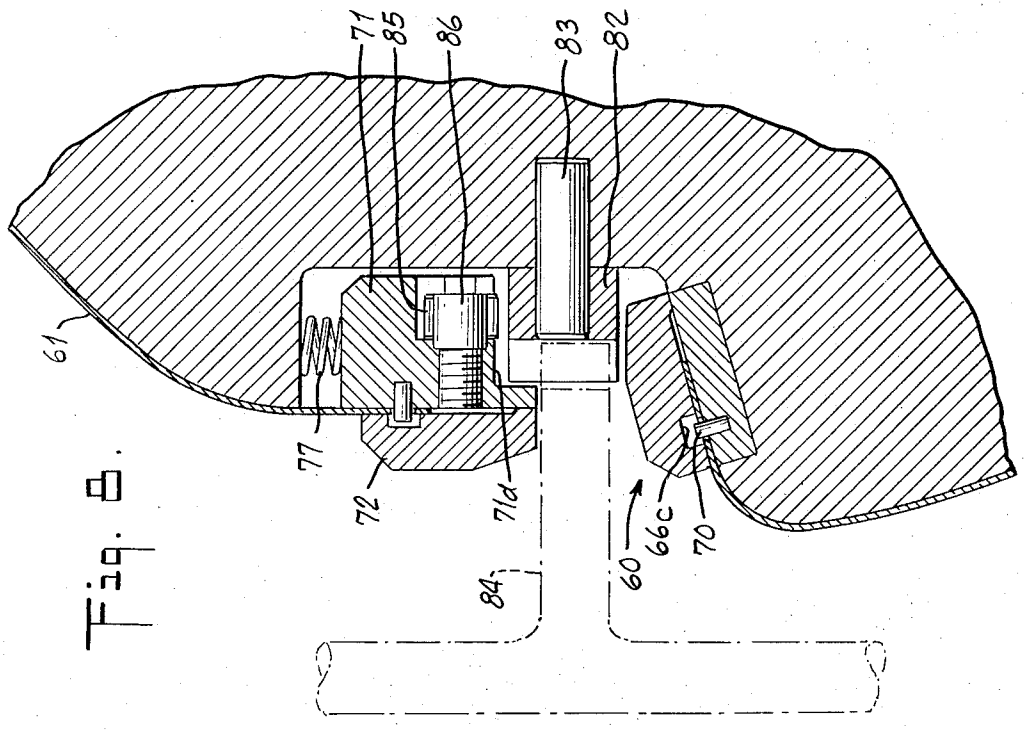
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Fig. 8.

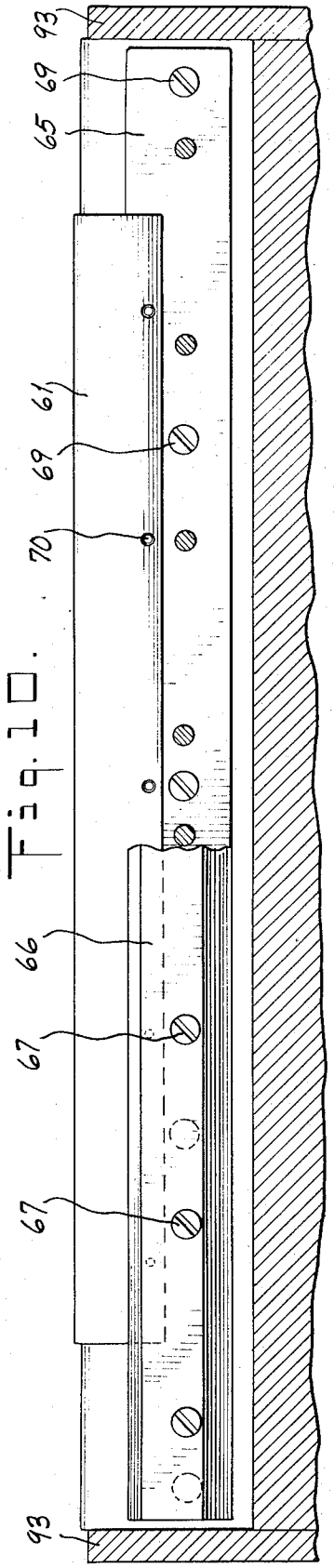

Fig. 10.

