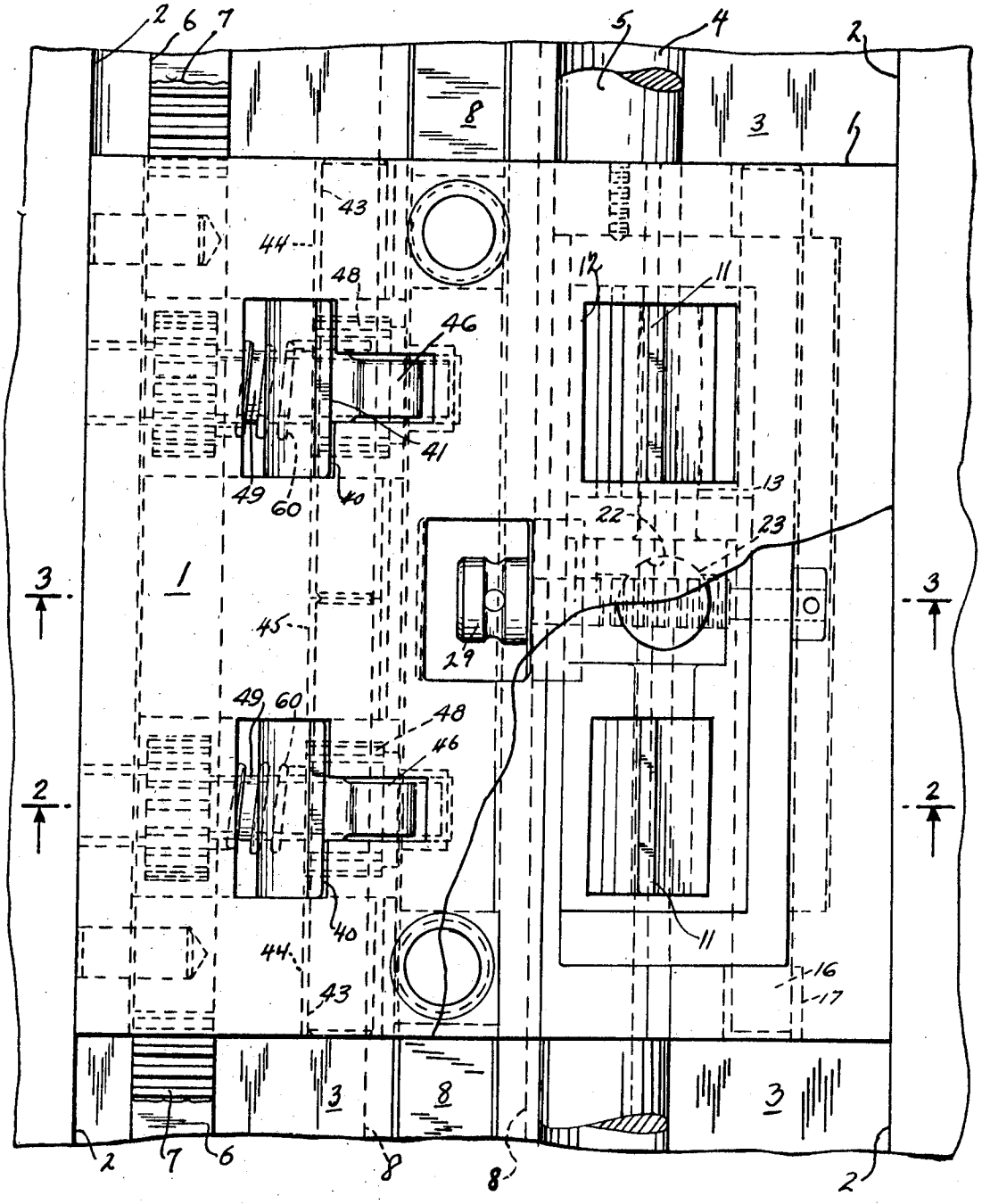
June 2, 1970 C. H. RINGE 3,515,066

UNDERSIDE LOCK-UP DEVICE FOR PRINTING PLATES

Filed Feb. 15, 1968 2 Sheets-Sheet 1

