

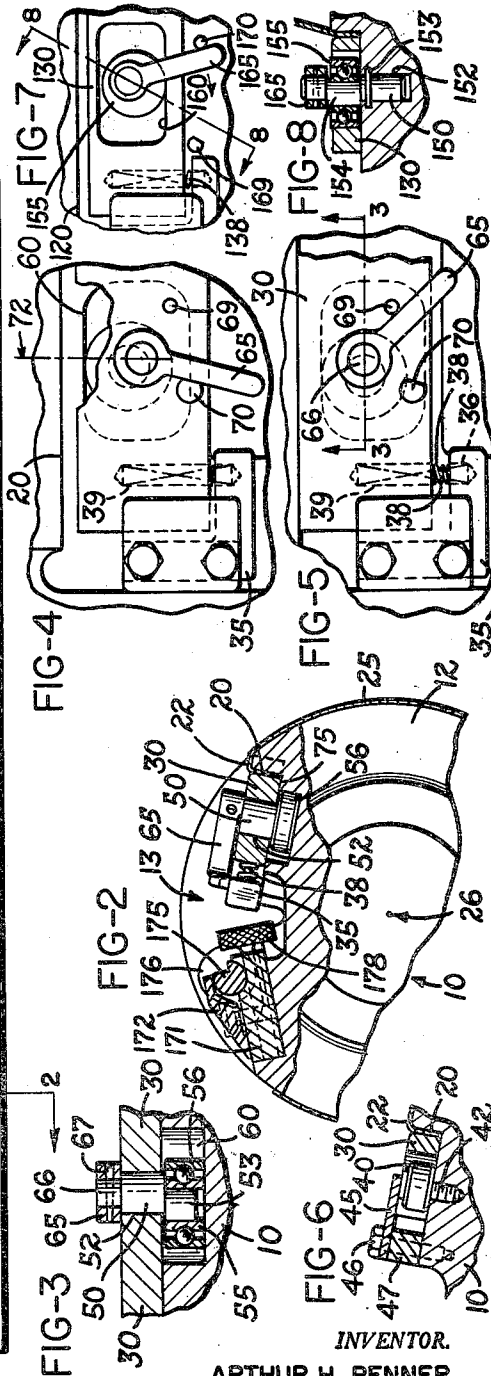
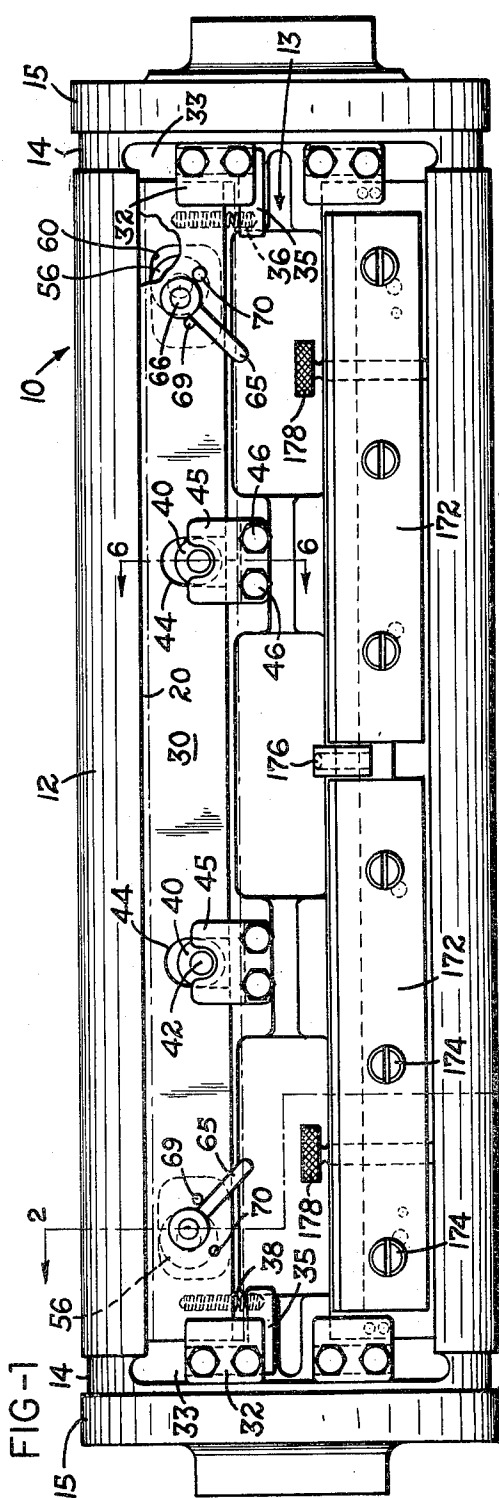
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PLATE CLAMP FOR PRINTING PRESS

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PLATE CLAMP FOR PRINTING PRESS

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The present invention relates to plate clamps or printing presses, particularly to a novel plate clamp construction which permits rapid engagement of a plate by the clamp while the plate is held in properly aligned relation by an operator.

