Sept. 26, 1961 J R. PARRISH 3,001,472

CIRCUMFERENTIALLY GROOVED PRINTING PLATE CYLINDER

Filed July 22, 1957

Fig. 1

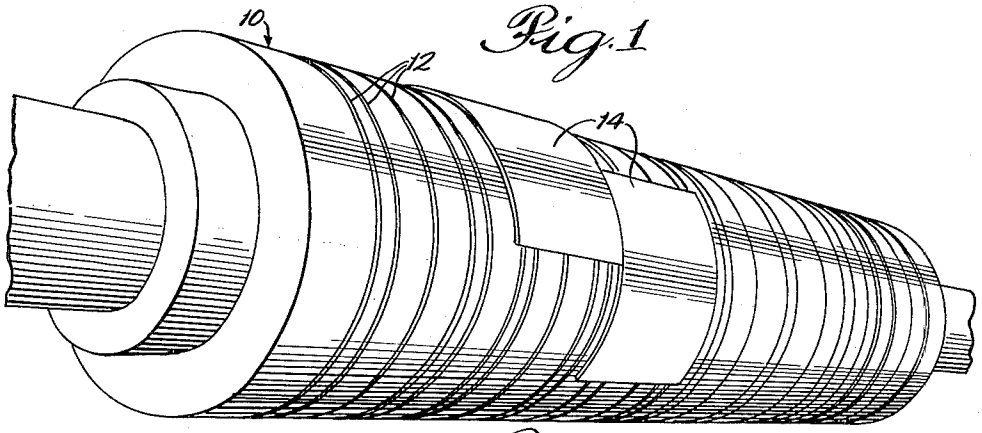


Fig. 2

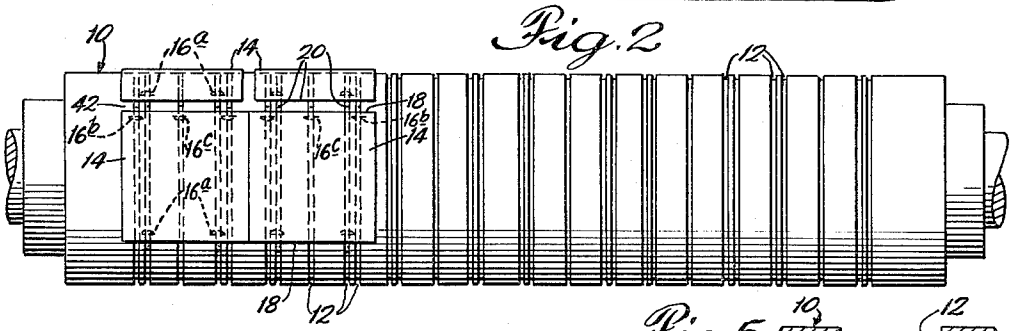


Fig. 5

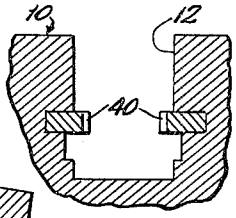


Fig. 3

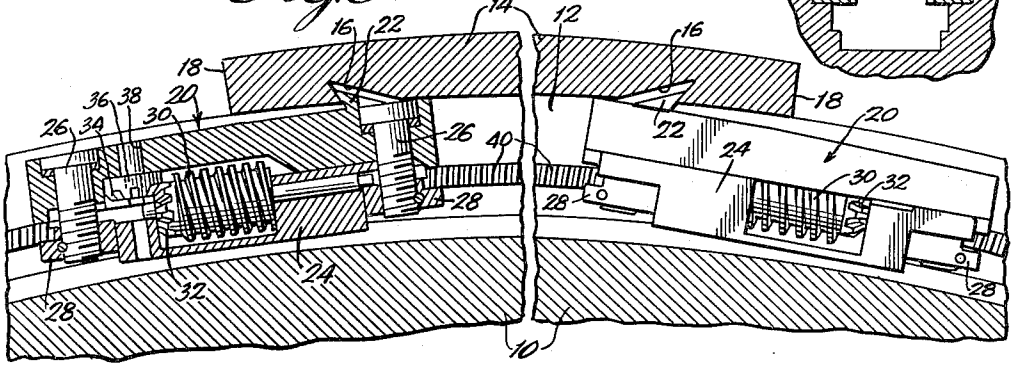
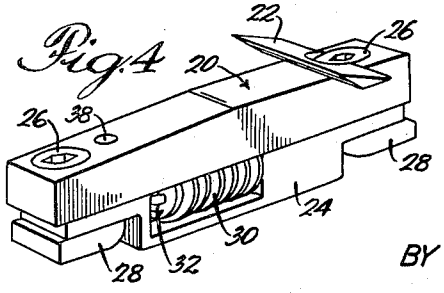