FIG. 1



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FIG. 2

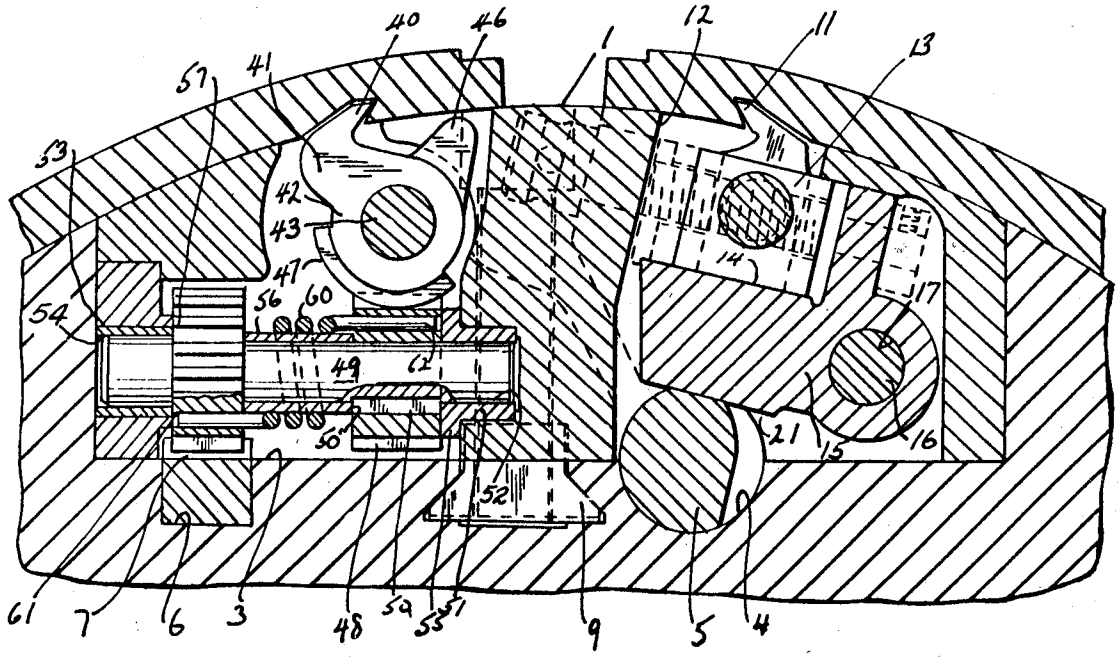
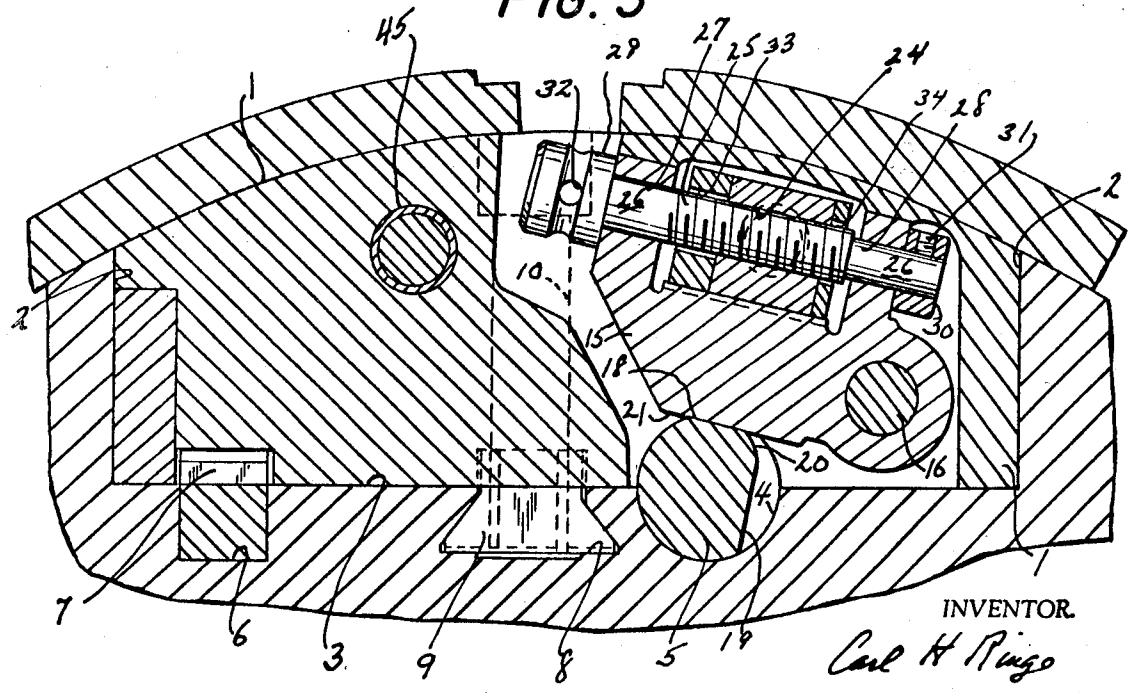


