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(54) Plate lock-up device for printing press.

(57) A plate lock-up device for a printing press includes plate lock-up bases (6, 31), a plurality of gripper plates (14, 38), spring members (17, 44), and a plurality of plate gripper cams (20, 46). The plate lock-up bases (6, 31) extend in the axial direction of a plate cylinder (1) and at least one of leading and trailing plate lock-up units (5, 30) is located in a gap formed in the circumferential surface of the plate cylinder (1). The gripper plates (14, 38) are pivotally supported by the plate lock-up bases (6, 31) and aligned in the axial direction of the plate cylinder (1). Each of the spring members (17, 44) is inserted between a corresponding one of the gripper plates (14, 38) and a corresponding one of the plate lock-up bases (6, 31). The springs bias the corresponding gripper plate (14, 38) in a plate gripping direction. The plurality of plate gripper cams (20, 46) are aligned on pivot shafts (19, 45) and each is engaged with the corresponding gripper plate (14, 38). The plate gripper cams (20, 46) cause the gripper plates (14, 38) to pivot in a plate release direction upon pivotal movement of the pivot shafts (19, 45).

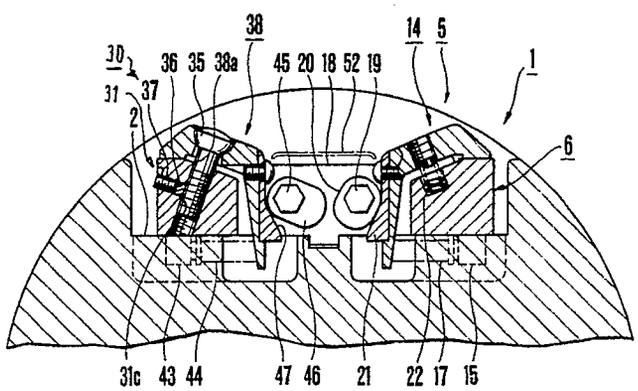

FIG.4

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Background of the Invention

The present invention relates to a plate lock-up device mounted in a plate cylinder of a printing press to fix leading and trailing ends of a plate to be wound around the circumferential surface of the plate cylinder.

A gap having a substantially rectangular section is formed in the outer circumferential surface of a plate cylinder of each printing press so as to extend by almost the entire length of the plate cylinder. A plate lock-up device consisting of a leading plate lock-up unit for gripping the leading end, i.e., a gripper end, of the plate and a trailing plate lock-up unit for gripping the trailing end, i.e., an end opposite to the gripper end, of the plate cylinder is arranged in this gap and fixed on the bottom surface of the gap so as to extend in an axial direction of the cylinder.

Conventional leading and trailing plate lock-up units comprise elongated plate lock-up bases extending in the axial direction of a plate cylinder, a plurality of gripper plates pivotally supported by a plurality of bolts at edges of these plate lock-up bases and opened/closed upon pivoting to grip or release the plate with the plate lock-up plates, and a plurality of cams engaged with gaps of edges of the gripper plates. The plurality of cams are aligned along pivotal cam shafts. A plurality of compression coil springs are interposed between the plate lock-up bases and the gripper plates to bias the gripper plates in an open direction.

With the above structure, when a plate is to be gripped, the corresponding cam shaft is pivoted. Then, the gripper plates divided into a plurality of portions in the longitudinal direction of the plate cylinder are simultaneously released from engagement with the cams and are opened by an elastic force of the compression coil springs. The leading end of the plate is inserted between the gripper plates and the corresponding plate lock-up base, and the cam shaft is pivoted in a direction opposite to the direction described above. The gripper plates are pivoted and closed against the biasing forces of the compression coil springs by the action of the cams, thereby gripping the leading end of the plate.

The plate lock-up base of the trailing plate lock-up unit is supported on the bottom surface of the cylinder gap and is movable along the circumferential direction of the plate cylinder. A plurality of plate stretching bolts are threadably engaged at a plurality of positions in the longitudinal direction of this plate lock-up base such that the heads of the bolts abut against the wall surface of the gap of the plate cylinder.

With the above structure, after the leading end is gripped by the leading plate lock-up unit as described above is wound around the circumferential surface of the plate cylinder, the trailing end of the plate is gripped by the trailing plate lock-up unit. The plate lock-up bolts are tightened by circumferential movement of the trailing plate lock-up unit, and the plate is brought into tight contact on the circumferential surface of the plate cylinder. Spring members are inserted between the trailing plate lock-up unit and the gap. When the plate stretching bolts are loosened, the plate lock-up unit is moved toward the wall surface of the gap by the spring forces of the spring members and is loosened.

In such a conventional plate lock-up device, since a plurality of gripper plates are pivoted to pivot the cams so as to grip the plate, a gripping operation after adjustment of the gripper plates results in nonuniform gripping forces between the gripper plates. As a result, the plate tends to be deformed, and contact adjustment of the gripper plates is cumbersome to prolong the mounting time.

