United States Patent

[11] 3,626,848

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[21] Appl. No. **831,394**
[22] Filed **June 9, 1969**
[45] Patented **Dec. 14, 1971**

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[54] **LOCKUP FOR THIN PLATES**
8 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **101/415.1**
[51] **Int. Cl.** **B41f 27/12**
[50] **Field of Search** 101/415.1, 378, 383, 375

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ABSTRACT: A lockup for a thin printing plate of the type having inwardly bent leading and trailing edges in which a U-shaped longitudinally extending spring is mounted in a slot formed in the printing cylinder with a cam shaft on one side of the spring for pressing the legs of the spring in the same direction for respectively holding the leading edge captive and for hooking onto the trailing edge to lock the plate to the cylinder and to provide continuous automatic takeup as the cylinder revolves.

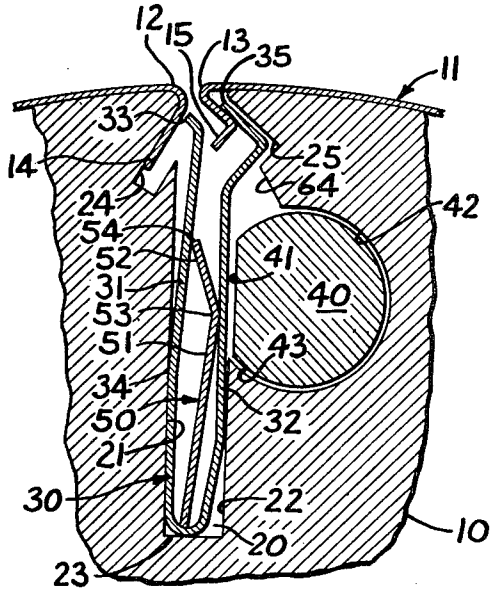