Fig. 4



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CIRCUMFERENTIALLY GROOVED PRINTING PLATE CYLINDER

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This invention relates to printing rolls for use on high speed rotary presses and more particularly to a novel roll assembly comprising in combination a grooved cylinder and a plurality of printing plates secured thereto.

In the printing industry at the present time it is common practice to employ plate cylinders having spiral circumferential grooves. The plates attached to the cylinder are bevelled on the edges, and clamps secured in the grooves are adapted to overlap the bevelled edges to hold the plates on the cylinder. There are a number of disadvantages to this method of securing the plates. The clamps must be used on at least three edges of the plates and, consequently, it is impossible to mount plates immediately adjacent each other. This makes it impossible to print adjacent plates which bleed, i.e. print to the very edge of the margin of the page. Hence, special care must be taken to stagger bleed pages on the cylinder. Furthermore, when these cylinders are used in high speed presses which process webs at a rate in excess of, say 1200 feet per minute, the plates have a tendency to raise from the surface of the cylinder due to centrifugal force. Upon each revolution of the cylinder the raised plate is slapped with violence against the face of the plate cylinder as it contacts the impression cylinder. This continual flexing frequently causes the plate to crack. The cracked plate, of course, must be replaced.

It has also been proposed previously to lock the plates to spirally grooved cylinders in tension by providing a pair of undercut grooves in the bottom of the printing plate, referred to in the art as "scarfs," and employing complementary clamps which may be tightened in the grooves to hold the plate in tension against the surface of the roll. The scarfs usually run axially for some distance along the length of the plate, spaced inwardly a slight distance from the trailing and leading edges. These long scarfs considerably weaken the plate, but are unavoidable where spiral grooves are used in the cylinder. With the spiral groove system it is not possible to predict exactly where the plate will fall on the cylinder. Furthermore, tension lockup in spiral grooved cylinders tends to twist the plate to distort it from a square or rectangle to a parallelogram. This results in throwing the plate out of registration and bulging it away from the face of the cylinder. Obviously, in color work where perfect registration is desired, distortion of any magnitude cannot be tolerated.

It is the object of this invention to provide a printing roll assembly wherein the plates are secured to the surface of the cylinder in tension but without any of the disadvantages mentioned above.

Another object is to provide a roll assembly wherein the plates contain very short scarfs pre-positioned to align with circumferential grooves in the cylinder.

Another object is to provide a roll assembly of this type wherein the printing plates are located contiguously axially of the cylinder and spaced circumferentially a very small distance, in the order of about ¼ inch.

Another object of the invention is to provide a cylinder and tension lockup construction which is substantially less expensive to manufacture than other forms of tension lockup in conventional use.

Still a further object is to provide a predetermined correlation between the intersection of the printing plates and the grooves in the plate cylinder so that the scarf

matches the cylinder, thus facilitating complete interchangeability of the plates.

In a preferred form, the invention consists in the combination of a printing cylinder having a plurality of undercut circumferential grooves in parallel planes, each perpendicular to the axis of the cylinder, and printing plates having short scarfs overlying the grooves, secured to the cylinder by means of hooks disposed in the scarfs. The hooks are capable of being advanced or retracted in the cylinder grooves and locked to hold the plate in tension on the surface of the cylinder.

These and other objects will become apparent from the following description when read in conjunction with the accompanying drawing, wherein:

FIGURE 1 is a perspective view of a printing roll and plate assembly constructed in accordance with the invention;

FIGURE 2 is a front elevational view of a roll similar to the one shown in FIGURE 1 with plates assembled in different locations;

FIGURE 3 is an enlarged longitudinal sectional view through one of the circumferential grooves showing the tension lockup for securing plate 14 to the surface of the roll;

FIGURE 4 is a perspective view of a tension hook suitable for use in the invention; and

FIGURE 5 is a transverse sectional view through one groove 12.