In printing presses, particularly presses using flexible one-piece printing plates of flexible metal, paper, or flexible synthetic materials, it is desirable to clamp such plates securely at their leading edge to the plate cylinder of the press, and to accomplish this function while the plate is properly aligned for subsequent wrapping over the plate supporting surface of the cylinder. For example, assuming that the image material on the plate is squared with respect to the top edge of the plate, and assuming that the top edge is to be the leading edge when the plate is mounted on the cylinder, if a clamping bar is provided to grip the top edge against a clamping surface on the cylinder, and the bar is retracted from the surface, then the operator may insert such top edge of the plate against an aligning abutment or shoulder which is parallel with the cylinder axis, and when the bar is caused to clamp the plate edge in position, the plate will be properly aligned and can be wrapped about the plate cylinder, with its trailing edge being secured by suitable means if desired. In order to hold the plate properly in contact with such aligning shoulder it is desirable to provide a mechanism which will move the clamping bar to its clamping position rapidly and in response to relatively slight operating pressure, for example by a finger of the operator's hand while other fingers on the same hand are holding the plate in position.

The primary object of this invention is, therefore, to provide a novel plate clamp construction for printing presses in which clamping action may be initiated by relatively slight pressure exerted by the operator while he is holding a plate properly in alignment for mounting on the plate cylinder.

Another object of the invention is to provide such novel plate clamp construction wherein a clamping bar is normally biased into a clamping position, and releasing mechanism for the bar acts against the bias thereon to hold the bar in a released position with a force closely balanced with respect to the biasing or clamping force exerted on the bar such that slight actuation of the release member will initiate clamping movement of the bar.

A further object of this invention is to provide a novel plate clamp construction including a clamping bar biased to a normal clamping position with respect to a cooperating surface on a plate cylinder, and wherein release mechanism is provided for the bar including release members operating adjacent the two opposite ends of the bar to overcome the biasing force, and either of which upon manual actuation to a position where clamp pressure is applied will automatically cause the other release member to move in the same direction such that clamping pressure is applied across the full width of the bar.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

FIG. 1 is a plan view of a plate cylinder for a printing press, incorporating the novel plate clamp construction of the present invention;

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FIG. 2 is a view taken on line 2-2 in FIG. 1, showing the plate clamp construction and adjacent portions of the cylinder in section;

FIG. 3 is a detail sectional view on an enlarged scale showing the mounting of the clamp releasing roller and its offset or eccentrically located mounting pin; taken on line 3-3 in FIG. 5;

FIGS. 4 and 5 are plan views of one of the clamp release mechanisms, on an enlarged scale, and illustrating the clamping and releasing positions thereof;

FIG. 6 is a detailed sectional view of one of the clamp bar guiding devices, taken on line 6-6 in FIG. 1; and

FIGS. 7 and 8 are views of a modified form of clamp release mechanism.

Referring to the drawing, which illustrates preferred embodiments of the present invention, the plate cylinder 10 is adapted for mounting in a printing press of any type which prints directly or indirectly from a thin, flexible, wrap-around plate. The cylinder construction includes a main plate supporting surface 12 which extends around the majority of the cylinder circumference, and which terminates at a gap or cut out segment indicated by the general reference numeral 13. Outward of the plate supporting surface 12 the cylinder may be undercut as at 14, and outboard of such undercut sections there may be formed conventional bearers 15. Within the gap section 13 of the cylinder are the clamping and tensioning mechanisms for holding a plate rigidly in properly aligned relation upon the cylinder. The present invention is particularly concerned with the clamp for engaging the leading edge of the printing plate.

Referring particularly to FIG. 2, a first clamping surface 20 is formed on the cylinder, facing into the gap 13 and extending at a predetermined angle with respect to a tangent to the cylinder surface. Preferably the clamping surface 20 is so located that the leading edge 22 of a printing plate 25 is wrapped into the gap 13, and thus rolled back at such leading edge. The surface 20 is of considerable depth (i.e., extension toward the center of the cylinder) and is located in a plane parallel to the axis of rotation of the cylinder, indicated at 26 in FIG. 2.

