Jan. 28, 1969 H. BEISEL 3,424,085

STRUCTURE FOR CLAMPING PRINTING PLATES TO A PRINTING CYLINDER OF A ROTARY PRINTING PRESS

Filed March 4, 1966 Sheet 1 of 2

FIG. 1

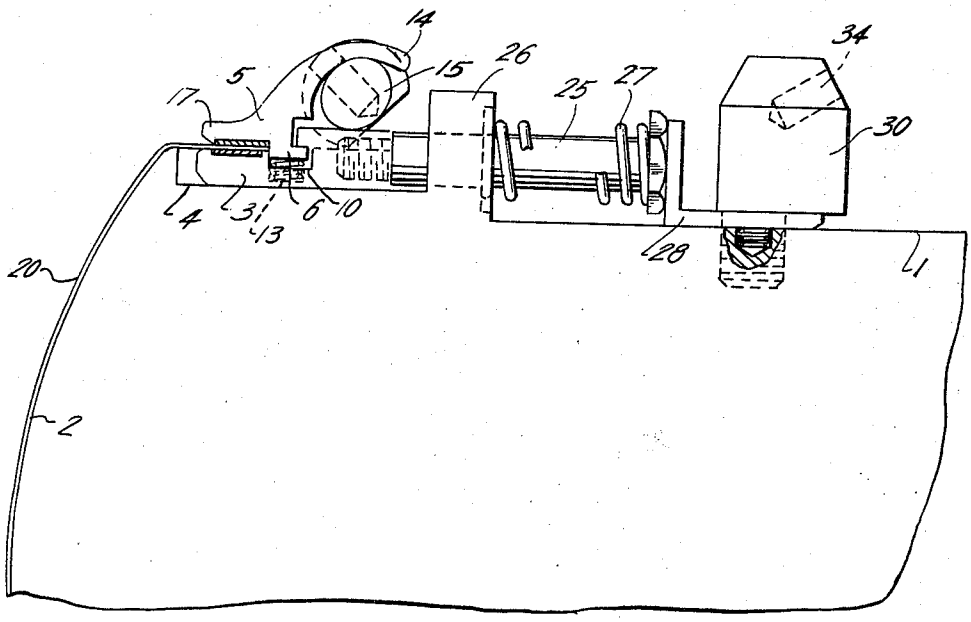



FIG. 3

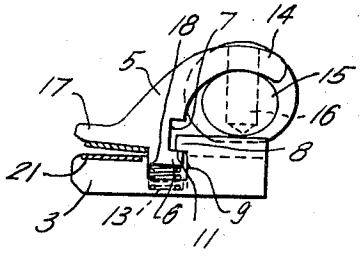
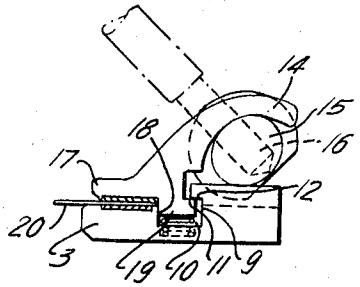



FIG. 4



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STRUCTURE FOR CLAMPING PRINTING PLATES TO A PRINTING CYLINDER OF A ROTARY PRINTING PRESS
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FIG. 2