FIG. 1

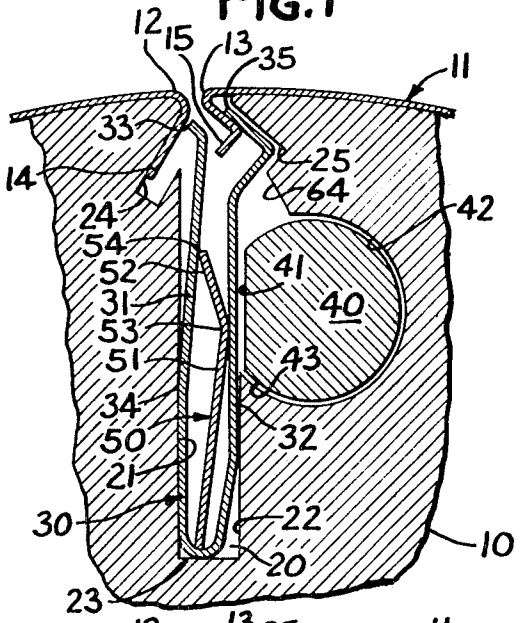

FIG. 2

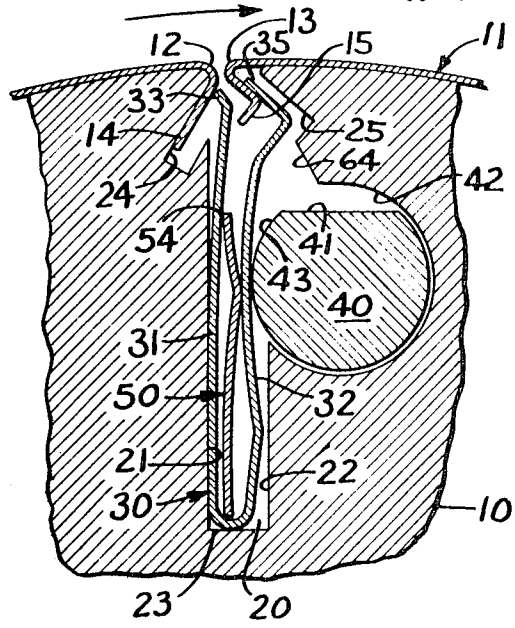

FIG. 5

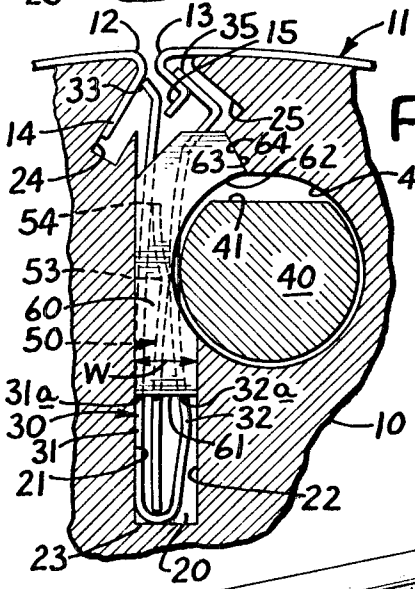

FIG. 6

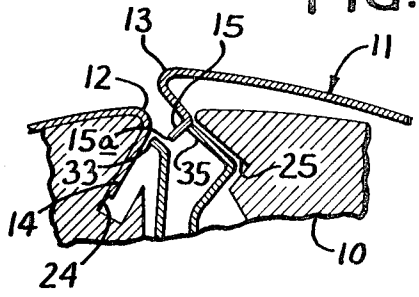

FIG. 4

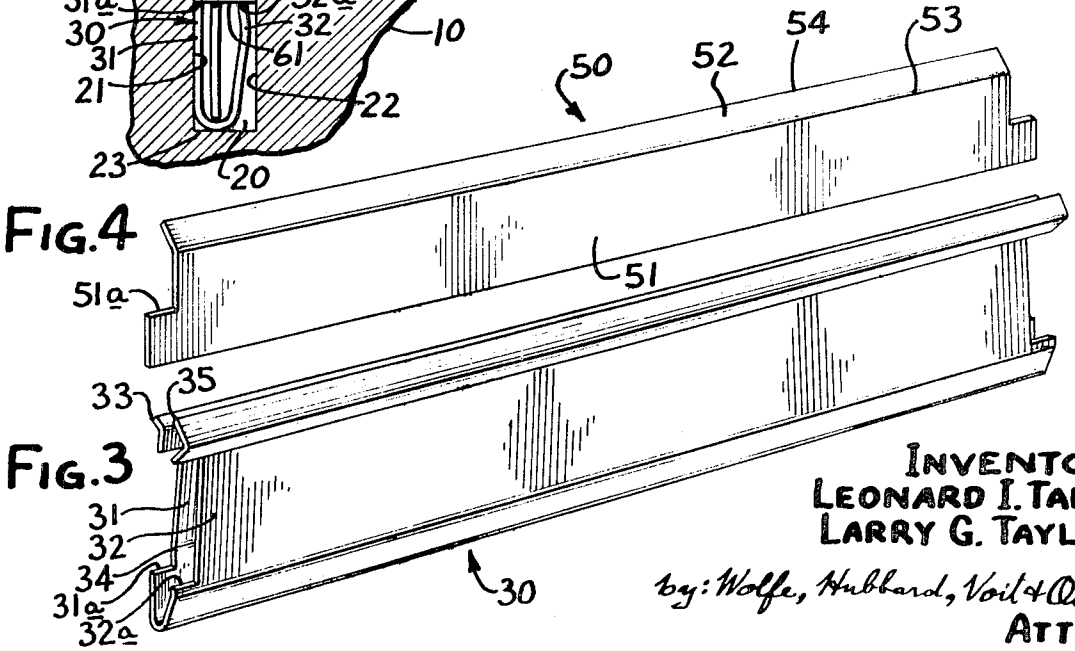

FIG. 3

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LOCKUP FOR THIN PLATES

It is an object of the present invention to provide a plate lockup for a thin-printing plate which is safe and secure with positive gripping at both the leading and trailing edges of the plate. It is a related object to provide a lockup for a thin plate of metal or plastic which enables repeated usage and long plate life by automatic equalization of the applied stress along the plate and avoidance of stress concentration thereby to avoid any localized regions of wear. In this connection it is an object to provide a lockup in which the maximum stress applied to the plate is a matter of engineering design and does not depend upon exercise of skill or judgment by the operator.