Cylinder 10 is of the type used in a multicolor rotary press and has a plurality of circumferential grooves 12 arranged in groups according to plan. The number of grooves comprising a group or set and their spacing is dictated by the size of the plates to be secured to the cylinder. Each of the grooves 12 lies in a plane perpendicular to the axis of the cylinder. The grooves are undercut so as to lock the hook carriages in place, as explained hereinbelow. Plates 14 are secured to the surface of the cylinder by means of hooks indicated generally by the numeral 20, FIGURE 3. The plates are of conventional construction having an electrotype surface supported by a lightweight reinforcing metal panel. For example, they may be prepared by laminating the electrotype to an aluminum plate with an intermediate layer of thermosetting resin. The backing material must have sufficient strength and hardness to permit scarfing and drawing the plates tightly by means of the tension hooks.

The grooves 12 are located so that at least two are provided for the usual sized plate. This permits using four hooks, two at either end. The total number of grooves and their spaced relationship will depend upon the total number and size of plates to be attached to the cylinder. Very small plates may be secured with two hooks in a single groove. In the drawing I have shown a set of five grooves for each plate comprising a single central groove with a pair of grooves on either side thereof. The circumferential borders of the plates may be contiguous but the axial borders 18 must be slightly spaced to permit manipulation of the hooks 20 by means of a tool. The undersides of the plates are scarfed, as indicated at 16. It will be noted that the scarfs 16 are short, preferably not longer than three times the width of the circumferential grooves. The scarfs are undercut toward the axial edges of the plate, as best shown in FIGURE 3. The location of the scarfs is predetermined according to the width of the plates so that each falls on a circumferential groove. The locations of the scarfs and grooves are so correlated that the plates are completely interchangeable one with the other. The plates are located on the cylinder by means of scribed lines running axially thereof on the face of the cylinder and by means of the central groove of each set. It has been found advantageous to

utilize one side of the central groove as the center line.

In locking the plate to the cylinder, the hooks 20 in adjacent circumferential rows are staggered, as best shown in FIGURE 2. The hooks 16*a* in the top plate run in the inner grooves of the group of five adjacent the left end of the roll. The hooks 16*b* run in the outer grooves of the same group. The hooks 16*c* run in the center groove. By staggering the hooks in circumferentially adjacent plates, the hooks may lie side by side in adjacent grooves rather than end to end in the same groove. Consequently, the circumferential distance between adjacent plates is much closer than it would be where access has to be provided for two hooks rather than one. The circumferential distance between plates is limited by the space required to manipulate the hooks and to adjust the plates for fine color register. This distance is of the order of ¼ inch. It will be apparent that with the five groove sets, two, four or five hooks may be used for each plate. The quarter inch spacing between plates circumferentially is required as in all high speed presses for the use of packing slots on the impression cylinder and the impaling pins which handle the folded pages in the press. The perforations left by the pins are usually trimmed off in the bindery.

Because the hooks are connected to the plates at the axial edges thereof, the circumferential edges may be abutted. This permits locating a series of bleed pages contiguously. In compression lockup only two plates can be axially contiguous because of the intervention of hooks engaging the edges of the plates.

Any suitable hook adapted to move lengthwise in the circumferential grooves and lock the plate in tension may be used in this invention. Various constructions are known in the art. The construction of the hook forms no part of the invention. To illustrate one such suitable construction, reference is made to FIGURES 3 and 4. The hook 20 illustrated therein consists of a carriage, indicated generally by the numeral 24, and the integral hook member 22 which slants rearwardly of the hook 20 to fit accurately within the scarfs 16 of the plates 14. The hook is locked in the undercut groove 12 by means of locking bolts 26 which have a T-head 28. By turning the bolt 26 through an angle of 90°, the head engages the underside of a pair of opposed racks 40 which project into the groove from the walls thereof, as best shown in FIGURE 5. One such bolt is located at either end of the carriage and permits the carriage to move along the groove in either direction while preventing it from moving radially outwardly. Disposed within the center of the carriage 24 is a worm gear 30 which meshes with the opposed racks 40 in the sides of the groove. The end of the worm gear 30 terminates in a bevel gear 32 which in turn meshes with another bevel gear 34 at right angles thereto. Bevel gear 34, which operates like a pinion, has a slot 36 of hexagonal or other configuration extending therethrough for receiving a wrench, which turns the pinion 34 to rotate the worm 30. Opening 38 in the carriage provides access to slot 36. In this way the carriage and the hook 22 integral therewith are driven (i.e. advanced or retracted) within the circumferential groove 12.