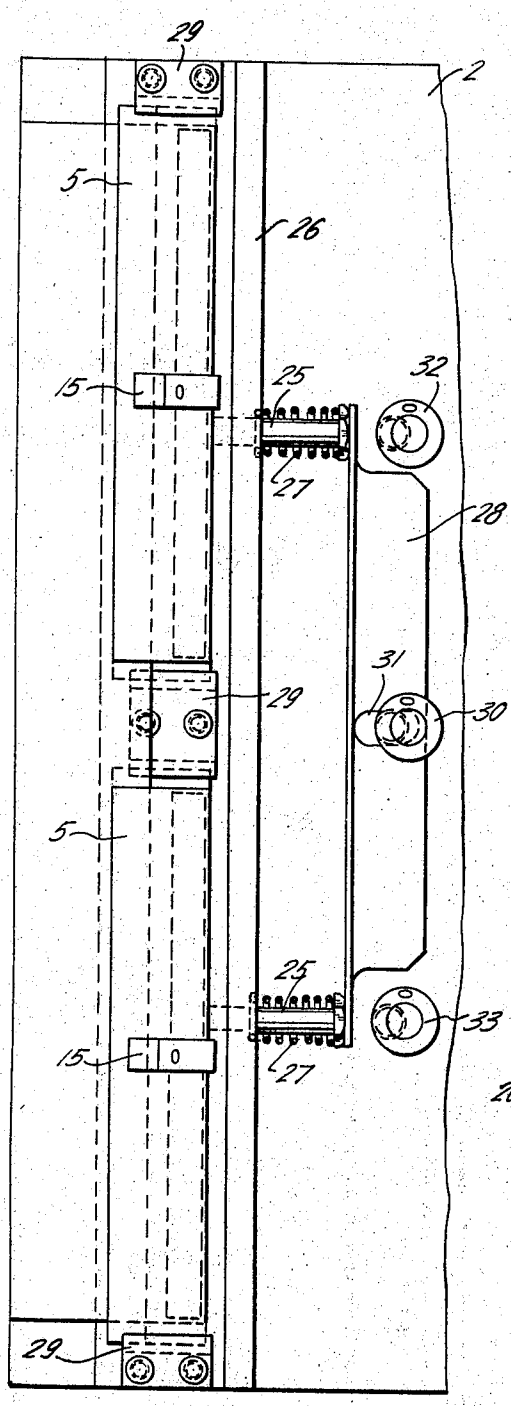
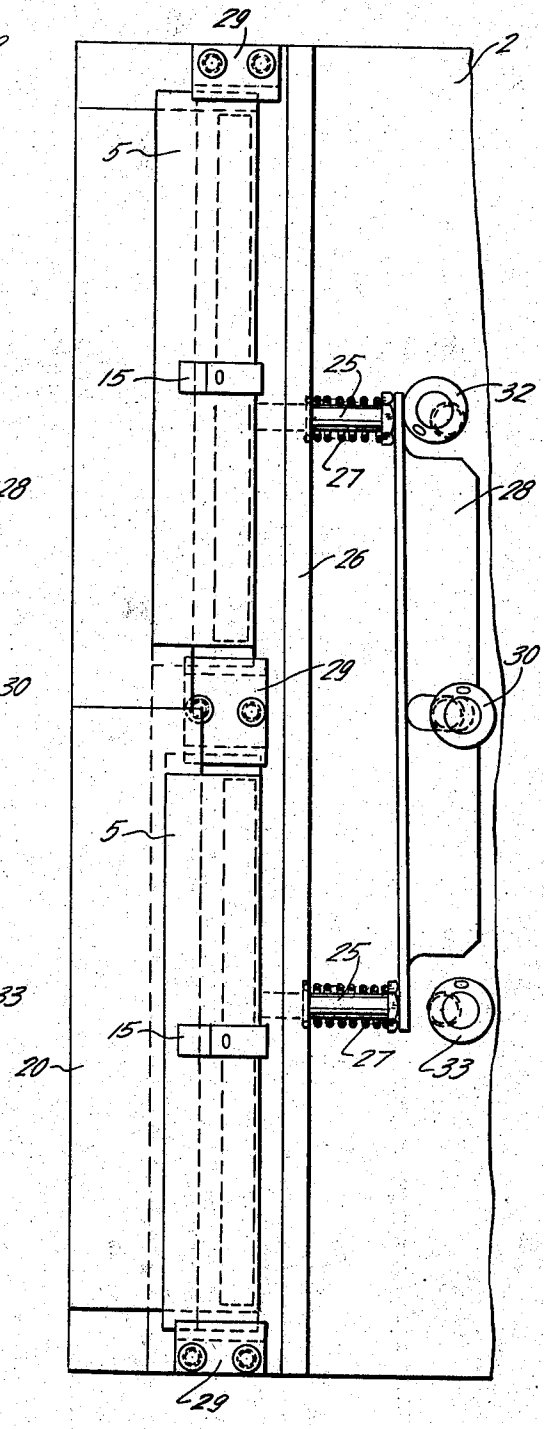



FIG. 5



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3,424,085

# STRUCTURE FOR CLAMPING PRINTING PLATES TO A PRINTING CYLINDER OF A ROTARY PRINTING PRESS

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U.S. Cl. 101—415.1 8 Claims
Int. Cl. B41f 29/06