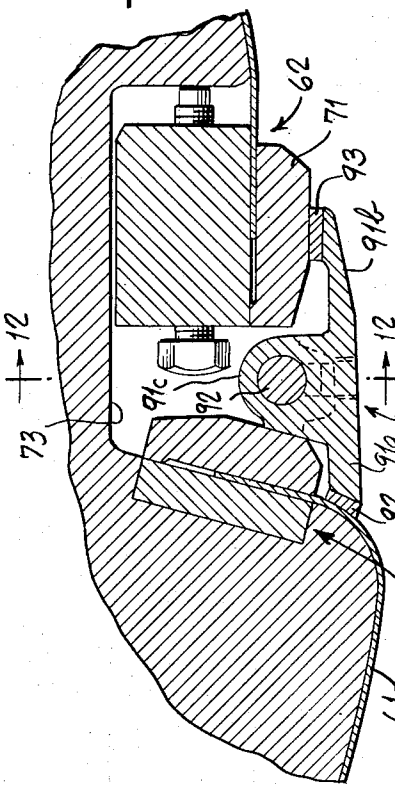

Fig. 11.

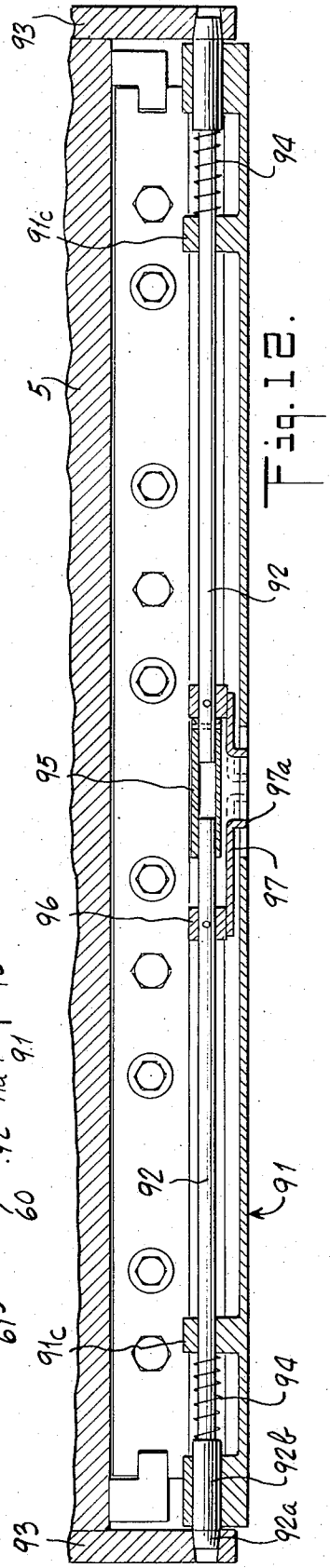

Fig. 12.

APPARATUS FOR FITTING FLEXIBLE PRINTING PLATES AND RIGGING TO PRINTING PRESS CYLINDERS

CROSS-REFERENCES

U.S. Pat. application Ser. No. 173,555, filed Aug. 20, 1971, now U.S. Pat. No. 3,762,319, by the same inventors, entitled "Plate Wiping Mechanism for Intaglio Press," discloses an apparatus which may be used on the same press with the present invention.

U.S. Pat. application Ser. No. 188,195, filed Oct. 12, 1971, now U.S. Pat. No. 3,759,177, by the same inventors, entitled "Printing Press With Sheet Inspection Station," discloses another apparatus which may be used on the same press with the present invention.