It is another object of the invention to provide a lockup in which a plate may be easily and quickly installed by snapping into place with detent action and in which the plate is clamped at both the leading and trailing edges simultaneously as a result of a single rocking movement of an operating shaft. When the clamping force is removed the plate may be just as readily snapped free.

It is a further object of the present invention to provide a lockup for thin plates which, in addition to its operating advantages, is more simple, economical and compact than lockups of conventional design.

It is another object to provide a plate for a thin plate lockup in which the plate itself is specially formed along the edge for rigidification and to facilitate snapping into position for temporary retention in readiness for locking up.

Other objects and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawing in which:

FIG. 1 is a fragmentary section taken through a plate lockup assembly incorporating the present invention with the lockup shown in its released condition;

FIG. 2 is a fragmentary section showing the lockup engaged with the leading and trailing edges;

FIG. 3 is a perspective view showing the U-shaped spring which forms the main element of the lockup.

FIG. 4 is a perspective view of a force-transmitting member or helper spring interposed between the legs of the "U";

FIG. 5 is a section similar to FIG. 1 but showing the manner in which the lockup springs are retained seated in the groove; and

FIG. 6 is a diagram showing the snapping of the trailing edge into seated position.

While the invention has been described in connection with a preferred embodiment, it will be understood that we do not intend to be limited to the particular embodiment shown but intend on the contrary to cover the various alternative and equivalent constructions which are included within the spirit and scope of the invention.

Turning now to the drawings there is disclosed in FIG. 1 a portion of a printing cylinder 10 of a press mounting a printing plate 11 having a leading edge 12 and a trailing edge 13. The plate is bent inwardly at the leading edge to form an acute angle terminating in a leading edge lip 14. Similarly the trailing edge is bent inwardly to form an acute angle for hooking engagement, the inwardly bent portion terminating in a trailing edge lip 15.

In accordance with the present invention the plate cylinder is formed with a relatively narrow radial slot into which is inserted a longitudinally extensive U-shaped clamping spring, the spring having a first leg presenting a tip for engaging the leading edge of the plate and a second leg presenting a hook for hooking onto the trailing edge of the plate. A camming member is provided extending along the length of the spring at the trailing edge side of the groove for applying force to the central portion of both of the legs for movement in the same direction so that when the shaft is rotated into clamping position, the leading edge of the plate is held, and the trailing edge is hooked and held under tension, to produce continuous automatic takeup of the plate as the cylinder rotates.

Thus referring to the drawing the cylinder 10 is formed with a narrow radially extending slot 20 defined by a leading edge wall 21, a trailing edge wall 22, and a bottom 23. Toward the top of the leading edge wall, the slot is widened, by making an angled undercut, to form a seating surface 24 for the lip 14 of the plate. Similarly, the trailing edge wall 22 is undercut, as indicated at 25, to provide clearance for the hook to be described.

Seated in the groove 20 is a longitudinally extending U-shaped spring 30 having a first leg 31 and a second leg 32 for engaging the leading and trailing edges of the plate. The leg 31 has a tip 33 which is positioned opposite the undercut surface 24 for bearing upon the lip 14 of the leading edge and for maintaining the same seated against the undercut 24. The leg 31 is bent, or sprung, slightly at 34 to provide clearance for insertion of the leading edge of the plate when the spring is in the relaxed condition shown in FIG. 1. The upper edge of the leg 32 is bent, as shown, to form a continuous hook 35 for hooking onto the trailing edge. The configuration of the hook 35 corresponds to that of the undercut surface 25 so that the hook, when the spring is in the relaxed state, nests within the undercut.

For the purpose of applying force against the center portion of the leg 32 of the spring, evenly distributed along its length, a cam shaft or rod 40 having a "flat" 41 is provided on the trailing edge side of the slot. The shaft is recessed within a longitudinal opening 42 of circular contour which intersects the wall 22 of the slot, the flat being substantially flush with the wall when in the position of throw off illustrated in FIG. 1. The term "cam" or "cam shaft" as used herein will be understood to be any movable force-transmitting member capable of applying distributed force laterally against the adjacent leg of the spring.