## ABSTRACT OF THE DISCLOSURE

Device for releasably clamping a printing plate to a rotary printing cylinder of a printing press includes an inner clamping rail and an outer clamping rail extending along the inner clamping rail, bearing means connected in part with one of said rails and in part with the other of said rails for connecting the outer rail to the inner rail for movement relative thereto about and radially with respect to an axis extending longitudinally of the rails between a clamping position and a release position, the bearing means extending substantially continuously along the entire length of the outer rail, spring means engaging the outer rail and urging the latter to the release position thereof, and cam means engaging the outer rail substantially continuously along the entire length of the bearing means for moving the outer rail in opposition to the spring means to the clamping position thereof and for distributing the clamping force when the outer rail is in the clamping position thereof substantially uniformly along the entire length of the bearing means.

My invention relates to rotary printing presses.

In particular, my invention relates to structure used for clamping printing plates to a rotary printing cylinder of a printing press.

Structure of this latter type conventionally includes an inner clamping rail with respect to which an outer clamping rail is tiltable for movement between clamping and non-clamping positions. A spring means and a cam means are provided to cooperate with the outer clamping rail so as to displace it between its positions with respect to the inner rail. Moreover the entire clamp is shiftably carried by the printing cylinder for movement between a plate-tensioning position in which the printing plate is tensioned and a non-tensioning position where the printing plate is untensioned.

Conventional structure of the above type generally includes a plurality of screws carried by and distributed along the inner rail and engaged by the outer rail so that the latter by pressing against these screws will distribute the clamping force among the screws. As a result, when the outer rail is displaced to its clamping position, the greatest clamping forces are always situated in the immediate regions of the screws. Between these screws the clamping force is quite often so small that the clamped end of the printing plate tends to be pulled out of the clamp in the spaces between the screws. The result is localized overloading of the clamped end of the printing plate. In addition to undesirably large tensioning of individual portions of the clamping plate, this arrangement results in certain undesirable circumstances in pulling of the clamped plate out of the clamp entirely. Furthermore, this conventional structure provides the disadvantage of making it possible for the excessively loaded screws to break, in which case the broken and therefore loose screw portions can result in damage to the printing press.



It is accordingly a primary object of my invention to provide a structure which will avoid the above drawbacks.

In particular, it is an object of my invention to provide between the inner and outer clamping rails a bearing means which will connect the outer rail to the inner rail for movement with respect thereto in such a way that the clamping force is distributed along the entire length of the outer clamping rail.

Thus, it is an object of my invention to distribute the clamping force along the entire clamped end of the clamping plate in a substantially uniform manner. In this way the danger of pulling of the printing plate out of the clamp or damaging of the printing plate is substantially reduced with my invention. Furthermore, it becomes unnecessary to provide the outer rail with openings for the load-carrying screws. Because these latter openings are no longer required in the structure of my invention, the clamping device of my invention can be very effectively cleaned.

Yet another object of my invention is to provide an exceedingly compact clamping assembly so that only a small part of the printing cylinder is required for the clamping structure of my invention, thus leaving the greatest part of the printing cylinder available to be covered by printing plate structure.

It is furthermore an object of my invention to provide a clamping structure which will reliably prevent the outer clamping rail from shifting when it clamps a printing plate to the inner rail, so that in this way an extremely precise clamping of the printing plate will be assured.

The objects of my invention also include the provision of a structure capable of simultaneously shifting a pair of clamping units between plate-tensioning and non-tensioning positions.

Furthermore, an object of my invention is to provide a structure which will make it possible for the operator to shift a pair of clamping units simultaneously between plate-tensioning and non-tensioning positions or to shift only a selected one of these units between the plate-tensioning and non-tensioning positions thereof. In this way it becomes possible to tension a pair of relatively small printing plates one after the other, or a single relatively wide printing plate can be simultaneously engaged by both units which can be simultaneously shifted between their tensioning and non-tensioning positions.

My invention is illustrated by way of example in the accompanying drawings, which form part of the application, and in which:

FIG. 1 is a fragmentary side view of a printing cylinder provided with the structure of my invention;

FIG. 2 is a top plan view of the structure of FIG. 1;

FIG. 3 is an end view of my clamping device shown in its release position;

FIG. 4 is an end view of the clamping device of my invention shown in its clamping position; and

FIG. 5 shows the structure of FIG. 2 in the position it takes when only one of the clamping units is displaced to a non-tensioning position.