FIG. 3



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United States Patent Office 3,515,066 Patented June 2, 1970

3,515,066

UNDERSIDE LOCK-UP DEVICE FOR PRINTING PLATES

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Filed Feb. 15, 1968, Ser. No. 705,814
Int. Cl. B41f 27/06
U.S. Cl. 101—378 6 Claims

ABSTRACT OF THE DISCLOSURE

An underside plate lock-up device for use in clamping stereotype printing plates on the plate cylinders of rotary newspaper printing machines in which one end of the plate is positioned by circumferential adjustable register hooks and the other end is engaged by tensioning hooks. The device utilizes spring activated hooks in which reaction of the hook pressure against the actuating springs is avoided. The clamping mechanism is in the form of bench assemblies in which the spring holding force is exerted between parts which are self contained in each assembly and in which the distance of application of the spring force is reduced to a minimum, the tips of the clamping hooks being movable between a clamping position and a releasing position. The hooks are pivotally supported and a driven spiral gear element is secured to the hook member and located concentrically to its pivotal axis. Another spiral gear meshes with the driven spiral gear element for driving same and is rotatably mounted on a cross shaft which is journalled in the assembly. Spring means connect the shaft to the driving gear so that it may be turned through an angle to thereby turn the driven gear and its associated hook. The spiral angle of the driving gear is sufficiently low so that the gears bind against turning of the driving gear by the driven gear. A lost motion is provided between the driving gear element and the cross shaft.

This invention relates to plate clamping mechanism for printing machines.

More particularly, the invention is concerned with underneath plate lock up devices of the type in which one end of the plate is positioned by circumferentially adjustable register hooks and the other end is engaged by tensioning hooks, due provision being made in each case for irregularity or lack of exact alignment of the hook receiving plate recesses with a surface element of the cylinder.

In Harless Pat. No. 2,832,288, there is disclosed a satisfactory form of mechanism of this character which has been extensively used, and embodies a quick release, positive lock up mechanism providing all necessary adjustments and accommodations for the plates. In this mechanism, however, the hooks at the tension end of the plate are actuated by a spring force, equal to the holding power necessary to hold the plate down against the very heavy centrifugal force produced by rotation of the cylinder in modern high speed presses. Other forms of underneath clamping mechanism in common use possess the same characteristic as to the use of spring pressure for holding down the plate.

In constructions of the type just discussed, the springs are comparatively bulky and require operating mechanism of considerable dimensions, so that a groove of considerable size, must be cut in the cylinder to accommodate the plate clamping mechanism, thus weakening the cylinder by reducing the moment of inertia of its section. Since the reduction occurs with reference to one principal axis and not the other, the possibility of objectionable vibration due to cylinder deflection is aggravated.

It is an object of the present invention to provide plate clamp mechanism of a compact character with permits a reduction in depth and over all cross sectional area of the cylinder groove.

It has been proposed (Dressel Pat. No. 2,645,177) to eliminate the heavy springs required by the foregoing designs, by utilizing actuating mechanism for the cylinder hooks which comprises spring actuated wedging arrangements with sufficiently low angle on the wedge elements so that the clamping action is a rigid one, preventing transmission of force back from the hooks to their actuating springs. Such construction has proved difficult in commercial machines due to the difficulty in incorporating them in the machine and providing the required movement and adjustments together with a rapid release and lock up.