Cooperating with the clamping surface 20 is a clamping bar 30 which is mounted for limited movement with respect to clamping surface 20 between a clamping position, shown in FIGS. 1, 2 and 5, and a released position shown in FIG. 4. The mounting for the bar 30 also provides for limited non-parallel motion of the bar with respect to the surface 20.

The bar 30 is guided at its outer ends by retainer plates 32 which are bolted onto pads 33 formed on the cylinder, thus limiting the motion of the bar 30 to an essentially sliding motion toward and away from the clamping surface 20. The pads 33 preferably include inwardly extending sections 35 which project toward the center of the cylinder behind the rear corners of the bar 30, and each of which includes a mounting hole 36 receiving a biasing means in the form of a spring 38, each such spring extending into a bore or hole 39 formed within the bar 30 (FIG. 5). Thus, these springs provide a means biasing the bar 30 into clamping position, engaging the edge 22 of the plate between the bar and the clamping surface 20 on the cylinder.

Further guides are provided for bar 30 in the form of rollers 40, two of which are shown in FIG. 1. These rollers are mounted upon studs 42 threaded or otherwise fixed to the cylinder (see FIG. 6) and are received in elongated generally U-shaped slots 44 formed in the bar 30. The fit between these rollers and the slots preferably permits a slight amount of endwise movement of the bar 30, so that limited canting or non-parallel motion of bar 30 with respect to clamping surface 20 is pos-

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sible, for example by retracting one end of the bar from the clamping surface while the other end remains in the clamping position. Bar 30 is also held essentially flat, with slots 44 around the rollers 40, by retainer plates 45 extending over the top of bar 30 and properly spaced as by extension of the mounting bolts 46 through a spacer 47 (FIG. 6). Thus the plates 32 and 45 serve primarily as guides to prevent excessive motion of the bar beyond the desired limits therefor.

The means for moving the bar to its release position is provided by complementary releasing mechanisms adjacent opposite ends of the clamping bar 30. Since these mechanisms are essentially of identical construction, differing only in that one is the complement of the other, i.e., operating in reverse direction, details of only one such mechanism are described herein, and the same reference numerals are applied to identical parts in each mechanism where shown. The releasing mechanism includes a cylindrical mounting pin 50 received in a mounting socket or hole 52 formed in bar 30. This mounting of the pin 50 within the bar preferably includes a bearing engagement of the middle portion of pin 50 extending through the bar with the bearing surface formed by the hole or socket 52, and thus from any force urging these surfaces into engagement, substantial friction will result tending to resist rotation of pin 50 within the bar. Each of the pins 50 includes a lower offset end 53 to one side of the axis of rotation of the pin within bar 30, or in other words an eccentric arrangement. The end 53 preferably provides a mounting for the inner race of a ball bearing 55, and the outer race 56 or such bearing provides a roller which in turn is engageable with a shoulder 60 formed in the cylinder 10, preferably as a face of a slot or recess in the cylinder beneath each end of the bar 30, as shown in FIG. 1. Thus, the shoulder 60 and the socket 52 provide reaction surfaces against which the clamp release mechanisms operate to overcome the force of springs 38.

The shoulder surface 60 preferably is formed parallel to the plane of the clamping surface 20, so that forces exerted between such shoulder and the roller are directed generally along the path of movement of the bar 30 toward and away from the clamping surface 20. This relationship between the shoulder and the clamping surface is of course not essential.

Each of the pins 50 is provided with a handle 65 mounted over the upwardly extending end 66 of the pin, and secured thereto by a pin 67 (FIG. 3) to form a handle providing for manual rotation of the pin 50 within the bar. Such rotation of the pin will of course move the center of the roller 56 in an arc with respect to the axis of rotation of the pin. The handle is so located with respect to the eccentric or offset end 53 of the pin, that when the bar 30 is in its clamping position, as shown in FIGS. 1 and 5, the handle 65 extends at an angle inwardly toward the center of the cylinder. A stop 69 may be provided for the handle at this position, but it will be understood that this stop is so located that it will not interfere with the application of full clamping pressure by the springs 38 through the bar 30 against the clamped edge of the printing plate. In this clamping position, as best seen in FIG. 5, the center or axis of rotation of the pin 50 is shown as being essentially aligned with the center of the roller 56 in a direction along the length of bar 30.