The rotary printing cylinder which is fragmentarily illustrated in FIG. 1 is provided with a cutout defined by a supporting surface 1, so that the part of the cylinder which has the supporting surface 1 forms a support means for the structure of my invention. Part of the surface 1 of the printing cylinder 2 is formed by a slide-surface 4 on which an inner clamping rail 3 is slidably supported. It will be noted that the surface 4 extends along a secant of the circular cross section of the cylinder 2. The clamping device includes, in addition to the inner clamping rail 3, an outer clamping rail 5 in the form of an elongated bar of suitable profile.

A bearing means is connected in part with the inner rail 3 and in part with the outer rail 5 for connecting the

outer rail 5 to the inner rail 3 for movement with respect thereto about and radially with respect to a predetermined axis between the non-clamping position or release position shown in FIG. 3 and the clamping position shown in FIG. 4. This bearing means is preferably formed integrally with the rails and includes a bearing portion 6 which is integral with the outer rail 5. This outer rail 5 is formed with an elongated opening or groove 7 extending longitudinally of the outer rail and defined in part by the bearing projection 6. This elongated opening 7 receives the elongated bearing shoulder 8 which is an integral part of the inner rail 3. The inner rail 3 is formed with an elongated opening or groove 9 which extends longitudinally of the rails and which receives the bearing projection 6. Thus, the bearing projections 6 and 8 overlap each other with each bearing projection extending into the opening formed in the other rail. The opening 9 is formed in a side surface which defines part of an elongated recess 10 formed in the lower or inner rail 3 and receiving that part of the outer rail 5 from which the bearing projection 6 extends into the opening 9.

Through this construction the outer rail is provided at its bearing part 6 with a bearing shoulder 11 having a flat surface which engages a flat surface of a shoulder 12 defined by the bearing projection 8 and limiting the upper part of the opening or groove 9.

A spring means 13 is provided for urging the outer rail 5 to its release position as well as for maintaining it in engagement with a cam described below for displacing the outer rail to its clamping position. This spring means 13 takes the form of a plurality of individual compression springs distributed uniformly along the lower rail 3 in the opening 10 thereof. The upper ends of the coil springs 13 press against the lower surface of the outer rail 5, and the spring means 13 acts not only to press the faces of the bearing shoulders against each other, but also to tend to turn the outer rail 5 in a clockwise direction, as viewed in FIGS. 3 and 4.

The outer rear surface of the inner rail 3 is engaged by an elongated cam 15 of oval or elliptical cross section, and this cam 15 engages the outer rear portion 14 of the outer rail 5. This outer rear portion 14 of the rail 5 extends over and engages the cam 15 so that the latter forms a cam means which can be turned, in a manner described below, between the positions shown in FIGS. 3 and 4 for respectively situating the outer rail 5 in its release and clamping positions. It is to be noted that the spring means 13 maintains the portion 14 of the outer rail 5 in engagement with the cam means 15. Between its ends the cam 15 is formed with an outwardly directed flange which is received in a groove formed in the outer surface of the inner rail 3 as well as in a cutout of the portion 14 of the rail 5, and this flange is formed with a bore 16 which extends into the body of the cam 15, as indicated in FIGS. 3 and 4, and which can receive the end of an operating pin, as shown in dot-dash lines in FIG. 4, so that by turning this operating pin it is possible to displace the cam 15 between its positions respectively illustrated in FIGS. 3 and 4. In this way it is possible for the operator to introduce the operating pin into the bore 16 and to turn the cam 15 through an angle of approximately 90° between the positions where the clamp will have its release and clamping positions, respectively. In the release position the free edge 17 of the outer clamp 5 is displaced from the inner clamp 3, while in the clamping position this outer free edge 17 of the clamping rail 5 is closely adjacent to and pressed toward the inner clamping rail 3. When the clamping edge 17 moves from the clamping position of FIG. 4 to the release position of FIG. 3 the outer clamping rail 5 turns about an axis which is defined by the bearing means 6, 8 and which is formed by the free edge of the shoulder or surface 12.

As is apparent from FIG. 4, the clamped end of the printing plate 20 is situated in a predetermined clamping plane, and the flat bearing surfaces of the rails which press against each other in the clamping position of the outer rail 5 are situated precisely in the clamping plane.