U.S. Pat. application Ser. No. 195,364, filed Nov. 3, 1971, now U.S. Pat. No. 3,749,330, by the same inventors, entitled "Apparatus for Delivering Sheets Onto A Moving Strip of Material," discloses another apparatus which may be used on the same press with the present invention.

U.S. Pat. application Ser. No. 298,443 filed Oct. 17, 1972, by the same inventors, entitled "Printing Pressure Control Apparatus For Intaglio Press," discloses another apparatus which may be used on the same press with the present invention.

U.S. Pat. application Ser. No. 298,444 filed Oct. 17, 1972 by the same inventors, entitled "Paper Feed Mechanism for Cylinder Press," discloses another apparatus which may be used on the same press with the present invention.

BRIEF SUMMARY OF THE INVENTION

The invention comprises three principal parts, namely:

1. a clamp for holding the leading edge of a flexible printing plate or flexible rigging on the periphery of a printing cylinder;

2. a mechanism for maintaining the plate smoothly on the cylinder and under tension during the installation of the plate on the cylinder; and

3. a mechanism for clamping the trailing edge of the plate to the cylinder periphery.

The mechanism for clamping the leading edge of the plate to the cylinder periphery may be of any suitable conventional construction.

The mechanism for holding the plate smooth and under tension during installation includes an auxiliary roller, a carriage supporting the roller and movable between:

1. a retracted position in which the roller is spaced from both the printing and pressure cylinders of the press; and

2. either of two active positions in which the roller engages one cylinder or the other.

The carriage is pivotally supported for movement between these three positions, and provision is made for locking the carriage in any one of the three positions. The carriage includes a pair of spaced parallel arms, with an extension on each arm slidable on the arm. The pivots for the auxiliary roller are on the extensions. Hydraulic motor means are provided on the arms for moving the extensions so that the roller may apply substantial pressure either to the pressure cylinder or the plate cylinder, so as to maintain substantial tension on a plate or sheet mounted thereon and clamped at the leading edge only. Means are provided to limit the movement of the auxiliary roller toward the cylinders of the press when the carriage is in its retracted position.

The mechanism for clamping the trailing edge of the printing plate or rigging sheet includes a pair of jaws which may be fastened together to grip the edge of the plate or sheet between them. The radially innermost jaw is provided at each end with a channel extending along the periphery of the cylinder. Two rails are fixed on the periphery of the cylinder adjacent the ends of the channeled jaw. These rails have flanges which are received in the channels. Roller bearings are captured between the flanges and the bottoms of the channels. A row of spaced coil springs biases the lower jaw toward a position in which the plate is under tension. The lower jaw and the upper jaw assembled with it may be moved against the tension of the springs to a tension releasing position by means of a single cam journaled on a pin fixed to the middle of the cylinder and rotatable by means of an external tool. The follower for the cam comprises a roller bearing rotatable on an arbor fixed on the lower jaw. The cam is provided with a concave notch which engages the follower when the plate tension is relieved, so that the cam and follower remain securely in their tension relieving positions, until the cam is rotated by the external tool.

DRAWINGS

FIG. **1** is a fragmentary elevational view of an intaglio printing press embodying the invention, with certain parts broken away.

FIG. **2** is a fragmentary sectional view taken along the line **2—2** of FIGS. **1** and **3**, on an enlarged scale.

FIG. **3** is a sectional view taken along the line **3—3** of FIG. **2**, with certain parts omitted.

FIG. **4** is an enlarged fragmentary sectional view showing the mechanism for clamping the printing plates to the plate cylinder.

FIG. **5** is an exploded fragmentary view showing the mechanism for clamping the leading edge of the plate to the plate cylinder.

FIG. **6** is a sectional view taken along the line **6—6** of FIG. **4**.

FIG. **7** is a sectional view taken along the line **7—7** of FIG. **6**.

FIG. **8** is a sectional view taken along the line **8—8** of FIG. **6**, showing the parts in positions in which the printing plate is under tension.