In order to transmit force, and hence motion, from the second leg of the spring to the first when the cam shaft is rotated, a longitudinally extending force transmitting member is interposed between the legs of the spring and bridging the central portion thereof. More specifically, an auxiliary spring member, or "helper" spring, is provided in the form of a plate of metal which is bent to form a cross section of dogleg shape. This helper spring, indicated at 50, has a flat body portion 51 and an upper portion 52 which is bent along a crease line 53 so as to extend upwardly and at an angle out of the plane of the portion 51. The member is so dimensioned that the crease line 53 is approximately aligned with the center of the cam shaft 40 to define a concentrated region to which force is applied, the upper edge 54 of the member serving to transmit such force efficiently to the upper portion of the leg 31 of the spring.

The operation of the lockup assembly will be apparent upon comparing FIGS. 1 and 2 which show the assembly in the thrown off and clamping positions, respectively. In the thrown off position the shaft 40 is rotated so that the flat 41 thereon is parallel to the leg 32 of the spring so that the hook 35 on the spring is free to assume its nested out of the way position along the undercut 25. At the same time the helper spring member 50 is in a substantially relaxed state, bridging the space between the two legs of the spring. The first leg 31 of the spring is "sprung" to a slightly retracted position to provide for access of the inwardly bent leading edge portion of the plate. The trailing edge is, as shown, hooked over the hook 35.

When the shaft 40 is rocked through a limited angle, for example, clockwise through an angle of 90°, the "high" portion 43 of the cam is crowded upwardly against the leg 32 of the spring forcing it and the hook 35 at the end of the leg to the left thereby positively hooking the trailing edge of the plate to hold it captive and taking up any slack. Because of the flexure provided by the upper portion of the spring leg 32, the trailing edge of the plate is maintained under tension to provide continuous and automatic takeup as the cylinder rotates, the normal direction of rotation being indicated by the arrow. Since the crease 53 of the helper spring is opposite the high portion of the cam, the helper spring is squeezed so that it tends to adopt a flattened shape as shown in FIG. 2, with the upper edge 54 applying stress to the upper portion of the spring leg 31, thereby bringing the tip 33 into firm seated engagement

along the leading edge portion **14** of the printing plate. This insures that the leading edge remains safely held in a reference position notwithstanding the peripheral tension which may be developed in the plate as it is ironed out by the cooperating cylinder under operating conditions. Such positive holding of the leading edge is particularly valuable where the plate is made of thin relatively soft material which would, by itself, be incapable of holding a well-defined crease at the leading edge. Flexing at the leading edge is eliminated.

To facilitate installation of the plate and to insure that the trailing edge portion **15** enters on the proper side of the hook **35** of the spring, and to achieve denting, the trailing edge, in addition to being bent inwardly, is bent into "Z" formation to provide an angled guiding surface indicated at **15***a* in FIG. **6**. Thus in installing a plate, the leading edge is first hooked over the undercut surface **24**, the plate is wrapped around the cylinder and the trailing edge is snapped into the opening of the slot. The surface **15***a* at the trailing edge thereupon engages the tip of the hook **35** so that the trailing edge moves into seated engagement with detent action, on the proper or left-hand side of the hook to hold the plate temporarily in position for lockup. To assist in guiding the lip at the trailing edge of the plate inwardly, the tip **33** of the leading edge spring is bent, as shown, in the same direction as the hook **35**. The Z configuration not only presents a guide surface **15***a* but it also serves to reenforce or rigidify the trailing edge of the plate, making the plate more durable in a usually vulnerable region of stress. The Z configuration in addition facilitates removal. Thus at the end of the printing run when the cam shaft **40** is rotated back into the thrown off position shown in FIG. **1**, insertion of a scale, screwdriver tip or the like between hook and the trailing edge at one end of the plate permits the end of the plate to be moved or pried upwardly, and since the trailing edge is rigidified against bending out of the plane of the plate, progressive release occurs along the entire length of the hook **35** causing the trailing edge to snap clear. Disengagement is assisted by the fact that the plate naturally tends to spring back or unwind to its normally flat state.