In order to prevent lateral shifting of the outer rail 5 during its tilting with respect to the inner rail, the surface 18 of the bearing portion 6 of the outer rail directly engages the surface 19 which defines the left limit of the recess or groove 10, as viewed in FIGS. 3 and 4. Therefore, in order to assemble the outer rail with the inner rail it is necessary to introduce and end of the bearing portion 6 into an end of the opening 10 and then to shift the outer rail longitudinally with respect to the inner rail until the parts are properly assembled. Therefore, after this longitudinal shifting of the bearing portion 6 into the opening 10 the rails are interlocked and while movable one relative to the other cannot be separated except by longitudinal shifting in a reverse direction.

In the release or open position of the clamp shown in FIG. 3, the surface 18 of the outer rail 5 forms a stop against which the extremity of the clamped end of the printing plate 20 is placed. Once the end of the plate 20 which is to be clamped is placed in engagement with the clamping surface 21 of the inner rail 3, the cam means 15 is turned by the operating pin which is introduced into the bore 16, so that the elongated clamping portion 17 of the outer rail 5 presses against the end of the plate 20 to clamp the latter between the rails. Inasmuch as the bearing surfaces of the bearing portions 6 and 8 are situated in the clamping plane, there can be no shifting of the printing plate 20 during the clamping thereof. Therefore, not only does the bearing means of my invention provide a structure where the clamping force is distributed along the entire length of the outer rail, but in addition a very precise positioning of the printing plate is assured.

The entire clamping unit, which consists of the inner clamping rail 3, the outer clamping rail 5, the spring means 13 and the cam means 15, can be shifted along the slide surface 4 of the support means 1 back and forth between tensioning and non-tensioning positions. In the tensioning position the plate 20 is tensioned while in the non-tensioning position, the tension on the plate 20 is released.

The tensioning structure includes a spring means composed in part of a tensioning bolt 25 fixed directly to the inner rail 3 by being threaded into a tapped bore situated at the rear of the rail 3. This tensioning bolt 25 extends slidably through a guide bore formed in a wall or rib 26 which is integral with the printing cylinder and forms part of the support means. The spring means includes, in addition to the tensioning bolt 25, a compression spring 27 which is coiled about a cylindrical portion of the bolt 25 between the head thereof and the rib 26. Thus, the spring 27 seeks to displace the tensioning bolt and the entire clamping means in the tensioning direction.

As is apparent from FIG. 2, the clamping means is formed by a pair of clamping units having the above-described structure and situated in side-by-side relation on the cylinder 2. The spring means includes a pair of tensioning bolts 25 extending slidably through guide openings formed in the rib 26 and respectively carrying compression springs 27, so that both of the clamping units are urged in the tensioning direction by the pair of spring means. A motion transmitting means 28 extends between and engages the heads of the bolts 25. This motion transmitting means 28 is in the form of an elongated angle member one wall of which slidably engages the surface 1 of the support means and the other wall of which engages the extremities of the bolts 25. Thus, as is apparent from FIG. 2, the motion transmitting means 28 extends between and engages both of the clamping units. The inner rails 3 of the clamping units extend at their ends somewhat beyond the outer rails 5, and these ends of the inner rails 3 are received in guide members 29 fixed to the cylinder 2 and serving to guide the clamping units for movement to the left and right between the non-tensioning and tensioning positions, as viewed in FIG. 2.

The motion transmitting means **28** serves to transmit to the bolts **25** motion from a rotary cam means part of which is formed by a rotary cam **30** in the form of an eccentric turnably carried by the cylinder **2** between the ends of the angle member **28**. This cam **30** has an accentric shaft portion extending through the slot **31** into the cylinder where this eccentric shaft portion is turnably connected with the cylinder so that the cam **30** can be turned from the position shown in FIGS. 1 and 2 to a position where its outer cylindrical surface engages the wall of the angle member which engages the screws **25**.

The rotary cam means further includes, in addition to the intermediate cam **30**, a pair of outer eccentric rotary cams **32** and **33** respectively aligned with the pair of clamping units and situated in the region of the ends of the motion transmitting means **28**. The eccentric cams **32** and **33** are identical with the cam **30**. It is to be noted that the cam **30** overlaps and engages the wall of the angle bar **28** which engages the surface **1**, so that this cam **30** serves to maintain the angle member **28** in the assembled position shown in the drawings. A straight line extending through all of the turning axes of the three eccentrics **30**, **32** and **33**, extends parallel to the axis of the cylinder **2**.