FIG. **9** is a view similar to FIG. **8**, showing the parts in positions in which the plate tension is relieved.

FIG. **10** is a view taken along the line **10—10** of FIG. **4**.

FIG. **11** is a sectional view on an enlarged scale, corresponding to a left to right reversed view of the lower portion of FIG. **4**, with a cover for the clamping mechanisms added.

FIG. **12** is a sectional view taken along the line **12—12** of FIG. **11**.

DETAILED DESCRIPTION

The press illustrated includes a front vertical frame member **1** and a rear vertical frame member **2** (FIG. **2**). Between the frame members **1** and **2** are journaled a plate carrying cylinder **3** and an impression cylinder **4**. Sheets of paper to be printed may be supplied by conventional sheet feeding mechanisms to a train of sheet feeding rolls **5, 6, 7**, from which they are transferred to the impression cylinder **4**, and pass through the nip be-

tween the impression cylinder and the plate carrying cylinder **3**. The printed sheets are then removed by a conveyor **9**, running over a sprocket **8**.

The press illustrated is a multicolor press. The ink applying mechanism includes a carriage **10** (FIG. **1**) on which are mounted three ink reservoirs **11, 12** and **13** connected by ink conveying roller trains **15, 16** and **17** to rollers **20, 21** and **22**, which transfer the ink to the plate on the cylinder **3**. The rollers **20, 21** and **22** are contoured, so that each contacts a portion only of the surface of the cylinder **3**. Typically, only one color of ink will be applied to any given portion of the surface of the plate, although it may be arranged that colors overlap, if desired.

The plate carrying cylinder **3** turns clockwise, as viewed in FIG. **1**. A wiping roll **25** is rotatably mounted so that it runs with its periphery in contact with the plate cylinder **3**, and also becomes immersed in a suitable solvent in a tank **26**. The wiping roll **25** removes the ink from the surface of the plate on the printing cylinder, between the lines on the plate, so that as the plate approaches the nip of the cylinders **3** and **4**, the only ink remaining on the plate is in the recessed lines.

The plate cylinder **3** is driven by a motor **27** through a multiple V-belt drive **28** and a suitable gear train (not shown). Conveyor **9** is driven from the plate cylinder **5** through a bevel pass shown at **29** in FIG. **1**. The wiping roll **25** is driven by a motor **30**, which may be controlled as described in our copending application, Ser. No. 173,555, mentioned above.

The cylinder for applying and relieving printing pressure between the plate cyoinder **3** and the impression cylinder **4** is shown in detail in our copending application, Ser. No. 298,433, mentioned above.

AUXILIARY ROLLER — FIGS. 2–3

An auxiliary roller **32** is rotatably supported on a pivotally mounted carriage **33**. The carriage **33** comprises a pair of arms **34, 35**, which are pivotally mounted on trunnions **36, 37**, fixed on the inner sides of the front and rear frame members **1** and **2**.

The left ends of the arms **34, 35** as they appear in the drawings, carry a T-shaped head, best seen at **35***a* in FIG. **3**. The T-shaped head **35***a* has formed therein an arcuate slot **35***b* which receives the shank of a screw **40**, which is threadedly received in the frame member **2**. By tightening the screw **40**, the arm **35** may be locked in any angular position.

In order to select the angular operating positions of the carriage **33** accurately, each of the arms **34, 35** is provided near its outer end with a housing **41**, which encloses a locating pin **42**. Each pin **42** has an enlarged head, tapered at its end, and is receivable in any one of three holes **43**, formed in the frame members **1** and **2**. A spring **44** is held in compression between a shoulder on the head **42** of the locating pin and the inner end of the housing **1**, and biases the locating pin toward the position where its head is received in one of the holes **43**. The outer end of the shank of pin **42** extends through the top of the casing **41** and is provided at its inner end with a handle **45** by means of which the head **42** may be withdrawn from one of the holds **43** for the purpose of shifting the operating position of the carriage **33**.