In the conventional plate lock-up device, as described above, since the plurality of plate stretching bolts are tightened to stretch the plate, it is difficult to uniformly stretch the plate, and mounting precision tends to be degraded. The plate stretching operation and the plate gripping operation must be performed at different work positions, resulting in cumbersome, time-consuming operations.

Summary of the Invention

It is an object of the present invention to provide a plate lock-up device which can improve gripping precision and is free from cumbersome adjustment.

It is another object of the present invention to provide a plate lock-up device which can reduce a printing preparation time and improve productivity.

It is still another object of the present invention to provide a plate lock-up device which can improve precision of contact between the gripper plates and plate lock-up units.

In order to achieve the above objects of the present invention, there is provided a plate lock-up device for a printing press, comprising plate lock-up bases, extending in an axial direction of a plate cylinder, at least one of leading and trailing plate lock-up units being located in a gap formed in a circumferential surface of the plate cylinder, a plurality of gripper plates pivotally supported by the plate lock-up bases and aligned in the axial direction of the plate cylinder, spring members, each inserted between corresponding ones of the gripper plates and the plate lock-up bases, for biasing the corresponding gripper plate in a plate gripping

direction, and a plurality of plate gripper cams, aligned on pivot shafts and each engaged with the corresponding gripper plate, for pivoting the gripper plates in a plate release direction upon pivotal movement of the pivot shafts.

One end of the plate is inserted between the open gripper plates and the leading plate lock-up base, and the corresponding pivot shaft is pivoted. The gripper plates are engaged with small-diameter portions of the corresponding gripper cams and can be pivoted, so that the gripper plates are pivoted by biasing forces of the spring members, thereby gripping the plate. After one end of the plate is gripped, the plate is wound around the circumferential surface of the plate cylinder. The other end of the plate is inserted between the open gripper plates and the trailing plate lock-up base. When the corresponding pivot shaft is pivoted, the gripper plates are engaged with the small-diameter portions of the corresponding gripper cams, and are free to pivot. The gripper plates are then pivoted by the biasing forces of the spring members, thereby gripping the plate.

When the same pivot shaft is further pivoted, the plate stretching cams are pivoted to move the trailing plate lock-up unit. The trailing plate lock-up unit is actually moved to stretch the plate, and the plate can be brought into tight contact with the circumferential surface of the plate cylinder.

Brief Description of the Drawings

Fig. 1 is a plan view showing a plate cylinder and a plate lock-up device mounted in the plate cylinder of a printing press according to an embodiment of the present invention;

Fig. 2 is a sectional view of the structure of Fig. 1 along the line II - II thereof;

Fig. 3 is a sectional view of the structure of Fig. 1 along the line III - III thereof;

Fig. 4 is a sectional view of the structure of Fig. 1 along the line IV - IV thereof;

Fig. 5 is a sectional view of the structure of Fig. 1 along the line V - V thereof;

Fig. 6 is a sectional view of the structure of Fig. 1 along the line VI - VI thereof;

Fig. 7 is a sectional view of the structure of Fig. 1 along the line VII - VII thereof; and

Fig. 8 is a sectional view of the structure of Fig. 1 along the line VIII - VIII thereof.

Description of the Preferred Embodiment

Figs. 1 to 8 show a plate lock-up device for a printing press according to an embodiment of the present invention.

Referring to Figs. 1 to 8, a gap 2 having a substantially rectangular section is formed in the outer circumferential surface of a plate cylinder 1 so as to extend by almost the entire length of the plate cylinder 1. A pair of guides 3 and 4 constituting saddle-like members are bolted on the bottom surface of the gap at each end portion of the gap 2. A leading plate lock-up unit 5 includes a plate lock-up base 6 having a substantially square section and extending in the axial direction of the plate cylinder. Thin-walled portions 6a at both ends of the plate lock-up base 6 are fitted in right and left guides 3 to restrict vertical movement of the thin-walled portions 6a and allow circumferential movement of these portions 6a. Screw holes 6b having a sectional shape shown in Fig. 3 are formed at a plurality of locations of the plate lock-up base 6 along its longitudinal direction. Adjusting screws 7 each having a tapered tip are threadably engaged with the screw holes 6b, respectively. Collared pins 8 are respectively inserted into pin holes at positions corresponding to the adjusting screws 7 such that collar portions are engaged in spaces between the plate lock-up base 6 and a wall surface of the gap 2. With this structure, when the adjusting screws 7 are rotated, the plate lock-up base 6 is finely moved and adjusted in the circumferential direction in cooperation with the tapered surfaces. Each compression coil spring 9 in Fig. 5 is inserted between a stud 10 on the plate lock-up base 6 side and a recessed hole 2a of the gap 2 to bias the plate lock-up unit 5 outward in the circumferential direction.