By turning the intermediate eccentric **30** through 180°, the motion transmitting means **28** is displaced to the left, as viewed in FIG. 2, acting simultaneously on both bolts **25** to displace the latter in opposition to the springs **27** also to the left, thus displacing both of the clamping units to their non-tensioning positions where a plate or plates clamped by the units will not be tensioned. Thus, as a result of this action both of the inner rails **3** will be displaced to the left, as viewed in FIGS. 1 and 2, along the slide surface **4**. In this non-tensioning position, the pair of clamping units can respectively be provided with relatively small printing plates, or a relatively wide printing plate which extends along the entire length of the printing cylinder can be simultaneously clamped by both units. After the units have been placed in their clamping positions, the eccentric or rotary cam means **30** can be turned back to the position shown in FIG. 2, so that the springs **27** now act to displace the units to their tensioning positions, thus tensioning the printing plate or plates. Inasmuch as the tensioning force is derived only from the springs **27**, it is not possible for the clamping units to provide on the plate or plates a tensioning force great enough to damage the printing plate or plates. Thus, the springs **27** are designed so as to exert a sufficiently great tensioning force which will not damage the plates, and the operator cannot physically provide any greater tensioning force with the structure of my invention.

In the event that it is required to clamp only a relatively small printing plate to one of the units, then, as shown in FIG. 5, one of the outer rotary cams, such as the cam **32**, can be turned to act through the motion transmitting means **28** on only one bolt **25** which is aligned with the operated cam **32**, thus displacing only the one clamping unit to its non-tensioning position for receiving a new plate. After the new plate is clamped the eccentric **32** is returned to its initial position so that the spring **27** aligned with the cam **32** will now displace the units aligned with cam **32** into its tensioning position. The other clamping unit can be operated in precisely the same way by actuation of the eccentric **33**, so that both clamping units are individually operable. All three of the rotary cams **30**, **32** and **33** are formed with inclined bores **34**, respectively, as shown for the cam **30** in FIG. 1, which are of the same size as the bores **16** of the cams **15**, so that the same operating pin which is introduced into the bores **16** can also be used to operate the eccentric cams.

While the free clamping edges **17** of the outer rails **5** can be made relatively rigid, it is also possible to provide each outer rail **5** with a springy free clamping edge **17**. In this way it is possible for the springy clamping edge **17** to yield so as to serve to clamp relatively thick as well as relatively thin printing plates, the springy clamping edge being stressed to a greater extent by a relatively thick plate. Moreover, where a springy clamping edge is used for the outer rail, the cam means **15** can have a simple cylindrical cross section of sufficiently large diameter provided only with a flat surface portion in order to enable the springy clamping edge to be displaced between its clamping and non-clamping positions. A particular advantage of such a construction is that the cam **15** will in such case be turned through an angle of 90° between predetermined end positions independently of the particular thickness of the plate which is clamped.

It is to be noted that the structure of my invention according to which the bearing portions **6** and **8** of the clamping rails are in the form of projections mutually received in complementary recesses of the rails provides an exceedingly compact assembly requiring only a small part of the cylinder **2** in order to accommodate the clamp of my invention, so that a much greater part of the cylinder is available to be covered with printing plate structure.

Moreover, as was pointed out above, by situating the shoulder surfaces which press against each other, in the clamping position of the outer rail **5**, precisely in the clamping plane, the printing plate will not shift when it is clamped, so that a very precise positioning thereof is achieved. This is in sharp contrast with the above-described conventional structure where the clamping force is distributed along a plurality of screws which form a turning axis for the turnable clamping rail which is situated at a relatively great distance beyond the clamping plane. With this latter construction there will be an unavoidable shifting of the printing plate when it is clamped, and even a small degree of shifting of the end of the printing plate during clamping thereof will result in undesirable inaccuracy in the positioning of the printing plate.

Furthermore, the feature of my invention according to which it is possible to individually actuate a pair of clamping units which are situated in side by side relation or to operate them simultaneously with a relatively wide printing plate provides an extremely great flexibility for the structure adapting its use with printing plates of widely different sizes.