To release the plate, by moving the bar 30 to its release position, the operator grasps each of the handles 65 and rotates them outwardly of the cylinder, in the construction shown in FIGS. 1-6, to cause each roller 56 to bear against its associated shoulder 60, and because of the eccentric relation of the rollers and the central portions of pins 50 in bar 30, this will result in a retracting or releasing motion of bar 30 against the bias of springs 38. This rotation is continued until the handles 65 engage with stops 70, which are conveniently mounted

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on the bar. These stops are so located that the center of pin 50 and the contact line between roller 56 and shoulder 60 are sufficiently close to alignment with a plane 72 (FIG. 4) extending parallel to such line of contact and perpendicular to shoulder 60, that when the handles are stopped in this release position the force couple tending to rotate the pins in the opposite direction is insufficient or ineffective to overcome the static friction between the pins 50 and their sockets 52.

In other words, since the springs are tending to force the bar 30 toward its clamping position, the reaction force of shoulder 60 acting through the center of rotation of roller 56 (which is also the center of the eccentric pin portion 53) will tend to combine with the pressure of the bar 30 against the pin 50 to produce a force couple tending to rotate the mechanism in a direction opposite to the manual releasing motion. However, when the centers of the roller and of the pin 50 are relatively close to the plane 72, the effect of this couple to produce such rotation is insufficient to overcome the static friction resisting rotation of pin 50 within socket 52. This static friction force will of course increase as the center of roller 56 approaches plane 72, as the spring is being compressed.

If each of the handles 65 is swung to the release position and held momentarily, the releasing mechanisms will remain in the releasing position and the clamp bar will be held away from the clamping surface. Assuming that both of the releasing mechanisms are constructed as described above, then if either is tapped by a finger of an operator, as he uses both hands to hold the edge of a plate against a ledge 75 (FIG. 2) adjacent the lower edge of the clamping surface, this will initiate an automatic clamping movement of the bar 30.

It is possible to have one of the releasing mechanisms arranged to rotate farther or "over-center" in the release position of the bar, as by moving the center of roller 56 across plane 72. This of course will require that such over-center mechanism will have to be the one released manually, as in releasing an over-center toggle mechanism, while the other releasing member can be arranged to operate automatically in response to movement of the "over-center" toggle-type mechanism, in the manner previously described.

It is also possible to have the reaction surfaces reversed, as between the cylinder and the clamping bar. A suitable arrangement of this type is shown somewhat diagrammatically in FIGS. 7 and 8, wherein the clamping bar 130 is normally urged against a clamping surface 120 on the cylinder by a pair of biasing springs 138. The bar is provided at each end with an elongated slot or opening which forms a shoulder 160, and a roller 155 acts against this shoulder on the bar, being carried on a mounting pin 150 which is received in a socket or bore 152 in the cylinder, and held in place by a snap ring 153. The roller 155 is carried on an offset or eccentric portion 154 of the pin 150, and a handle 165 is fastened to the pin by suitable means such as described in connection with the apparatus shown in FIGS. 2 and 3. The operation of this mechanism is essentially the same as that previously described, with stops 169 and 170 provided for handle 165, limiting the rotation of the pin 150 for movement in the same manner as the pin 150 described above.

The present invention is particularly useful in the mounting of paper plates on machines which employ a wetted paper plate in the reproduction of copies, and for this purpose the cylinder 10 may be suitably coated with a corrosion resistant material, for example plated with chromium, or the cylinder may be constructed of stainless steel or the like. In such machines the wet plate will adhere over most of its length to the cylinder plate supporting surface, and it is usually unnecessary to fasten the trailing edge of the plate.

However, if it should be desirable to secure the trailing edge of the plate, or in connection with the use of