Screw holes 6c having a sectional shape shown in Fig. 7 are formed at a plurality of positions of the inclined surface of the plate lock-up base 6. A pin 11 having a semispherical head is threadably engaged with the corresponding screw hole 6c and is fixed by a set screw 13 through a plastic chip 12. Three gripper plates 14 divided in the axial direction of the plate cylinder and having an overall length almost equal to that of the plate lock-up base 6 are pivotally supported on the plate lock-up base 6 such that the semispherical head of the corresponding pin 11 is fitted in its hole. Each gripper plate 14 is a substantially L-shaped member. A gripper surface 14a of each gripper plate 14 opposes the gripper surface of the plate lock-up base 6. Although not shown, a plurality of projections are formed on the gripper surface 14a and are engaged with recessed grooves of the opposite gripper surface of the plate lock-up base 6. A plurality of studs 15 each having a sectional shape shown in Fig. 8 extend into the recessed holes 2a of the gap 2 and are aligned in the axial direction of the plate cylinder. Each compression coil spring 17 is inserted between a spring seat pin 16 threadably engaged with the screw hole of each stud 15 and the recessed hole at the lower end of the corresponding gripper plate 14. The compression coil spring 17 biases the corresponding gripper plate 14 in a direction to close the gripper

surface 14a. A plurality of box-like bearings 18 aligned in the axial direction of the plate cylinder are bolted at the central portion of the bottom surface of the gap 2. A cam shaft 19 having a hexagonal section is pivotally supported by the bearings 18 such that portions having a circular section are fitted in the bearings 18. A plurality of plate gripper cams 20 each having large- and small-diameter portions are mounted on the cam shaft 19 in the axial direction. Subplates 21 are aligned in the axial direction of the plate cylinder and are screwed on the vertical surfaces of the gripper plates 14 in correspondence with the gripper cams 20, respectively. When a portion of the cam shaft 19 which is exposed from a cover 52 is pivoted with a wrench, the large-diameter portions of the gripper cams 20 cause the gripper plates 14 to pivot against the biasing forces of the compression coil springs 17 to open the gripper surfaces 14a, respectively. Referring to Fig. 4, reference numeral 22 denotes a compression coil spring inserted between the plate lock-up base 6 and the corresponding gripper plate 14 to bias the corresponding gripper plate 14.

A trailing plate lock-up unit 30 arranged parallel to the leading plate lock-up unit 5 in the gap 2 has a plate lock-up base 31 having a square section and extending in the axial direction of the plate cylinder. Two thin-walled portions 31a are fitted in the right and left guides 4 so that vertical movement of the thin-walled portions 31a of the plate lock-up base 31 is restricted by right and left guides 4, but their circumferential movement is allowed. Screw holes 31b having a sectional shape shown in Fig. 5 are formed at a plurality of positions of the plate lock-up base 31 in its longitudinal direction. Spring seat pins 32 are threadably engaged with the screw holes 31b. Each compression coil spring 34 is inserted in the corresponding spring hole of the plate lock-up base 31 between a wall surface of the gap 2 and a corresponding washer 33 mounted on the corresponding spring seat pin 32 in a direction to separate the trailing plate lock-up unit 30 from the wall surface of the gap 2, i.e., in a plate stretching direction (to be described later).

Screw holes 31c each having a sectional shape shown in Fig. 4 are formed at a plurality of positions of the inclined surface of the plate lock-up base 31. A pin 35 having a semispherical head is threadably engaged with each screw hole 31c and is fixed by a corresponding set screw 37 through a corresponding plastic chip 36. Three gripper plates 38 divided in the axial direction of the plate cylinder and having an overall length corresponding to the overall length of the plate cylinder are pivotally supported such that the semispherical heads of the pins 35 are fitted in their holes, respectively. Each gripper plate 38 is a substantially L-shaped member. A gripper surface 38a of each gripper plate 38 opposes a corresponding gripper surface of the plate lock-up base 6. Although not shown, a plurality of projections are formed on each gripper surface 38a and are engaged with recessed grooves of the opposite gripper surface. Reference numerals 39 denote adjusting collars formed at boundaries of the divided plate lock-up bases 31. A right screw 40 and a left screw 41 are integrally formed with each collar 39. The right and left screws 40 and 41 are respectively engaged with the central plate lock-up base and each of the end plate lock-up bases. When the adjusting collars 39 are pivoted upon insertion of a tool 42, as shown in Fig. 3, the overall length of the plate lock-up bases 31 and gripper plates 38 can be slightly changed. A compression coil spring 44 is inserted between the lower end of the corresponding gripper plate 38 and a stud 43 supported on the bottom surface of the plate lock-up base 31 and extending in the corresponding recessed hole 2b of the gap 2 to bias the corresponding gripper plate 38 in a direction to close the corresponding gripper surface 38a. A cam shaft 45 having a hexagonal section and parallel to the cam shaft 19 is pivotally supported by the bearings 18 so that portions each having a circular section are fitted in the bearings 18, respectively. A plurality of plate gripper cams 46 each having large- and small-diameter portions are aligned along the cam shaft 45 so as to have the same phase as the plate gripper cams 20. Subplates 47 are screwed on the vertical surfaces of the gripper plates 38 in correspondence with the gripper cams 46, respectively. When a wrench is engaged with a portion of the cam shaft 45 exposed from the cover 52 to pivot the cam shaft 45, the large-diameter portion of the plate gripper cam 46 is engaged with the corresponding subplate 47 to cause the corresponding gripper plate 38 to pivot clockwise against the biasing force of the corresponding compression coil spring 44, thereby opening the corresponding gripper surface 38a.