It is an object of the present invention to provide mechanism utilizing spring actuated hooks, in which reaction of the hook pressure against the actuating springs is avoided, while eliminating the difficulties associated with the use of sliding wedge elements.

It is a further object of the invention to provide a structure of the type indicated in which the clamping mechanism takes the form of bench assemblies (as in the Harless patent, above-mentioned) but in which the spring holding force is exerted betwen parts which are self-contained and in each assembly and in which the distance of application of such force is reduced to a minimum.

In prior Ringe and Harless Pat. No. 3,019,729, granted Feb. 6, 1962 for Underside Lock-up Device for Printing Plates, there is disclosed a plate clamping mechanism intended primarily for magazine presses, as distinguished from newspaper presses, and in which the hook actuating mechanism takes the form of a sliding helical spur gear cooperating with an internal helical gear segment mounted for circumferential movement about the cylinder pivotal axis.

The present invention is, in one aspect, an improvement of that disclosure, an object being to utilize rotary gear elements, obviating the need for curvilinear or other circumferential gibs or guideways, while obtaining the advantages of self-locking and in a rugged form of construction suitable for high speed newspaper press uses.

A further object of the invention is to provide a clamping mechanism suitable for use in four-round (as distinguished from the more usual two-round) plate arrangements and with this in mind to provide clamping mechanisms for both ends of a plate together with means for restricting the same entirely within the cylinder body peripheral outline.

With the foregoing and other objects which will appear in the following full description in mind, the invention will now first be described with reference to the accompanying drawing and the features forming the invention will then be pointed out in the appended claims.

Description of the drawings

In the drawings:

FIG. 1 is a plan view of a plate cylinder clamping unit;

FIG. 2 is a section on the line 2—2 of FIG. 1;

FIG. 3 is a section of the line 3—3 of FIG. 1.

Description of the preferred embodiment of this invention

Each clamping unit assembly comprises a frame block 1 fitting in and slidable along a cylinder groove having side walls 2 and bottom wall 3. The arrangement of the assemblies along the cylinder grooves, the use of spacer blocks between the same and the adaptation of the clamping equipment for printing pages of various sizes are in

general as disclosed in the above mentioned Harless patent and will not be further described herein.

The cylinder groove 2–3, also has a semi-cylindrical recess 4 in its bottom 3 for accommodating a cam shaft element 5, as later described, a rectilinear groove 6 for accommodating an operating rack bar element 7 and a dovetail groove 8 for accommodating dovetail nuts 9 by means of which the assembly is releasably secured in desired position along the groove.

Elements 5 and 7 are the only operating elements in common to the various assemblies. A comparison of the present construction with that of the previous Harless patent above mentioned shows the reduction in groove depth of about one-third, with no sacrifice of strength of parts or operating convenience and accuracy.

Each plate clamping assembly is secured in position by a pair of threaded bolts 10 cooperating with dovetail nuts 9 as before mentioned and holding the body securely in locked position in the cylinder groove. The mechanism provided comprises a pair of hooks for engaging one end of the plate to register it and a pair of hooks. for engaging the opposite end of the plate for tensioning it.

Considering first the registry hooks 11, these protrude from rectangular openings 12 in the upper surface of the block body 1 (which is generally shaped to conform to the cylindrical contour of the cylinder) and are carried at opposite ends of a bar 13, which is slidable chordwise of the cylinder on surface 14 formed on a support member 15 which is carried on pins 16 journaled in the block body 1 at 17.

The continuous cam shaft 5, previously mentioned, is cylindrical through about half its circumference to provide a solid bearing against the groove 4. It has flats 18 and 19 constituting high and low dwells respectively which are joined by a rise 20.

In the position of FIGS. 2 and 3, the high dwell engages under the flat surface 21 formed on the support member 15 for holding it up in operating position. Turning the shaft 5 (counterclockwise in the figures) through somewhat more than a right angle will bring the flat 19 below the surface 21, for dropping the support member 15 to silence the register clamps as discussed more fully below.