The arms **34, 35** are provided with a pair of extensions **46**, slidable in suitable channels provided in the arms **34, 35**. The extensions **46** are operated by means of hydraulic motors **47**, which are pivotally fixed at their left-hand ends to posts **48** fastened to the arms **34, 35**. The hydraulic motors **47** operate piston rods **50**, which are pivotally fixed to the extensions **46**.

A pair of stops **51** are fixed on the frame members **1** and **2** in alignment with the ends of the extensions **46**, when the carriage **33** is in its retracted position, as shown in full lines in FIG. **3**. Each stop **51** is provided with an adjustable screw **52**, by means of which the stop positions of the extensions **46** may be varied as required.

In the normal running condition of the press, the carriage **33** is in its retracted position, shown in full lines in FIG. **3**, so that the extensions **46** engage their stop screws **52**, and the surface of the roller **32** does not engage the surface of either the plate cylinder **5** or the pressure cylinder **4**.

When a plate is being installed on the plate cylinder **5**, the leading edge of the plate is first fastened to the plate cylinder **5** by means of a clamp generally indicated at **60** in FIG. **3**. The carriage **33** is then released from its position illustrated in full lines and is turned clockwise from that position about the trunnions **36** to a position in which the pins **42** engage the uppermost holes **43** and the roller **32** engages the printing plate **61** adjacent the leading edge of the saddle **5***a* on which the plate is to be mounted. The plate cylinder **5** is then rotated counterclockwise, with the roller **32** holding the plate **61** smoothly and firmly against the saddle **5***a*. When the trailing edge of the plate moves near the roller **32**, then that trailing edge may be clamped in a clamping mechanism **62**, shown in detail in FIGS. **4** and **6–12**.

A similar procedure is used in applying a flexible rigging sheet to the pressure cylinder **4**. The clamps **63** and **64** used respectively at the leading and trailing edges of the rigging sheet on the pressure cylinder **4** need not be exactly like the clamps **60** and **62** of the plate cylinder, since the location of the rigging sheet on the pressure cylinder **4** does not involve the degree of precision required for the location of the plate **61** on the plate cylinder **5**.

LEADING EDGE CLAMP — FIGS. 4–5

The clamping mechanism **60** for the leading edge of the printing plate **61** is best seen in these two figures. This clamping mechanism **60** includes an inner jaw **65** recessed in and fastened to the plate cylinder **5** by screws **69** (FIG. **10**), and an outer jaw **66**, which may be fastened to the inner jaw **65** by means of a series of spaced machine screws **67**. Outer jaw **66** is provided on its inner face, at its margin remote from the plate **61**, with a projecting flat surface **68**, whose thickness is less than the thickness of the plate **61**, so that the jaws **65** and **66** will tend to contact on the inner teeth of the jaws when in their clamped positions. The face of the jaw **66** which engages the plate **61** is provided with a plurality of rows of sharp pointed teeth **66***a* near the edge of the plate **61**, and with a plurality of rows of teeth **66***b* having flattened or truncated points, engaging the plate **61** farther from the edge than the sharp points **66***a*. This construction insures that the marginal edge of plate **61** will be held tightly by the sharp points **66***a*, and allows the plate **61** to shift laterally where it is located under the flat points **66***b*.

The outer jaw **66** is also provided with a plurality of spaced openings **66***c* (FIGS. **4, 8** and **9**), which loosely receive the heads of locating pins **70,** which are firmly fixed in the lower jaws **65,** and which are received in openings in the plate **61** to fix its location precisely and accurately with respect to the cylinder **5.**