A plurality of plate stretching cams 49 each having large- and small-diameter portions are mounted on the cam shaft 45 and aligned in the axial direction of the plate cylinder so as to have a phase different from that of the plate gripper cams 46. Subplates 50 are fixed by bolts 51 on the vertical surfaces of the plate lock-up base 31 in correspondence with the plate stretching cams 49, respectively. When a wrench is engaged with the portion of the cam shaft 45 exposed from the cover 52 to pivot the cam shaft 45, the trailing plate lock-up unit 30 can be pivoted by the large-diameter portions of the plate stretching cams 49 through the subplates 50 toward the wall surface of the gap against the biasing forces of the compression coil

springs 34, respectively. Therefore, the plate gripped by the gripper plates 38 can be loosened. Reference numeral 52 denotes the cover having several openings formed in the axial direction to allow engagement between a wrench and each of the cam shafts 10 and 45, so as to cover portions above the cam shafts 19 and 45; 53 and 54, adjusting bolts for finely moving the plate lock-up units 6 and 31 in the axial direction of the plate cylinder and fixing them at proper positions.

An operation of the plate lock-up device having the above structure will be described below. When a wrench is engaged with the portion of the cam shaft 19 exposed from the cover 52 in the illustrated state, the plate gripper cams 20 are pivoted, and their large-diameter portions are brought into slidable contact with the corresponding subplates 21. The gripper plates 14 are pivoted counterclockwise against the biasing forces of the compression coil springs 17, respectively, so that the gripper surfaces 14a of the gripper plates 14 are opened. One end of the plate is inserted between the gripper surfaces 14a and the mating gripper surfaces of the plate lock-up base 6. When the cam shaft 19 is pivoted in a direction opposite to that of the above operation, the plate gripper cams 20 are pivoted so that the small-diameter portions of the cams 20 are brought into slidable contact with the corresponding subplates 21. The gripper plates 14 are released by the plate gripper cams 20 and pivoted clockwise by the elastic forces of the compression coil springs 17. The gripper surfaces 14a are closed to grip one end of the plate. In this case, equal spring forces of the compression coil springs 17 are applied to the gripped portions, and therefore uniform forces are applied throughout the width of the plate.

After one end of the plate is gripped, when the plate cylinder is rotated by about one revolution, the plate is wound around the circumferential surface of the plate cylinder 1. A wrench is engaged with the end of the cam shaft 45 exposed from the cover 52 in the illustrated state, the plate gripper cams 46 are pivoted so that their large-diameter portions are brought into contact with the corresponding subplates 47. The gripper plates 38 are pivoted clockwise against the elastic forces of the compression coil springs 44, respectively, and the gripper surfaces 38a of the gripper plates 38 are opened. The other end of the plate is inserted between the gripper surfaces 38a and the gripper surfaces of the plate lock-up base 31. The cam shaft 45 is pivoted in a direction opposite to that of the above operation, and the plate gripper cams 46 are pivoted so that their small-diameter portions are brought into contact with the corresponding subplates 47. The gripper plates 38 are released by the plate gripper cams 46, and then the gripper plates 38 are pivoted counterclockwise by the elastic forces of the corresponding compression coil springs. The gripper surfaces 38a are closed to grip the other end of the plate. Equal spring forces of the compression coil springs 44 are applied to the gripped portions, and the plate is uniformly gripped throughout its width. At this time, the large-diameter portions of the plate stretching cams 49 abut against the corresponding subplates 50, and the trailing plate lock-up unit 30 is kept moved in a direction to come close to the wall surface of the gap 2. In this state, the plate is not stretched yet.

When a wrench is engaged with the extended end portion of the cam shaft 45 to pivot it to a state shown in Fig. 6, the small-diameter portions of the plurality of plate stretching cams 49 simultaneously abut against the corresponding subplates 50, the trailing plate lock-up unit 30 is released by the plate stretching cams 49. The trailing plate lock-up unit 30 is moved away from the wall surface of the gap 2 by the compression coil springs 34, and the plate is stretched and brought into tight contact with the circumferential surface of the plate cylinder 1. In this case, since the plate is stretched by the elastic forces of the compression coil springs 34, it is stretched with a uniform tension throughout its width.

When the plate is to be removed from the plate cylinder, the cam shaft 45 is pivoted to bring the large-diameter portions of the plate stretching cams 49 into contact with the corresponding subplates 50. The trailing plate lock-up unit 30 is moved in the direction of the wall surface of the gap 2 and and the plate is loosened. When the cam shaft 45 is further pivoted to bring the large-diameter portions of the plate gripper cams 46 into contact with the subplates 47, the gripper plates 38 are opened to release one end of the plate. When the plate cylinder 1 is rotated by about one revolution, the plate is unwound from the plate cylinder. When the cam shaft 19 is pivoted to bring the large-diameter portions of the cam shafts 19 into contact with the corresponding subplates 21, the gripper plates 14 are opened, and the other end of the plate is released, thereby completing removal of the plate.

As described above, the cams located at positions close to each other are pivoted to grip/release both the ends of the plate and to stretch/loosen the plate.

As is apparent from the above description, according to the present invention, the plate lock-up device comprises plate lock-up bases, extending in the axial direction of the plate cylinder, at least one of leading and trailing plate lock-up units being located in a gap formed in a circumferential surface of the plate cylinder, a plurality of gripper plates pivotally supported on the plate lock-up bases and aligned along the axial direction of the

plate cylinder, spring members located between the gripper plates and the plate lock-up bases to bias the gripper plates in a plate gripping direction, and a plurality of plate gripper cams engaged with the corresponding gripper plates and aligned on the pivot shafts on the plate lock-up bases to pivot the gripper plates in a plate release direction upon pivotal operation of the pivot shafts. The equal spring forces of the spring members are applied to both the ends of the plate throughout its width, and gripping precision can be improved. At the same time, cumbersome adjustment of the gripper plates need not be performed, and plate gripping and release operations are performed at substantially one position. A plate preparation time can be shortened, and productivity is improved.

In addition to the above structure, at least one of the plate lock-up bases is arranged to be movable in the circumferential direction of the plate cylinder. The plate lock-up device further includes spring members, inserted between the movable plate lock-up base and the wall surface of the gap of the plate cylinder to bias the movable plate lock-up base, and a plurality of plate stretching cams aligned on one of the pivot shafts to move the movable plate lock-up base in a plate release direction upon pivotal movement of the pivot shaft. Since the plate is stretched by the spring forces of the spring members, a uniform tension is applied to the plate throughout its entire width. Therefore, the plate will not be deformed and contact precision can be improved. Unlike the conventional arrangement using a large number of bolts for gripping both the ends of the plate on the plate cylinder and releasing the ends of the plate therefrom, gripping and release of both the ends of the plate can be performed at substantially one position upon pivotal movement of the cam shafts. Therefore, the plate preparation time can be further reduced, productivity can be improved, and labor can be reduced.

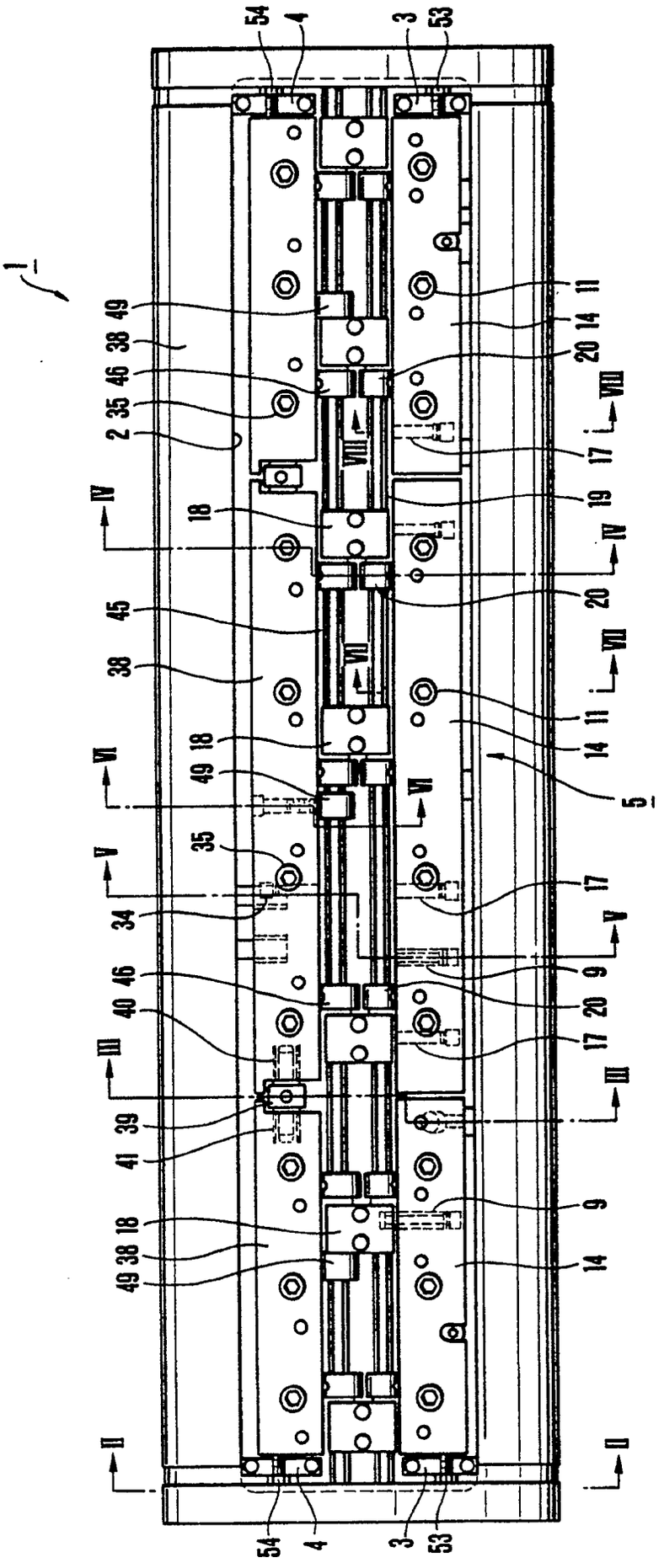
Claims

1. A plate lock-up device for a printing press comprising plate lock-up bases (6,31) extending in an axial direction of a plate cylinder (1), at least one of leading and trailing plate lock-up units (5,30) being located in a gap formed in a circumferential surface of said plate cylinder (1); characterized by
   - a plurality of gripper plates (14,38) pivotally supported by said plate lock-up bases (6,31) and aligned in the axial direction of said plate cylinder (1);
   - spring members (17,44), each inserted between corresponding ones of said gripper plates (14,38) and said plate lock-up bases (6,31) for biasing said corresponding gripper plate (14,38) in a plate gripping direction; and
   - a plurality of plate gripper cams (20,46), aligned on pivot shafts (19,45) and each engaged with said corresponding gripper plate (14,38), for pivoting said gripper plates (14,38) in a plate release direction upon pivotal movement of said pivot shafts (19,45).

2. A device according to claim 1, characterized in that at least one of said leading and trailing plate lock-up units (5,30) serves as a plate lock-up unit movable in a circumferential direction of said plate cylinder (1), and characterized by further including other spring members (34), inserted between said movable plate lock-up base and a wall surface of said gap (2) of said plate cylinder (1), for biasing said movable plate lock-up base in a plate stretching direction, and a plurality of plate stretching cams (49), aligned on at least one of said pivot shafts (19,45), for moving said movable plate lock-up base in a plate loosening direction upon pivotal operation of said at least one of said pivot shafts (19,20).

3. A device according to claim 1 or 2, characterized in that said plate gripper cams (46) on said at least one of said pivot shafts (19,45) have the same phase as said plate gripper cams (20) on a remaining pivot shaft.

4. A device according to claim 1,2 or 3, characterized in that said plate gripper cams (46) on said at least one of said pivot shafts (19,45) have a phase different from said plate stretching cams (49) on said at least one of said pivot shafts (19,45).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VIII

FIG.1

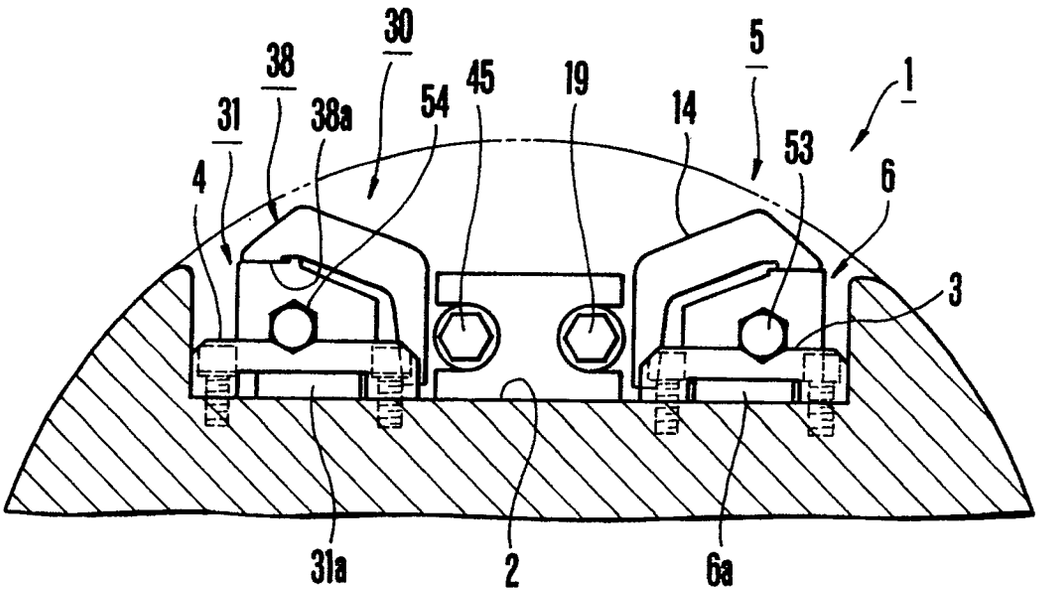
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FIG.2

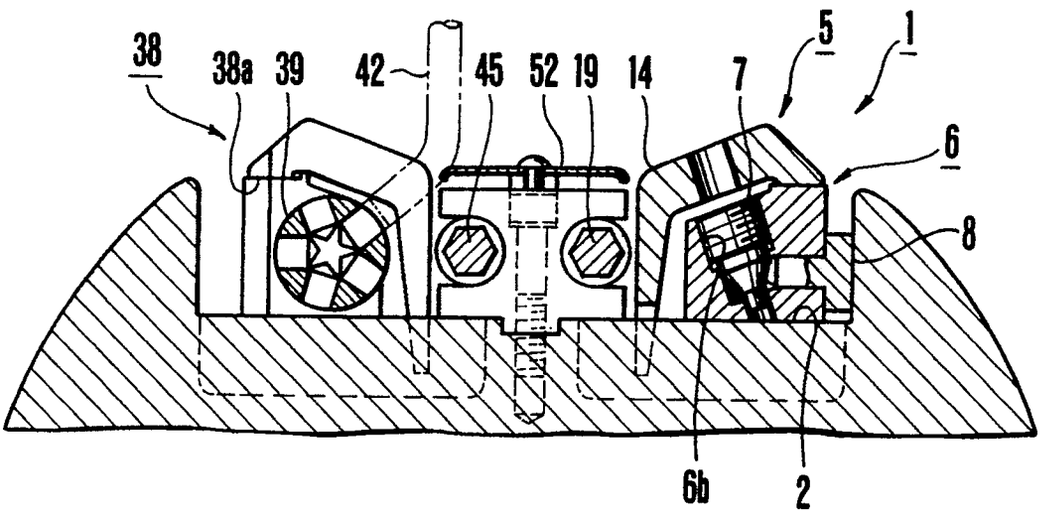
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FIG.3

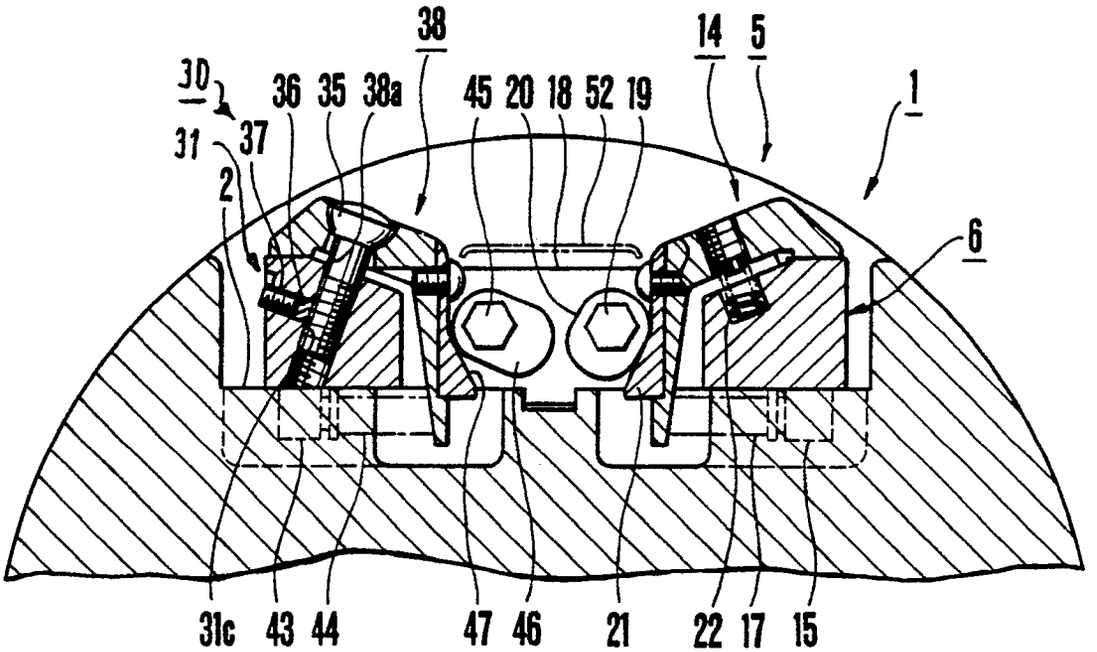
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FIG.4

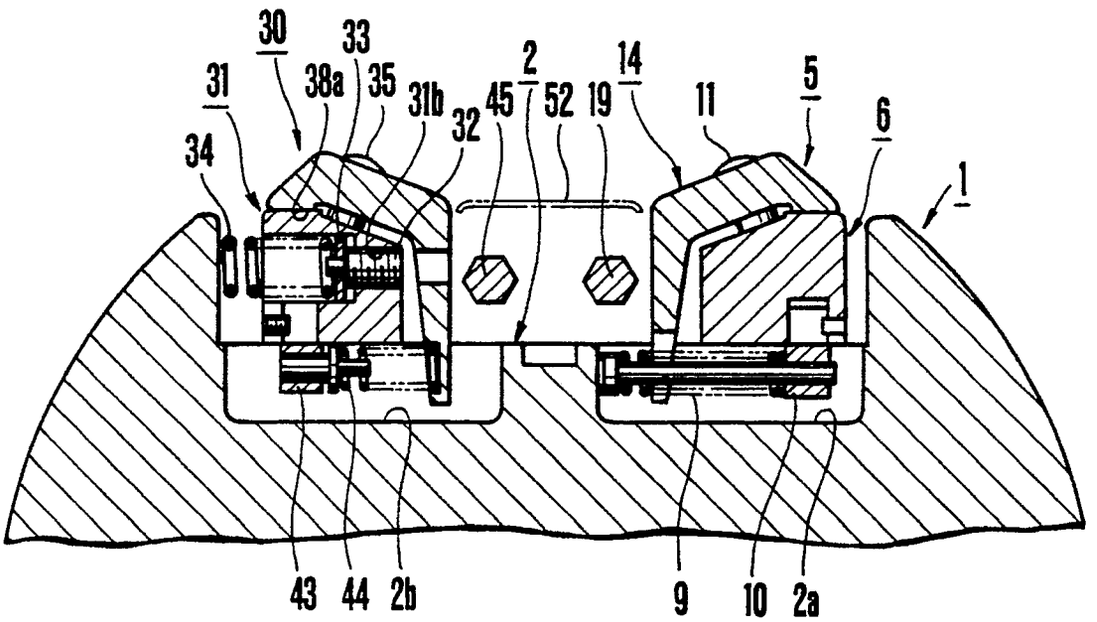
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FIG.5

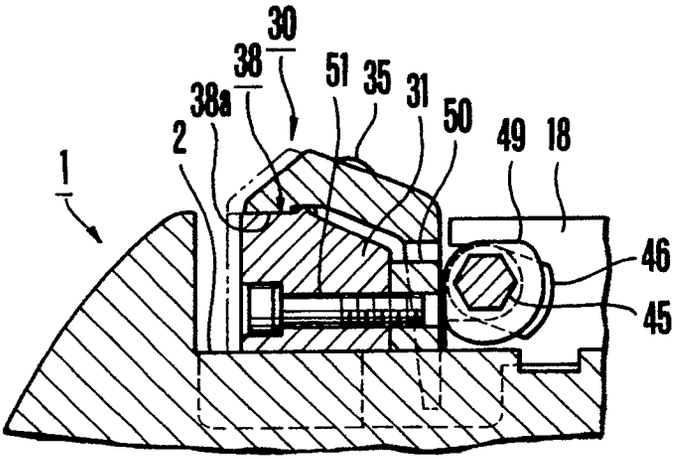

FIG.6

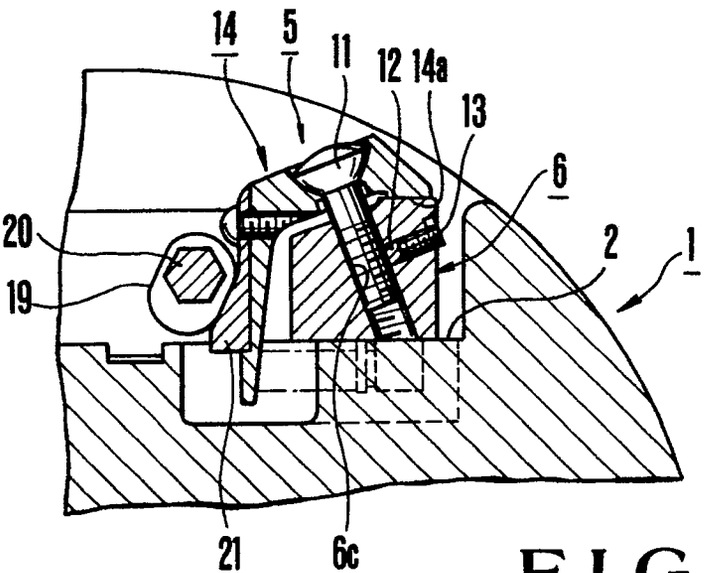

FIG.7

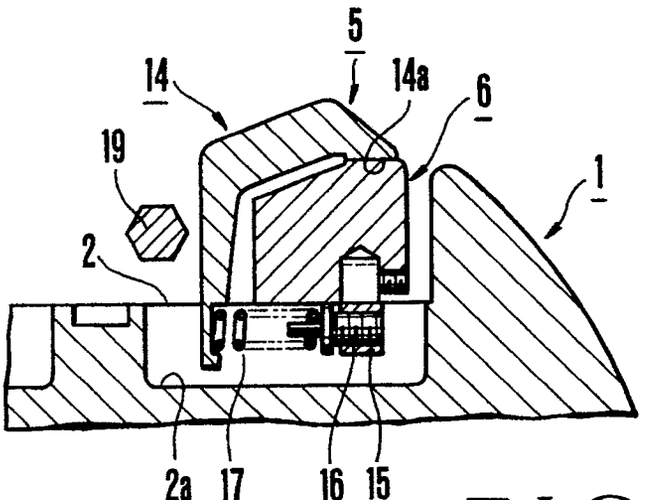

FIG.8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 90 10 3620

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	US-A-3 110 255 (JESCHKE, DU BOIS) * the whole document *	1	B 41 F 27/12
A	GB-A-1 199 345 (ALBERT FRANKENTHAL) * the whole document *	1,2	
A	GB-A-1 584 657 (CROSFIELD ELECTRONICS) * the whole document *	2	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 41 F

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	08 November 90	EVANS A.J.

CATEGORY OF CITED DOCUMENTS

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P: intermediate document
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D: document cited in the application
L: document cited for other reasons

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