The hook carrying bar 13 has a bore 22 accommodating a poppet 23, serving as a pivot for the bar, and the poppet 23 has a cross bore 24 which is internally threaded and takes the threaded section 25 of an operating shaft 26. This shaft is journaled at 27 and 28 in the support member 15 and located axially by its head 29 at one end and a collar 30 fixed to it by a set screw 31 at its other end. The head 29 is provided with bores 32 for receiving a pin wrench for turning the shaft 26. As will be apparent, turning shaft 26 by reason of the cooperating screw threads 24 and 25 adjusts the positioning of the poppet 23 and bar 13 chordwise and along the surface 14 of the support member. The threaded shaft section 25 is accommodated in bore 33, 34, which bores are sufficiently oversized to permit pivotal movement of the bar 13 about the axis of poppet 23, to permit slight pivotal movement. This slight pivoting movement permits engagement in somewhat misaligned pockets and also engagement in a line of pockets which is not precisely parallel to the cylindrical element cylinder surface.

As is apparent from FIG. 1, the metal of the body 1 is substantially solid, being interrupted only by the openings for hooks 11 and an opening for access to the shaft head 29. Viewed from beneath, the metal is hollowed out to provide space for the parts mentioned, but leaving adequate section for taking any strain upon the hooks with a multiple of the required factor of safety.

The tension hooks 40 are formed independently of each other, at the ends of short arm sections 41 carried by hubs 42 integral therewith and supported on short shafts 43 which are journaled at 44 and 45 in the block 1. As is apparent, the unsupported length of each shaft 43 is negligible so that the hook support by its shaft is exceptionally solid. The hub 42 also carries a knock out arm 46 for assisting in the removal of a plate and an operating gear sector 47 about 135° in extent, which meshes with operating gear element 48 carried on a cross shaft 49 and rotatable through a limited arc as determined by key 50 and circumferentially elongated slot 50′ forming a lost motion connection. The shaft 49 is journaled in bushings 51, 53 fittings in aligned bores 52, 54 in the body member 1. A flange 55 in bushing 51, serving to take the axial thrust of gear 48, as mentioned below. A sleeve 56 abutting gear 48 at one end serves with bushing 53 to locate axially pinion 57 which is keyed to the shaft 49 so as to be rotatably fixed to the same. This pinion 57 meshes with the rack 7, previously mentioned. Pinion 57 and gear 48 have a yielding connection formed by a torsion spring 60, one end of which is received in a bore 61 in the pinion 57 and the other end of which is received in a bore 62 in the gear 48.

Pinion 57 and rack 7 may be a standard involute spur gear and cooperating rack. The gear elements 47, 48 take the form of spiral gearing of form suitable for gears with axes at an angle (in this case, 90°). Following the known principles for such gearing (e.g., "Spiral and Worm Gearing," Industrial Press, New York, 1914), the spiral angle (angle of tooth to axial plane) of the driver 48 and driven gear 47, respectively, are complementary angles (in this case, 66° and 24°, respectively), the pitch radii and number of teeth being selected in accordance with known practice to give approximately equal pitch radii.

In the structure actually shown by way of illustration and with the spiral angles mentioned, spiral gear sector 47 is formed on a basis of twenty teeth to a complete circumference while gear 48 has eight teeth, the pitch radii being substantially equal, and the distance between centers being only very slightly more than one inch. (The parts being shown in proportion to their actual dimensions, it will be apparent that an exceptionally compact structure has been provided.)

With a comparatively small spiral angle (24°) on the driven gear 47 and comparatively high spiral angle (66°) on the driving gear 48, the gear pair is self-locking (analogously to worm and worm wheel construction), so that while gear 48 readily drives gear sector 47, gear 48 locks when it is attempted to drive it by means of gear sector 47.