TRAILING EDGE CLAMPING MECHANISM — FIGS. 4 and 6–10

The trailing edge clamping mechanism **62** includes an inner jaw **71** and an outer jaw **72.** The jaws **71** and **72** are located in a recess **73** formed in the outer surface of the cylinder between the plate supporting saddles. The inner jaw **71** does not touch the bottom of that recess, but is supported outwardly from it, as clearly appears in the drawings, especially FIGS. **4** and **7–9.** The inner jaw **71** is provided at each end with a channel **71***a* (FIG. **7**), extending parallel to the inner and outer surfaces of the jaw. A pair of rails **74** are fixed to the bottom of the recess **73** by means of bolts **75.** The upper ends of the rails **74** have flanges projecting toward the inner jaw **71,** and received in the channels **71***a*. Roller bearings **76,** best seen in FIG. **7,** are captured between the flanges of the rails **74** and the bottoms of the channels **71***a*. The flanges of the rails **74** are provided with recesses **74***a* (FIG. **6**), to receive the bearings **76** and hold them in position. The vertical dimensions of the inner jaw **71** and its channel **71***a*, as compared to the vertical dimensions of the rails **74** and its flange, as viewed in FIG. **7,** are such that the inner jaw **71** is supported solely by the rails **74,** and its under surface is spaced above the bottom of the recess **73.**

The inner jaw **71** is provided with a plurality of spaced apertures **71***b* (FIGS. **4** and **7**), in which are received springs **77,** which are held in compression between one wall of the recess **73** and a spring retainer **78** threadedly received in the aperture **71***b*, and adjustable in position by means of a hexagonal head **78***a*. This assembly is best seen at the top of FIG. **4.**

The springs **77** bias the inner jaw **71** and the entire clamping mechanism **62** in a direction to maintain the flexible printing plate **61** under tension.

The inner jaw **71** is provided with a second row of spaced apertures **71***c*, in which are threadedly received a plurality of screws **80** having hexagonal heads **80***a* at their outer ends. The inner ends of the screws **80** abut against a surface at the side of the recess **73.**

When the printing plate **61** is first installed on the press, the screws **80** are backed off so that their ends are spaced from the side of the recess **73.** The only force then tending to hold the printing plate **61** under tension is the force due to the springs **77.** After the plate has been installed on the press, the screws **80** may be tightened, thereby placing the plate **61** under additional tension. Note that there is no structure limiting the movement of the lower jaw **71** in a downward direction as viewed in FIG. **6.** In other words, the forces due to the spring **77** and the compression in the screws **80** are opposed only by the tension in the plate **61,** so that the plate **61** is held firmly and smoothly in place on the press.

In order to relieve the tension in the plate **61,** the screws **80** must first be backed off so that their inner ends are not engaging the sides of the recess **73.** A cam **82** is provided for moving the lower jaw **71** against the compression of the springs **77.** The cam **82** is mounted on a pivot pin **83,** and is rotatable on that pin by means of an externally applied key or other tool, as shown at **84** in FIGS. **8** and **9.** In the plate tensioning position shown in FIG. **6,** the cam **82** is spaced from a recess **71***d* formed in the lower jaw **71.** A cam follower is located in the recess **71***d*, and comprises a roller bearing **85** rotatable on a stud **86.** When the cam **82** is rotated through 90° from the position shown in FIG. **6,** the surface of the cam engages the roller bearing follower **85,** and forces the lower jaw **71** upwardly, as viewed in FIG. **6** and also in FIG. **9.** This compresses the springs **77,** and relieves the tension in the printing plate **61,** as is shown in FIG. **9.**

The outer jaw **72** is similar in structure and function to the outer jaw **66** of the clamp **60,** described above. The outer jaw **72** is held in place in clamping position on the lower jaw **71** by means of a plurality of screws **87,** best seen in FIGS. **6–7.**

The outer jaw **72** is longer than the inner jaw **71,** so that its ends overhang that inner jaw and the rails **74,** as seen in FIG. **7.** A pair of springs **88** are held in compression between the ends of the upper jaw **72** and the rails **74.** When the screws **87** are loosened to remove a plate from the clamp, the springs **88** are effective to separate the jaw **72** from the jaw **71,** thereby readily releasing the plate **61** from the grip of the clamp.