metal plates, the trailing edge of which preferably should be secured and tensioned, then a trailing edge clamp such as shown in FIGS. 1 and 2 can be employed. This construction includes the clamping bars 171 over which are carried movable clamp members 172 held loosely in position by the mounting studs 174. A cam 175 is mounted beneath the rearward edge of the clamp members 172, and may be rotated by a wheel 176 to cause a generally pivotal motion of the clamp members 172 about studs 174, engaging the edge of a plate between the members 172 and the bar 171. This entire clamp mechanism may then be drawn away from the plate supporting surface 12 by rotation of the tensioning studs 178 to tension the plate.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In combination with a cylinder of a printing machine, a clamp for securing one end of a sheet member to said cylinder, comprising means forming a first clamping surface on said cylinder, a clamping bar adapted to engage one end of a sheet member, means mounting said bar on said cylinder for limited movement with respect to said clamping surface between clamping and releasing positions parallel to said surface and also providing for limited non-parallel motion of said bar with respect to said surface, means biasing said bar toward engagement with said surface along essentially the full extent thereof to clamp one end of a sheet member between said bar and said surface, clamp release means including reaction surfaces formed on said cylinder and on said bar, one of said reaction surfaces being a shoulder and the other an annular socket, a roller engageable with said shoulder, a cylindrical mounting pin extending from said roller parallel to and offset from the axis of rotation thereof, said pin being mounted in said socket providing for arcuate movement of said roller with respect to said socket, a handle on said pin for manual rotation thereof to swing said roller against said shoulder causing retraction of said bar from said clamping surface, and stop means limiting pivoting of said handle to a position where the component of force from said biasing means tending to cause rolling motion of said roller along said shoulder and concurrent arcuate movement of said roller about said socket is insufficient to overcome the frictional force between said pin and said socket.

2. In combination with a plate cylinder of a printing machine, a plate clamp for securing one end of a printing plate to said cylinder, comprising means forming a first clamping surface on said cylinder, an elongated clamping bar adapted to engage one end of said plate and press it against said surface, means mounting said bar on said cylinder for limited movement with respect to said clamping surface between a clamping position wherein an edge of a plate is engaged between said bar and said surface and a release position wherein said bar is moved farther from said surface, means biasing said bar toward said clamping position, clamp release members acting on opposite ends of said bar by reaction with said cylinder against said biasing means to move said bar to its release position, each said release member including a roller and a cylindrical pin portion carrying said roller in freely rotatable relation on an axis parallel to and offset from the axis of said pin portion, socket means receiving said pin portions of said release members and defining an axis of rotation about which said releasing force against said bar by reaction with said cylinder in response to rotation of said release members about such axis, handles on each of said release members providing for manual independent rotation thereof, and stops limiting rotation of said release mem-

bers in a releasing direction to a position where the center of each roller is sufficiently close to a plane passing through the axis of the adjacent pin portion and perpendicular to said clamping surface such that the force couple resulting from action of said biasing means through said bar against said release members is insufficient to overcome the static friction between said pin portions and said socket means.

3. In combination with a plate cylinder of a printing machine, a plate clamp for securing one end of a printing plate to said cylinder, comprising means forming a first clamping surface on said cylinder, an elongated clamping bar adapted to engage one end of a plate, means mounting said bar on said cylinder for limited movement with respect to said clamping surface between clamping and releasing positions parallel to said surface and also providing for limited non-parallel motion of said bar with respect to said surface, means biasing said bar toward engagement with said surface along essentially the full extent thereof to clamp one end of a printing plate between said bar and said surface, clamp release means including a shoulder formed on said cylinder parallel to said surface, a pair of rollers each engageable with said shoulder adjacent opposite ends of said bar, a cylindrical mounting pin extending from each of said rollers parallel to and offset from the axis of rotation thereof, means forming mounting sockets for said pins in said bar adjacent the ends thereof providing for opposed and independent arcuate movements of each said roller with respect to said bar, handles on each of said pins for manual rotation thereof to swing said rollers against said shoulder causing retraction of said bar from said clamping surface, and stop means limiting pivoting of said handles to a position where the force component tending to produce rolling motion of said rollers along said shoulders and concurrent arcuate movement of said rollers to permit clamping action of said bar is insufficient to overcome the frictional force between said pins and their mounting sockets.

4. In combination with a plate cylinder of a printing machine, a plate clamp for securing one end of a printing plate to said cylinder comprising means forming a first clamping surface on said cylinder, an elongated clamping bar adapted to engage one end of a plate, means mounting said bar on said cylinder for limited movement with respect to said clamping surface between clamping and releasing positions parallel to said surface and also providing for limited non-parallel motion of said bar with respect to said surface, means biasing said bar toward engagement with said surface along essentially the full extent thereof to clamp one end of a printing plate between said bar and said surface, clamp release means including shoulder means formed on said bar, a pair of rollers each engageable with said shoulder means adjacent opposite ends of said bar, a cylindrical mounting pin extending from each of said rollers parallel to and offset from the axis of rotation thereof, means forming mounting sockets for said pins in said cylinder adjacent the ends of said bar providing for opposed and independent arcuate movements of each said roller with respect to said bar, handles on each of said pins for manual rotation thereof to swing said rollers against said shoulder causing retraction of said bar from said clamping surface, and stop means limiting pivoting of said handles to a position where the force component tending to produce rolling motion of said rollers along said shoulders and concurrent arcuate movement of said rollers is insufficient to overcome the frictional force between said pins and their mounting sockets.