The torsion spring 60 may exert a torque of only a few inch pounds, as, for example, five inch pounds or less, corresponding (since the distance from the tip of the hook 40 to the axis of its shaft 43 is only about one inch to a circumferential spring pressure at the hook tip of only an equal number of pounds of force. This may be contrasted with commerical constructions now in use, in which the spring pressures approximate two hundred and fifty pounds and upwards. It will be noted that the holding force exerted by the hook against the plate will be at least equal to that exerted by the heavy springs of the prior art construction and may even exceed this force, in any case where these springs yield. This force, however, is carried by parts very compactly arranged and, hence, subject to practically no deformation. Forces on the hook member 41 due to tension or centrifugal force on the plate, are carried in a plane at right angles to the cylinder axis by the shaft 43 which has substantially no unsupported length and which, hence, are communicated directly to the body 1. The thrust axially of the shaft 43 due to the spiral angle of the teeth is carried directly adjacent the plate itself by pressure of the hook 40 against the adjacent wall of the opening in body 1 through which it protrudes, and by the teeth of sector 47 meshing with the gear 48. Gear 48, in turn, is solidly supported by shaft 49 adjacent one end of this shaft and the thrust due to its spiral angle is taken by the bushing flange 55, seat-

ing directly on the solid metal of the body member **1** so as to form a thrust member abutting the gear **48**.

As will now be apparent, the forces involved in actually holding the plate in operation are closely confined to the parts mentioned and the distance from point of support to point of support, exceeds in no case about an inch. The structure is, therefore, to all intents a rigid one so that there is no tendency for vibration and creeping or growth of the plate due to resilient interaction between the plate clamping hooks and the plate.

In operation, when the plate is clamped in position, the key **50** is brought toward the end of its travel in slot **50'**. The spring **60** has an initial preload (when key **50** engages the other end of slot **50'**) and is capable of turning the gear **48**, so as to cause the hook to engage properly in the plate pocket and also to follow up and take up and looseness which may be created by the growth of the plate, if such occur. The spring action also permits the hooks **40** to engage in slightly different positions circumferentially of the cylinder, as may be required by an axial misalignment, deformation of metal in one pocket as compared to another. The new result is a rigid, balanced holding action, together with any needed follow up. Since the force exerted by spring **60** is small in any event, minor variations in it are not of importance. It is, therefore, possible to locate the assembly of FIGS. 1–3 in any desired position along the cylinder groove and with respect to rack **7**. Assuming by way of illustration the use of a pinion **57** having twenty teeth, it will be apparent that the maximum variation in angular position of the spring end in bore **61** of this pinion due to adjustment of position of the assembly, will be no more than 9°, an amount not substantially affecting the preload of the spring **60**, in view of the fact that the spring is used merely to obtain and maintain engagement and is not required to supply the holding force.

In the usual plate cylinder, each clamping arrangement as described will be duplicated in a diametrically opposed position on the cylinder, so as to provide for holding two substantially semi-cylindrical plates around the cylinder. The provision above mentioned by which the hooks **40** and also the knock out arms **46** may be retracted below the surface of the cylinder, while the hooks **11** may (by turning the cam shaft **5**) be similarly retracted, makes it possible to silence a plate clamping assembly, so that a longer plate may be placed on the cylinder with its middle part spanning the clamping assembly. Thus, where only two diametrically opposite sets of clamping assemblies are used, silencing one of them permits the clamping of "tubular" (substantially 360°) plates. Where four plate clamping assemblies are used around the cylinder, it becomes possible to clamp four 90° plates in position around the cylinder or by silencing two diametrically opposite acts of plate clamping assemblies to use only two semi-cylindrical plates around the cylinder.

What is claimed is:

1. In a printing plate cylinder, a plurality of plate clamping mechanisms each comprising a hook member having a tip movable between a plate clamping and a plate releasing position, a pivotal support for the said hook member and a driven spiral gear element secured to the said hook member and located concentrically to its pivotal axis, a cross shaft, means journaling said cross shaft and means for turning said cross shaft, a driving spiral gear element meshing with the said driven spiral gear element and rotatably mounted on the said cross shaft, resilient means connecting the said shaft to the said driving spiral gear element so as to turn the same and thereby turn the driven gear and hook toward a plate clamping position, the spiral angle of the said driven gear being sufficiently low so that the said gear binds against turning of the driving gear by the driven gear, a lost motion connection between the said driving gear element and the cross shaft, whereby the turning of the cross shaft in the reverse direction through a predetermined angle turns the driving and driven gear in a reverse direction, bringing the hook to its plate releasing position. An operating member movable between a plate clamping position and a plate releasing position extending in a direction parallel to the longitudinal axis of the plate cylinder, and gear means drivingly connecting the said operating member with the said cross shafts for rotatably moving the same between plate clamping and plate releasing positions.