For the purpose of retaining the U-shaped spring **30** and helper spring **50** seated in the groove **20** in spite of centrifugal force, a retaining ledge is formed at the base of the spring members, near the bottom of the slot, over which is positioned a specially shaped retaining block. Thus, referring to FIGS. **3–5**, the legs **31**, **32** of the spring member **30** are notched out to provide ledges **31***a*, **32***a*. Similarly, the helper spring **50** is notched to provide a retaining ledge **51***a*. The ledges are dimensioned to fall into alignment. For the purpose of engaging the ledges, a retaining block **60** is provided having a dimension W which corresponds to the width of the slot, having a blocking surface **61**, an arcuate surface **62** for the purpose of "clearing" the cam shaft, and a retaining surface **63** which abuts against an angled surface **64** formed on the wall **22** of the slot. It will be apparent that because of the engagement at the retaining surface, the retaining member **60** is locked in the slot with its blocking surface **61** in obstructing engagement with the ledges **31***a*, **32***a*, **51***a*, of the springs. It will also be apparent that where a number of springs **30**, **50** are used, end to end, within a continuous slot **20**, a single blocking member **60** having a width which is double the width of the ledges may be employed to anchor the ends of adjacent spring elements.

The lockup assembly described above is particularly well suited for the holding of thin offset-printing plates which, where made of metal, may have a thickness of only 0.013 inch, or even as little as 0.006 inch. At the leading edge the plate is maintained firmly seated on the undercut. Any tendency for the leading edge crease to unfold is prevented by the continuous longitudinal engagement of the tip **33** of the spring leg **31**. Similarly at the trailing edge any tendency for the crease to unfold is prevented by the continuous hooked engagement which tends to apply clamping force along the edge of the plate in the region of the crease, rather than below it. Moreover, any tendency for the trailing edge crease to unfold is resisted by the obstruction of the edge of the Z lip by the backside of the spring leg **31**.

It is to be noted that because of the fact that spring members extend the entire width of the plate there is no concentration of force from point to point along the width. On the contrary, force is evenly applied and minor dimensional irregularities are automatically accommodated so that the maximum stress is kept well below the point which will cause localized deformation of the plate material. This not only is true where the plate is made of aluminum or metal having similar characteristics but also where the plate is made of relatively soft plastic material. It may be noted further that maximum spring forces occur in the locked up condition which is to be distinguished from prior lockup arrangements in which the spring is increasingly stressed as it is forcibly moved to the position of throw off. The maximum stress applied to the plate is, nevertheless, completely independent of the press operator. No judgement is required in the rocking of the cam shaft **40** from the thrown off position shown in FIG. **1** to the clamping position shown in FIG. **2**. Nor need any judgment be exercised in inserting the leading and trailing edges of the plate into the slot in position for lockup. The slot **20** is, at its mouth, of narrower width than the slot usually provided in lockups of this general type. The effective opening may be as little as 0.030 inch. Not only does this insure a maximum amount of printing area, but the amount of material which must be removed from the cylinder to accommodate the spring assembly is minimized so that the integrity of the cylinder is retained.

The assembly is inherently compact because of the flat nesting of the spring elements. Since the springs are continuous the length of the cylinder, the force applied per unit length may be kept low so that the spring elements may be relatively small and made of relatively light spring stock. For example, in a practical case, the radial dimension of the U-shaped spring may be on the order of only an inch and a half, made of stainless steel of approximately 0.025 inch thickness suitably hardened.

While the term "printing plate" has been used in reference to the plate engaged by the lockup, it will be apparent that the lockup is not limited to use with plates intended expressly for printing and the term may accordingly be understood in the generic sense. The term "U-shaped" will be understood to refer to any spring or composite spring assembly having longitudinally extensive spring legs which are arranged generally parallel to one another in closely spaced relation.

The term "force-transmitting member (or element)" as used herein, and which is applied to the member **50** is not necessarily limited to a helper spring of the type shown but will be understood to include any member or portion of a member which forms a force transmitting bridge between the central portions of the first and second legs so that force and movement applied by the cam to the central portion of the second leg is transmitted to the first leg to bring the top of that leg to bear upon the bent over leading edge of the plate.