When the cam **82** is rotated 90° from the position shown in FIG. **6,** a concave recess **82***a* becomes alined with the roller bearing **85** and holds the cam **82** and follower **85** securely in position, so that the tension in the printing plate **61** continues to be relieved.

COVER PLATE — FIGS. 11–12

These figures illustrate a cover plate **91,** which is placed over the clamp assemblies **60** and **62,** to close the space between those clamp assemblies and thereby to prevent the accumulation of dirt or foreign material in the recess **73.** As seen in FIG. **11,** the plate **91** has a pair of wings **91***a* and **91***b*, each having a gasket **92, 93** of compressible material bonded to its extremity. The gasket **92** is adapted to engage the leading edge of the printing plate **61,** the gasket **93** is adapted to engage the outer surface of the outer jaw **71** of the clamp mechanism **72.**

The cover plate **91** has integrally formed therewith two upstanding lugs **91***c*, in which are received a pair of locking rods **92.** Each rod **92** has a tapered tip **92***a* adapted to engage a corresponding recess in an end plate **93** of the cylinder **5.** A spring **94** encircles each rod **92** between one of the lugs **91***a* and a shoulder **92***b* formed on the rod **92.** The spring **94** biases the locking rod **92** toward the locking position shown in FIG. **12,** in which the tip **92***a* engages the recess in end plate **93.** The inner ends of the locking rods **92** are encircled by a common sleeve **95.** Each rod **92** has pinned to its inner end a sleeve **96** to which is welded a handle **97** having a projecting end **97***a* accessible through an opening in the plate **91.** By moving the handles **97***a* to the dotted line positions shown in FIG. **12,** the locking pins **92** are withdrawn from the recesses in the end plates **93,** so that the cover assembly **91** may be removed.

We claim:

1. A printing press, comprising:

a. a plate cylinder;

b. an impression cylinder rotatable about an axis parallel to the axis of the plate cylinder;

c. means including a frame supporting said cylinders for rotation about said parallel axes and for movement of one of said cylinders in a direction perpendicular to its axis to shift said one cylinder between a printing position in which the cylinders are in rolling contact and a non-printing position in which the cylinders are separated;

d. means on each cylinder for clamping the leading edge of a sheet;

e. means on each cylinder for clamping the trailing edge of a sheet;

f. a roller for applying pressure to such a sheet and its associated cylinder during installation of the sheet on the cylinder; and

g. means including a carriage supporting the roller for movement between a retracted position spaced from both the cylinders and either of two active positions in which it engages one cylinder or the other.

2. A printing press as in claim **1,** including means for pivotally supporting the carriage for movement between three angular positions corresponding to the retracted position and the two active positions of the roller.

3. A printing press as in claim **1,** including means for locking the carriage in any of said three angular positions.

4. A printing press as in claim **1,** in which said carriage includes:

a. two parallel spaced arms pivotally mounted for rotation about a common axis;

b. an extension on each arm, slidable on its associated arm;

c. pivots for the roller on said extensions.

5. A printing press as in claim **4,** including motor means for driving the extensions along the arms.

6. A printing press as in claim **5,** including stop means mounted on the frame of the press for limiting movement of the roller toward the cylinders when the carriage is in its position corresponding to the retracted position of the roller.

7. A printing press as in claim **1,** in which:

a. said plate cylinder has a saddle for receiving a printing plate and a recess at the trailing end of the saddle for receiving a clamp;

b. said trailing edge clamping means includes a pair of jaws extending substantially the full axial length of the plate and engageable with the trailing edge of the plate, at least one of said jaws having channels at its ends extending parallel to the plate;

c. a pair of rails attached to the cylinder and having flanges received in said channels, said flanges and channels cooperating to support the slidable clamp;

d. spring means biasing the slidable clamp in a direction to stress the plate in tension over the saddle; and

e. cam means operable to stress the spring means in a sense to relieve the tension in the plate.

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