5. In combination with a plate cylinder of a printing machine, a plate clamp for securing one end of a printing plate to said cylinder, comprising means forming a first clamping surface on said cylinder extending angularly with respect to the surface of said cylinder and parallel to the axis of rotation thereof, a clamping bar, means

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mounting said bar on said cylinder adjacent said clamping surface for limited movement with respect to said clamping surface between clamping and releasing positions in which said bar extends essentially parallel to said clamping surface, spring means urging said bar toward engagement with said surface to clamp one end of a plate in fixed relation to said cylinder, clamp release means including a shoulder formed on said cylinder, a pair of rollers each engageable with said shoulder adjacent opposite ends of said bar, a cylindrical mounting pin fastened to each of said rollers with its axis of rotation parallel to and offset from the axis of rotation of the associated roller, means forming mounting sockets in said bar receiving said pins in relatively close fitting relationship providing for rotation of said pins in said bar producing concurrent arcuate movement of each said roller with respect to said bar, handles on each of said pins providing a means for manual rotation thereof to move said rollers against said shoulder producing a retracting force in opposition to said spring means, and stops limiting rotation of said pins to a position where the axis of each said roller and the axis of its associated pin is sufficiently close to a plane perpendicular to said clamping surface and passing through the axis of such associated pin that the force couple resulting from action of said spring means through said bar against said pins and said roller is insufficient to overcome the static friction between said pins and said sockets.

6. In combination with a plate cylinder of a printing machine, a plate clamp for securing one end of a printing plate to said cylinder, comprising means forming a first clamping surface on said cylinder extending angularly with respect to the surface of said cylinder and parallel to the axis of rotation thereof, a clamping bar, means mounting said bar on said cylinder adjacent said clamping surface for limited movement with respect to said clamping surface between clamping and releasing positions in which said bar extends essentially parallel to said clamping surface, spring means urging said bar toward engagement with said surface to clamp one end of a plate in fixed relation to said cylinder, clamp release means including shoulders formed on said bar, a pair of rollers each engageable with one of said shoulders adjacent opposite ends of said bar, a cylindrical mounting pin fastened to each of said rollers with its axis of rotation parallel to and offset from the axis of rotation of the associated roller, means forming mounting sockets in said cylinder receiving said pins in relatively close fitting relationship providing for rotation of said pins to produce concurrent arcuate movement of each said

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roller with respect to said bar, handles on each of said pins providing a means for manual rotation thereof to move said rollers against said shoulders producing a retracting force in opposition to said spring means, and stops limiting rotation of said pins to a position where the axis of each said roller and the axis of its associated pin is sufficiently close to a plane perpendicular to said clamping surface and passing through the axis of such associated pin that the force couple resulting from action of said spring means through said bar against said pins and said roller is insufficient to overcome the static friction between said pins and said sockets.

7. In combination with a plate cylinder of a printing machine, a plate clamp for securing one end of a printing plate to said cylinder comprising means forming a first clamping surface on said cylinder, an elongated clamping bar, means mounting said bar on said cylinder for limited movement with respect to said clamping surface between clamping and releasing positions parallel to said surface and also providing for limited non-parallel motion of said bar with respect to said surface, means biasing said bar toward said surface along essentially the full extent thereof to clamp one end of a printing plate between said bar and said surface, clamp release means for moving one end of said bar between said releasing and clamping positions, reaction surfaces formed on said cylinder and on said bar adjacent the other end of said bar, one of said reaction surfaces being a shoulder, and the other an annular socket, a clamp release member including a roller engageable with said shoulder, a pin extending from said roller parallel to and offset from the axis of rotation thereof, said pin being mounted in said socket providing for arcuate movement of said roller about said socket, a handle connected for manual rotation of said release member to swing said roller against said shoulder causing retraction of said other end bar from said clamping surface, stop means limiting pivoting of said release member to a position where the component of force from said biasing means tending to cause rolling motion of said roller along said shoulder and concurrent arcuate movement of said roller about said socket is insufficient to overcome the frictional force between said pin and said socket, and said release member being responsive to movement of said one end of said bar to clamping position to cause automatic operation of said release member and movement of said other end of said bar to clamping position.

No references cited.