We claim as our invention:

1. In a plate lockup for a thin printing plate having inwardly bent leading and trailing edges, the combination comprising a plate cylinder having an axially extending radial slot formed in the surface thereof, said slot defining a first undercut surface for seating the inwardly bent leading edge of the plate and a second undercut surface arranged opposite thereto, a longitudinally extensive U-shaped spring seated in the slot, said U-shaped spring having a first leg presenting a tip opposite the first undercut surface in position for bearing upon the leading edge of the plate and a second leg having an edge of hook cross section nested with the second undercut surface and extending under the inwardly bent trailing edge of the plate, means including a spring actuating cam shaft extending the length of the U-shaped spring along the trailing edge side of the slot and having a longitudinal ridge for applying force to the central portion of the second leg, force transmitting means bridging the space between the legs so that when the cam is rotated the force transmitting member causes the tip of the

first leg to be brought to bear against the leading edge of the plate to hold it captively seated against the first undercut surface accompanied by movement of the edge of hook cross section on the second leg out of nested position with respect to the second undercut surface and into hooking engagement with the trailing edge of the plate for resiliently tensioning the plate for continuous automatic takeup as the cylinder rotates.

2. In a plate lockup for a thin printing plate having inwardly bent leading and trailing edges, the combination comprising a plate cylinder having an axially extending radial slot formed in the surface thereof, said slot defining an undercut surface for seating the inwardly bent leading edge of the plate, a longitudinally extensive U-shaped spring seated in the slot, said U-shaped spring having a first leg presenting a tip in the form of a longitudinal edge opposite the undercut surface in position for bearing upon the leading edge of the plate and a second leg having an edge of hook cross section for underlying the inwardly bent trailing edge of the plate, a manually rotatable cam shaft extending along the length of the U-shaped spring on the trailing edge side of the slot and having a longitudinal raised portion for applying force to the central portion of the second leg thereby to move the hooked edge thereon into engagement with the trailing edge of the plate, and means including a force-transmitting member interposed between the two legs for transmitting force from the second leg to the first so that the tip of the first leg is brought into engagement with the leading edge of the plate when the cam shaft is rotated.

3. The combination as claimed in claim 3 in which the force-transmitting member is in the form of a spring plate having a portion bent out of the plane thereof for normally (filling up) bridging substantially the entire gap between the first and second legs so that inward movement of the second leg brought about by the cam causes force to be transmitted from the second leg to the first leg for simultaneous movement of the two legs.

4. The combination as claimed in claim 3 in which the force-transmitting member is in the form of a spring plate of dogleg shape having a central bend generally aligned with the axis of the cam shaft for defining a region of concentration of applied force, the bend defining an upper portion dimensioned to extend into force-transmitting engagement adjacent the tip portion of the first leg of the U-shaped spring.

5. In a plate lockup for a thin printing plate having inwardly bent leading and trailing edges, the combination comprising a plate cylinder having an axially extending radial slot formed in the surface thereof, said slot defining an undercut surface for seating the inwardly bent leading edge, a longitudinally extensive U-shaped spring seated in the slot, said U-shaped spring being in the form of a centrally bent plate of spring metal characterized by first and second legs spaced closely parallel to one another, said first leg presenting a longitudinal edge at its tip arranged opposite the undercut surface in a position for bearing upon the leading edge of the plate, said second leg having an edge for underlying said inwardly bent trailing edge and formed into a hook for hooking onto said trailing edge of the plate, means including a cam shaft having a flat thereon forming a substantial continuation of one of the walls of the slot but capable of projecting out into the slot for engagement of the second leg of the spring when the shaft is rotated thereby to apply tension to the hooked trailing edge of the plate, a helper spring in the form of a flat plate of spring metal bent at its central portion positioned between the legs of the U-shaped spring so that when the second leg is engaged by the cam, movement is transmitted from the second leg to the first leg so that the tip of the first leg engages the leading edge of the plate thereby to hold it captive against the undercut surface, and means mounted in the slot for holding the U-shaped spring and helper spring seated in the bottom of the slot.