The curvature of plates 14 should be accurately formed to the radius of the cylinder or of smaller radius, but never of greater radius. I have found that if the radius of the plate is greater than that of the cylinder, the plate will move when the press is in operation, although it has been tightened down into contact with the cylinder face. In assembling, the plate is placed on the cylinder with the scarfs 16 aligned with the appropriate circumferential groove 12. This alignment occurs automatically when the center line of the plate is aligned with the edge of the central groove. The hooks for circumferentially adjacent plates lie side by side in adjacent grooves, as explained above. Consequently, the distance 42 between the plates is maintained at an absolute minimum. By using a hexagonal wrench (not shown) the hooks are moved outwardly until the hook members 22 securely engage the scarfs 16, and the plate is held under tension. The axial edges of the plates are aligned with the axial guide lines scribed on the surface of the roll to obtain correct registration.

The plates shown in FIGURE 1 illustrate a different circumferential arrangement while maintaining the contiguous axial relationship. The staggered plates eliminate an axial space running along the entire length of the cylinder and its attendant difficulties with respect to registration.

It will be apparent from the foregoing description that this particular system of circumferential grooves disposed normal to the axis of the cylinder coupled with a tension lockup permits the plates to use scarfs of minimum length, thus greatly increasing their strength and resistance to fracture during use. I have found that this cylinder-plate assembly construction will withstand very high speeds in the neighborhood of 1200 feet per minute for periods of one month without becoming dislocated or warped. It will also be apparent that the normal circumferential grooves are much easier to cut than the spiral grooves and, thus, the cost of manufacturing a cylinder of this type is substantially less than that for the conventional cylinder using spiral grooves. It will also be appreciated that plates may be cut and rescarfed if necessary to obtain more perfect registration.

An important advantage of utilizing independently operated hooks is that they permit twisting a plate that is out of square as, for example, where diagonally opposed corners are out of alignment.

It will be understood that the grooves and cooperating scarfs can be differently arranged to accommodate other size plates while still maintaining the complementary relationship explained above. Other changes in the construction of the plates and cylinder will be apparent to thoes skilled in the art without departing from the invention as defined in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A printing roll assembly capable of carrying a variable number of printing plates comprising in combination a cylinder having printing plates secured thereto, a plurality of circumferential grooves cut in the surface of said cylinder, said grooves lying in parallel planes perpendicular to the axis of said cylinder, each of said plates having at least three scarfs, one adjacent one edge and two adjacent the other edge, each said scarf being parallel with the axis of the cylinder and overlying one of said grooves, securing means comprising hooks disposed within said scarfs and a carriage adapted to run in each said groove completely around the circumference of the cylinder independently of carriages in other grooves, and including gear means for driving the carriage within said groove and means carried by the carriage and operable in any position of the carriage within said groove for actuating said gear means, each of said hooks being detachably connected to one said carriage, whereby said hooks are adjustable to exert tension forces on said plates when mounted at any place on the circumference to hold them securely to the surface of the cylinder during high speed rotation.

2. The printing roll assembly of claim 1 wherein said circumferential groove carries racks in opposed sides thereof and said gear means comprises a rotatable worm cooperating with said racks for driving said carriage in said groove.

3. The printing roll assembly of claim 1 wherein each of said scarfs is no longer than three times the width of the groove over which it lies.

4. The printing roll assembly of claim 1 wherein at least one of said plates has four scarfs adjacent opposed edges thereof.

5. The printing roll assembly of claim 1 in which said

plates are mounted on the cylinder contiguously in axial rows.

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