I claim:

**1.** A device for releasably clamping a printing plate to a rotary printing cylinder of a printing press, comprising an inner clamping rail and an outer clamping rail extending along said inner clamping rail, bearing means connected in part with one of said rails and in part with the other of said rails for connecting said outer rail to said inner rail for movement relative thereto about and radially with respect to an axis extending longitudinally of said rails between a clamping position and a release position, said bearing means extending substantially continuously along the entire length of said outer rail, spring means engaging said outer rail and urging the latter to said release position thereof, and cam means engaging said outer rail substantially continuously along the entire length of said bearing means for moving the outer rail in opposition to said spring means to said clamping position thereof and for distributing the clamping force, when said outer rail is in said clamping position thereof, substantially uniformly along the entire length of said bearing means.

**2.** A device as recited in claim **1** and wherein said bearing means includes a pair of elongated shoulders extending longitudinally along and operatively connected with said rails, respectively, and said shoulders pressing against each other when said outer rail is in said clamping position thereof.

**3.** A device as recited in claim **2** and wherein said rails define a predetermined clamping plane in which an end of a printing plate is clamped when said outer rail is in said clamping position thereof, and said shoulders respectively having surfaces pressing against each other

and situated substantially in said clamping plane when said outer rail is in said clamping position.

4. A device for releasably clamping a printing plate to a rotary printing cylinder of a printing press, comprising an inner clamping rail and an outer clamping rail extending along said inner clamping rail, bearing means connected in part with one of said rails and in part with the other of said rails for connecting said outer rail to said inner rail for movement relative thereto about and radially with respect to an axis extending longitudinally of said rails between a clamping position and a release position, said bearing means distributing the clamping force, when said outer rail is in said clamping position thereof, along the entire length of said outer rail, spring means engaging said outer rail and urging the latter to one of said positions, the cam means engaging said outer rail for moving the latter in opposition to said spring means to the other of said positions, said bearing means including a pair of elongated shoulders extending longitudinally along and operatively connected with said rails, respectively, and said shoulders pressing against each other when said outer rail is in said clamping position thereof, said rails defining a predetermined clamping plane in which an end of a printing plate is clamped when said outer rail is in said clamping position thereof, and said shoulders respectively having surfaces pressing against each other and situated substantially in said clamping plane when said outer rail is in said clamping position, said bearing means including elongated portions of said rails which are formed with elongated openings respectively defined in part by elongated projections of said rails which overlap each other and respectively extend into said openings for interlocking said rails with each other, said projections defining said shoulders and having said surfaces which press against each other susbtantially in said clamping plane when said outer rail is in said clamping position thereof.

5. A device as recited in claim 4 and wherein said spring means presses said shoulder surfaces against each other and maintains said outer rail in engagement with said cam means.

6. A device as recited in claim 1 and wherein said outer rail has a substantially rigid elongated clamping portion extending longitudinally of said outer rail for engaging part of a printing plate to press the latter against said inner rail when said outer rail is in said clamping position thereof.

7. A device as recited in claim 1 and wherein said outer rail has an elongated springy clamping portion extending longitudinally of said outer rail for engaging and pressing part of a clamping plate against said inner rail when said outer rail is in said clamping position.



8. In a printing press, a rotary printing cylinder, support means carried by said cylinder, clamping means carried by said support means for releasably clamping at least one printing plate, said clamping means being supported by said support means for shifting movement between a plate-tensioning position and a plate-non-tensioning position, at least two spring means operatively conected with said clamping means for urging the latter from said non-tensioning to said tensioning position thereof, rotary cam means turnably carried by said cylinder, and motion-transmitting means situated between said cam means and spring means in engagement with both of said spring means for transmitting movement of said cam means to both of said spring means for displacing said clamping means to said non-tensioning position thereof in response to turning of said cam means, said clamping means including a pair of clamping units situated beside each other, said two spring means being respectively connected with said units and each including an elongated tensioning bolt and a spring coiled thereabout, said spring engaging part of said support means and parts of said bolts, respectively, for acting through the latter on said clamping units to urge said units to said tensioning positions thereof, said motion-transmitting means including an elongated member engaging both of said bolts and said cam means including a pair of outer cams respectively situated in alignment with said units and an intermediate cam situated between said outer cams for acting through said elongated member simultaneously on both of said bolts for simultaneously displacing both units to said non-tensioning positions thereof, said outer cams being individually operable for displacing said elongated member with respect to a selected clamping unit in alignment with the operated cam to its non-tensioning position.


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