6. In a plate lockup for a thin printing plate having inwardly bent leading and trailing edges, the combination comprising a plate cylinder having an axially extending radial slot formed in the surface thereof, said slot defining an undercut surface for seating the inwardly bent leading edge of the plate, a longitudinally extensive U-shaped spring seated in the slot, said U-shaped spring having a first leg presenting a tip in the form of a longitudinal edge opposite the undercut surface in position for bearing upon the leading edge of the plate and a second leg having an edge for underlying said inwardly bent trailing edge and formed into hook shape for hooking onto said trailing edge of the plate, a cam shaft extending along the length of the U-shaped spring on the trailing edge side of the slot for applying force to the central portion of the second leg thereby to engage the hook with the trailing edge of the plate, means including a longitudinally extensive force-transmitting member in the form of a spring plate interposed between the two legs for transmitting force from the second leg to the first so that the tip of the first leg is brought into engagement with the leading edge of the plate when the cam is actuated, the spring plate being longitudinally coextensive with the U-shaped spring, the spring and plate being notched at the ends to form aligned ledges, and a blocking member registered with the slot for blockingly engaging the ledges on the plate and spring for holding the latter in seated position in the groove against centrifugal dislodgement as the cylinder rotates.

7. In a plate lockup for a thin printing plate having inwardly bent leading and trailing edges the combination comprising a plate cylinder having an axially extending radial slot formed in the surface thereof, said slot having a first undercut surface along the edge corresponding to the leading edge of said plate as regards the direction of rotation of said cylinder, for seating the inwardly bent leading edge of the plate, a second undercut surface provided along the trailing edge of said slot, a longitudinally extensive U-shaped spring having a first leg presenting a longitudinal edge adjacent the said first undercut surface and a second leg having a longitudinal edge formed into hook cross section and disposed between the said second undercut surface and the inwardly bent trailing edge of the plate, a rockable shaft extending the length of the U-shaped spring along the trailing edge side of the slot, said shaft having a camming surface thereon for projection from the plane of said trailing side to engage said second leg whereby upon rotation of said shaft the said second leg is forcibly displaced in a direction opposite the direction of rotation of said cylinder to engage the inwardly bent trailing edge of the plate and exert a constant tension thereon, and means for transmitting the motion of said second leg to said first leg whereby the longitudinal edge of the first leg is brought to bear against the inwardly bent leading edge of the plate.

8. In a plate lockup assembly, the combination comprising a thin printing plate having inwardly bent leading and trailing edges, a plate cylinder having an axially extending radial slot formed in the surface thereof, the slot defining an undercut surface for seating the inwardly bent leading edge of the plate, a longitudinally extensive U-shaped spring seated in the slot, said U-shaped spring characterized by first and second legs spaced closely parallel to each other, said first leg presenting a longitudinal edge at its tip opposite the undercut surface in position for bearing upon the inwardly bent leading edge of the plate and a second leg having a longitudinal edge formed into hook cross section for underlying the inwardly bent trailing edge of the plate, the inwardly bent trailing edge of the plate being bent into Z formation to provide a lip for snapping over the edge of hook cross section when the plate is installed, the edge of the first leg being bent in the same direction as the edge on the second leg for engagement by the trailing edge during insertion of the plate to guide it into its snapped position, means including a longitudinally extending spring actuating cam at the trailing edge side of the slot for applying force to the central portion of the second leg thereby to move the edge of hook cross section into resilient engagement with the snapped in place trailing edge of the plate, and force-transmitting means bridging the space between the legs so that said movement of said second leg causes the tip of the first leg to be brought to bear against the leading edge of the plate to hold it captively seated against said undercut surface.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,626,848 Dated December 14, 1971

Inventor(s) LEONARD I. TAFEL and LARRY G. TAYLOR

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 12, change "denting" to read "detenting".

Column 5, line 28, change "3" (second occurrence) to "2";

lines 30-31, delete "filling up";

line 36, change "3" to "2".

Signed and sealed this 19th day of September 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents