Fig. 3
PLATE HOLDING MECHANISM FOR STEREOTYPE PRINTING PLATES USED ON PLATE CYLINDERS OF ROTARY PRINTING PRESSES

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ABSTRACT OF THE DISCLOSURE

The invention relates to a mechanism for holding stereotype printing plates on plate cylinders of rotary printing presses through applying tension in the longitudinal axial direction by means of clamps which are partly flexible or spring biased longitudinally and engage in bevelled rims of the stereotype printing plates, the clamps all being locked simultaneously whereby the tensile forces are transmittable via spacing rods.

PRIOR ART

A clamping device of this kind became known through the U.S. Patent No. 2,065,002 whereby the clamps are moved against resilient pressure by the printing plate itself whereupon the springs engage in fixed abutments of the plate cylinder. The locking pressure causes additional cracking stress on the plate. This increases with the spring pressure due to the pressure applied and there is a tendency for the stereotype printing plate to bulge due to centrifugal forces which are encouraged whereas they should be counteracted.

In a different plate holding mechanism according to the U.S. Patent No. 2,642,800 it was tried to avoid these defects by holding each stereotype printing plate on the cylinder with a multiple number of clamps embracing dovetail portions of the plate. Closing of these clamps took place through the turning of operating rods at the front end of the plate cylinder such that the one spring-pressed clamp, in order to displace its abutment, moves the stereotype printing plate against the other clamp which is essentially unmovable in the axial direction. For this purpose, each pair of clamps is located on a longitudinally movable sleeve serving as abutment for the resilient support of the one clamp, the other end of the sleeve being screw-threaded to the clamp which is fixed to the plate cylinder. This device consists for each semi-cylindrical stereotype printing plate of four operating rods with four pairs of clamps each spaced thereof, making a total of 16 clamping locations. Registry adjustment in the axial direction is not possible with this mechanism.

A third plate holding mechanism was made known in the German Patent No. 1,032,757. In that, the clamping movement is made by semi-cylindrical clamping rings spaced at the front end of the plate cylinder and is transmitted by longitudinally resilient spacing or pressure rods to the clamps making the same clamping movement to the outer clamping rings which have resilient support in the axial direction. With this device, the plate is held through the outer clamps. As a consequence, a bending load is applied to the stereotype printing plate which more than offsets the force originating from the centrifugal force. Thus, forces are created which increase instead of eliminate these undesirable forces. Two plates side by side are simultaneously mounted with this mechanism however axial registry is not possible.

The German Patent No. 1,235,336 introduced a method to mount plates separately and also register them axially with a device of this kind. A defect of this device, however, is that the cylinder has to be provided with deep grooves for the rods and that the plates can only be staggered by 90° to each other whereas 45° and 135° are not possible. Furthermore, it seems incredible with large plate widths that one pressman alone should be able to mount the plates since the third plate has to be mounted from the left hand end on the right end of the cylinder and the second plate from the left hand end on the right end of the cylinder. These plates are so far away from the locking device that one person cannot hold the plate in the locking device and at the same time set the locking movement in operation.

SUMMARY OF THE INVENTION

An object of the invention is to provide a stereotype of printing plate holding mechanism in a rotary press which provides for the necessary holding forces and copes with the extreme centrifugal forces prevailing in the printing plates of such presses and in which the stereotype printing plates are subjected which is far beyond the maximum operating speed.

Furthermore, the mechanism will make it possible to hold and register each plate separately, whereby the latter is specially important for multi-color work. The locking mechanism will be within reach of the plate so that one pressman can mount the plates. The plate cylinder will have no grooves or gaps thus affording as much rigidity as possible. This is particularly important for a smooth run of the press with the high speeds that are required. The known plate holding devices referred to and also the tension lock-up devices require grooves and gaps in the cylinders which must even be staggered to each other on each cylinder half for reasons connected with the guiding of the paper. This implies that even cylinders with large diameters are prone to deflection, especially in the center of the cylinder where may occur staggered gaps overlap. That is why there is a bend in the center in the otherwise steady bending line though it is rather defined due to the attenuation.

It is also desired to avoid with the plate holding device according to this invention disturbing din in the holding strength if the position of the resilient clamps is moved from the center position during registering. High locking forces and relatively small spring spaces call for the use of cup springs which, bundled as a package, furnish the required stroke. If this is neglected, circumstances may arise where in one extreme registry position, due to reaching the end position, the holding force increases excessively whereas in the other extreme registry position the holding force of the spring bundle drops enormously.

Experience has taught that the clamps after a certain running time of the rotary printing machine dig into the plate bevels due to the impacts resulting from the printing pressure.

In case of a rigid locking device this would imply that the holding strength of the clamps to the plate decreases and is even non-existent in extreme cases. It is therefore also an object of the invention to eliminate this problem.

It is thusly provided that closing and opening are effected by movement of three or more semi-cylindrical clamp rings disposed in pairs and making a gripping or embracing movement, as well as by one part of the series of clamp rings through compressional or tensile forces transmitted by spacing rods and the other part of the series of clamp rings through tension springs sup-
ported by a semi-cylindrical clamp ring. Opening is ef-
5 fected without these resilient forces and solely by means of
tensional and compressional forces. For this general solution it is suggested, in particular, that a first series of clamp segments spaced on the circumferential half of the plate cylinder and acting on the outer bevel end of the plate be mounted slidably on the outer end of the plate cylinder and be adjustable for axial registering; that an inner semi-cylindrical clamp ring presses against a bevel on the inner end of the plate and is slidable with
10 spacing rods which are situated on a semi-cylindrical
collar at the face of the plate cylinder and act against the
direction of the action of the first series of clamp seg-
ments; that two further clamp rings be flexibly or spring biased slidable against a series of clamp segments acting on the outer bevel; and that two final clamp rings be
15 flexibly or spring biased slidable in the acting direction of the clamp segments acting on the outer bevel.

Between these clamp rings there are rings serving as support for the stereotype printing plate. The clamp rings and supporting rings have bores through which the pressure rods extend. The supporting rings are secured tightly to the plate cylinder as by screws. The collars located at the cylinder end are actuated by screws, which during release operation find support on the bottom floor of the bores in the plate cylinder and act flexibly and in a spring biased manner against the plate cylinder during the locking operation. As a result of this the holding force exerted on the stereotype printing plate does not decrease even if the clamps dig into the bevels in the course of time.

The construction of such a mechanism according to the invention has advantages because the plates are gripped across the width in three or more sections and around the cylinder circumference along the whole length of the plate whereas on the plate sections lying in between no tension is exerted which could cause these sections to crack. Partial clamping of the plate in cooperation with the sections free of stress insures that the plate fits perfectly on the plate cylinder even at top press speed.

All angles of drift such as 45°, 90° and 135° of the plates to each other are possible without having to provide special cylinders for the various arrangement possibilities of the plates. Plate cylinder manufacture is economical. Plate holding devices of any arrangement may be mounted on a standard cylinder. It is also possible later on to alter the angle of drift set by the factory.

All clamp rings and supporting rings are turned pieces. This also applies to the spacing and transmitting rods. The manufacture of parts is therefore possible with little expenditure.

Lastly, the plate cylinder body may be constructed as a tube since the shell is not intersected or weakened by grooves. This results in substantial weight reduction because cylinders with boarings up to even half of their outer diameter lose only about 6% of their stiffness. The loss of rigidity at a bore diameter of 30% of the outer diameter is below 1%.

Due to the unchanged rigidity of the plate cylinder, defects are avoided which are inherent in cylinders of which the shells are intersected by gaps. Impression prompts vibration in such cylinders, the highest amplitude which lies in the plane which is associated with the weak moment of inertia. For this reason, a device according to the compact cylinder insures a constant printing result at all press speeds.

With the device according to the invention, each plate can be held separately and be registered separately. The plate can easily be mounted by one person because the locking device is located at the outer edge of the stereotype printing plate. The tensional forces acting via the clamp on the stereotype printing plates are uniform and independent from their longitudinal register position. Loosening of the plate because the clamps dig in is impossible due to the spring biased threaded spindle of the locking device.

DESCRIPTION OF THE PREFERRED EMBODIMENT

A practical embodiment of the invention is represented in the accompanying drawings and is also described in some detail. The drawings show in FIG. 1 a longitudinal section on line I—I of FIG. 3, FIG. 2 a second longitudinal section on line II—II of FIG. 3, through the plate cylinder equipped with the clamping mechanism, and

FIG. 3 a view in the axial direction from the right.

Four pairs of plates are mounted on plate cylinder 1. However, only plates 2 and 3 are shown on the drawing. The pairs of plates not shown are symmetrically arranged to pairs 2 and 3 on plate cylinder 1. The stereotype printing plates 2 and 3 respectively are held at the beveled inner ends of the plate through clamp segments 4 and 5. To obtain registry, they are adjustable in the axial direction through threaded pins 6 and 7 respectively which find support in the neighboring supporting rings 8 and 9 respectively.

The stereotype printing plate 3 is seized by means of the intermediate clamp ring 10 in the bevel 11 on the rear of the printing plate intermediate its ends and is squeezed against the clamp segments 5. The required force is furnished by the manually operated threaded spindle 12 having a head housed in a borehole 14 in the end of the plate cylinder and which finds support on the cup spring bundle 13 during closing of the clamping device and on the bottom end of the borehole 14 during the opening procedure. Upon turning the threaded spindle 12, the semi-circular collar 15 is moved in the axial direction of the plate cylinder 1. This movement is transmitted by the spacing rods 16 to, see FIG. 2, the clamp ring 10. The rods 17 to 20 are fixedly connected with the clamping ring 10, see FIG. 1, the rods transmitting the clamping and releasing movements of the clamp ring 10 to the clamp rings 21 and 22. The clamping rings 21 and 22 have apertures axially therethrough connecting with axially extending sockets to receive spring bundles. The tensional forces are transmitted axially toward the inner ends of the plates by spring bundles 23 interconnected between the ends of the rods and the clamp rings 21 and 22. Clamp ring 22 adjacent the inner end of the plate 3 is opened through pulling along by means of nuts 24 on rods 17 to 20, and clamping ring 21, at the outer end of plate 3, and clamp segments 32 for plate 2 are opened by means of bringing the respective rod shoulder 25 on the rods 17 to 20 and 17' to 20' into contact with the face of the respective clamp rings 21 and 23. This occurs when the clamp ring 10 is moved by the spacing rods 16 attached to the semi-circular collars 15.

Instead of using the manually operated threaded spindle 12, one of the well known fast acting locking devices may be used. Opposed to clamp rings 10, 21 and 22 in the same direction as the clamp segments 5 are clamp rings 26 and 27 acting on the stereotype printing plate 3 via the cup spring bundles 28 to urge the plate towards the outer end of the plate cylinder. The cup spring bundles 28 find support on the pressure rods 29 and 30 respectively which also perform the registry movement of clamp segments 5, as a consequence of which the spring pressure which acts on the stereotype printing plate 3 via the cup springs 28 remains constant in spite of registering plate 3.

The construction of the plate holding mechanism for plates 2 is like that of stereotype printing plates 3. The clamp segments 26' are like clamp segments 4; and components 7 and 9 are like components 6 and 8 respectively, so also components 10, 12, 13, 14, 15, 17 to 20, 22, 23, 24, 26 to 30 equal components 10', 12', 13', 14', 15', 17'
to 20', 22', 23', 24', 26' to 30'. The spacing rods 31 have the same function as spacing rods 16, that is to transmit the movement of the semi-circular collar 15' to the semi-circular clamp ring 10'.

One slight difference in the plate holding mechanism for stereotype printing plate 2 as compared with the semi-circular clamp ring 31 is in the arrangement of the clamp segments 32 as the two stereotype printing plates 2 and 3 are so close as to leave no possibility for the use of a continuous outer clamp ring for plate 2. This also applies to the stereotype printing plate not shown to left of plate 2.

Between the clamp rings there are supporting rings 8 and 9 which support the stereotype printing plates with their broad surface and which in radial direction serve as abutment for the clamp rings and clamp segments respectively. The supporting rings 8 and 9 are tightly screwed to plate cylinder 1 which has a smooth cylindrical body without any gaps or grooves.

If the cylinders are to carry four plates in circumference, the clamp rings would be split quarter-cylindrical. The invention, therefore, also applies to quarter-cylindrical clamp segments.

What is claimed is:

1. Mechanism for holding stereotype printing plates on a plate cylinder of a rotary printing press, said connecting rod means adapted in one axially moved direction to abut said clamping ring means and opposed to said resilient connecting means connecting said connecting rod means to the clamp ring means, said operating means for the collar means having spring biased mounting means on the plate cylinder for imparting inward axial movement of the collar and the spacing rod means connected thereto for locking said clamping ring means through their resilient connecting means to said printing plate and said operating means for the collar means pressing against said plate cylinder when moved in one direction to move the collar and its connected spacing rod means axially outward causing said connecting rod means to move axially outward into abutting contact with their connected clamping ring means thereby moving them axially outward to release said clamping ring means from the printing plate.

2. Mechanism for holding stereotype printing plates on a plate cylinder according to claim 1 wherein said printing cylinder has an axially extending bore-hole therein having an inner end bottom floor and opening to the outer end of the cylinder, said operating means for the collar means including an axially extended threaded spindle threadedly connected to its outer end portion to said collar means and having its inner end rotatably mounted in said bore-hole, resilient means interposed between the plate cylinder and the spindle urging it and the collar means threadedly attached thereto axially inward, said inner end of the spindle riding against the bottom floor of the bore-hole when rotated in a direction to move the collar means axially outward to release said clamping ring means.

3. Mechanism for holding stereotype printing plates on a plate cylinder according to claim 1 wherein said inner end clamping segment means has mounting means on said cylinder permitting its axial adjustment for engaging the adjacent inner end of the printing plate for registering the printing plate.

4. Mechanism for holding stereotype printing plate on a plate cylinder according to claim 3 wherein said supporting rings are securely spaced apart supporting rings secured on said cylinder and distributed between said clamping rings and having bores therethrough for said rod means, said supporting rings serving as abutment for the stereotype printing plate.

5. Mechanism according to claim 4 wherein said supporting rings are generally T-shaped in cross section having the end of the leg thereof secured to the cylinder and the underneath cap portions serving to be slidably engaged by portions on said clamping rings and segments.

6. Mechanism for holding stereotype printing plates according to claim 4 wherein said clamping rings and the supporting rings have axial bores through which said rod means extend.

7. Mechanism according to claim 6 wherein the legs of the T-shaped in cross section supporting rings have axial bores through which said rod means extend.

8. Mechanism according to claim 4 wherein said supporting rings are secured to said cylinder by screws.

9. Mechanism according to claim 3 wherein at least one of said supporting rings on the cylinder is further axially inward from said inner end clamping segment means, and the mounting means for said inner end clamping segment means for axial adjustment includes a thread pin in engagement with the segment means at one end and at its other end with said at least one supporting ring.

10. Mechanism for holding stereotype printing plates on a plate cylinder according to claim 1 wherein said clamping ring means are made up of a number of segments.

11. Mechanism for holding stereotype printing plates on a plate cylinder according to claim 4 wherein said supporting rings are split into segments according to the
number of stereotype printing plates mounted on a given circumferential area.

12. Mechanism for holding stereotype printing plates on a plate cylinder of a rotary printing press according to claim 2 including a second set of such mounting means as for said first mentioned printing plate for mounting a second printing plate adjacent and inward on the cylinder from the first mentioned printing plate, a second collar means mounted outward of the first collar means and on the end of the cylinder and having spacing rod means extending therefrom and slidably through said such mounting means for the first mentioned printing plate and to the like mounting means for the second printing plate, said second printing plate having an end clamping segment means for its end adjacent the first mentioned printing plate, said last mentioned clamping segment means being mounted on said cylinder.

13. Mechanism according to claim 12 wherein said mounting means for said end clamping segment means for the second printing plate is axially adjustable for axially registering the second printing plate.

14. Plate holding mechanism for printing cylinders comprising spaced apart supporting ring means secured to the printing cylinder and having an axial bore therethrough and means for holding a clamping ring from radial outward movement therefrom, an operating collar means having adjustable means mounting it for axial movement on an end of said cylinder, said mounting means for the collar means having resilient means urging the collar toward the end of the cylinder, a clamping ring means received on said cylinder at the end adjacent said collar means and having lug means adapted to engage bevels on the end of said printing plate and a portion thereof engaged by the holding means on the adjacent supporting ring means, an axially extending socket in said clamping ring opening toward the end of the cylinder and connected with an axil aperture therethrough, a second and intermediate clamping ring means received on said cylinder intermediate the ends and having an axial bore therethrough, a portion thereof slidably engaging a portion of said supporting ring holding means thereadjacent, a connecting rod threaded at both ends and connected at one end and extending from in said socket and through said aperture in the clamping ring means, through said supporting ring means axial bores, through said intermediate clamping ring means to which it is connected and on to adjacent the inboard end of the printing plate, a third clamping ring means received on said cylinder adjacent the inboard end of the plate and having an axial bore therethrough and a socket through which the inboard end of the connecting rod extends and having a portion thereof engaging the adjacent support ring holding means and a lug thereon engaging a bevel on said plate, said third clamping ring means having a socket opening toward said cylinder end, spring means in said sockets of the first and third clamping ring means and about said ends of the connecting rod, washer and nut means received on said threaded ends of the connecting rod biasing secured said rod to said clamping rings through said spring means, clamping segment means on said cylinder having lugs engaging bevels at the inboard end of said plate and a portion engaged with an adjacent supporting ring means, threaded pin means on said clamping segments pressing against said last mentioned supporting ring means and engaging said clamping segments for movement toward and away from the adjacent end of said plate, a pressure rod connected with said clamping segment and extending through axial bores in said supporting rings (and having a threaded end toward the end of said cylinder), a clamping ring adjacent the outboard end of said plate and having socket and spring means engaging said pressure rod and a lug engaging a bevel on said plate and extending toward the outboard end thereof, said last mentioned clamping ring having a portion thereof engaged by the holding means of the adjacent supporting ring, an intermediate clamping ring received on said cylinder and having an axial bore through which said pressure rod extends and a lug extending outboard and engaging a bevel in the plate, said last two mentioned clamping ring means having sockets in alignment with the axial bores and spring means therein engaging portions on said pressure rod biasing said clamping ring means associated therewith and their lugs in engagement with the plate, and spacing rods connected at one end to said operating collar means and extending through axial bores in said spaced apart supporting ring means to where its other end is connected to said second and intermediate clamping ring means.

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WILLIAM B. PENN, Primary Examiner
CERTIFICATE OF CORRECTION


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

Column 7, line 40, after "thereadacent" cancel the period (.) and insert a (,).

Column 8, beginning in line 24 and ending in line 25, cancel "[and having a threaded end towards the end of said cylinder]."

SIGNED AND SEALED
MAY 12, 1970

(SEAL)
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