2. In a printing plate cylinder, a plurality of plate clamping mechanisms each comprising a hook member having a tip movable between a plate clamping and a plate releasing position, a pivotal support for the said hook member and a driven spiral gear element secured to the said hook member and located concentrically to its pivotal axis, a cross shaft, means journaling said cross shaft and means for turning said cross shaft, a driving spiral gear element meshing with the said driven spiral gear element and rotatably mounted on the said cross shaft, resilient means connecting the said shaft to the said driving spiral gear element so as to turn the same and thereby turn the driven gear and hook toward a plate clamping position, the spiral angle of the said driven gear being sufficiently low so that the said gear binds against turning of the driving gear by the driven gear, a lost motion connection between the said driving gear element and the cross shaft, whereby the turning of the cross shaft in the reverse direction through a predetermined angle turns the driving and driven gear in a reverse direction, bringing the hook to its plate releasing position, an axially extending operating member movable between a plate clamping position and a plate releasing position extending in a direction parallel to the longitudinal axis of the plate cylinder, and gear means drivingly connecting the said operating member with the said cross shafts for rotatably moving the same between plate clamping and plate releasing positions, the said operating member comprising an axially movable rack and the gear means comprising gears fixed to the said cross shafts and meshing with the said rack.

3. In a printing cylinder having an axial groove and a plurality of plate clamping assemblies fitting and secured in the groove, a plate clamping assembly comprising a support block, means securing the support block to the cylinder groove, adjustable rigid plate clamping means mounted in the said block to one side thereof and opposed resilient plate clamping means mounted in the said block to the other side thereof, the resilient plate clamping means comprising a shaft member having its longitudinal axis parallel to the longitudinal axis of the printing cylinder, a hook member carried thereby and comprising a driven spiral gear sector, and means mounting the shaft member in the said block, a cross shaft supported radially inward of the first said shaft member and also journaled in the block means for turning the cross shaft for moving the hook member, a driving spiral gear element rotatably carried on the cross shaft, a thrust member abutting the block and spiral driving gear element for transmitting force axially of the cross shaft to the block and spring means coupling the cross shaft to the said spiral driving gear, an operating member extending in a direction parallel to the longitudinal axis of the plate cylinder being movable between a plate clamping position and a plate releasing position, and gear means drivingly connecting the said operating member with the said cross shaft for rotatably moving the same between plate clamping and plate releasing positions, the driven spiral gear sector spiral angle being sufficiently low so that the gear pair locks against torque transmitted from the driven gear sector to the said driving gear, whereby reaction of a plate against the clamping mechanism is transmitted through the said gear pair to the said thrust member.

4. In a printing cylinder having an axial groove and a plurality of plate clamping assemblies according to claim

3, a lost motion connection between the said cross shaft and driving spiral gear element, whereby rotation of the cross shaft in the reverse direction retracts the resilient plate clamping means.

5. In a printing cylinder having an axial groove and a plurality of plate clamping assemblies according to claim 4, a plate dislodging arm carried by the said resilient plate clamping hook member and positioned below the cylinder surface and angularly in advance of the said hook member when the said hook member is in clamping position, whereby retraction of the hook member by the said lost motion connection first moves the hook member and then the plate dislodging member below the cylinder surface.

6. In a printing cylinder having an axial groove and a plurality of plate clamping assemblies according to claim 5, a movable support for the said adjustable rigid plate clamping means, and an operating member for holding the said support in an operative position of the said rigid plate clamping assemblies, the said operating member being also movable to a second position permitting retraction of the said plate clamping assemblies to an inoperative position below the surface of the said cylinder.

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U.S. Cl. X.R.

64—15, 27; 74—424.5, 458