Feb. 26, 1957 C. L. CLAFF ET AL 2,782,712

SHEET OR WEB FED ROTARY PRINTING PRESS

Filed Dec. 22, 1952 2 Sheets-Sheet 1

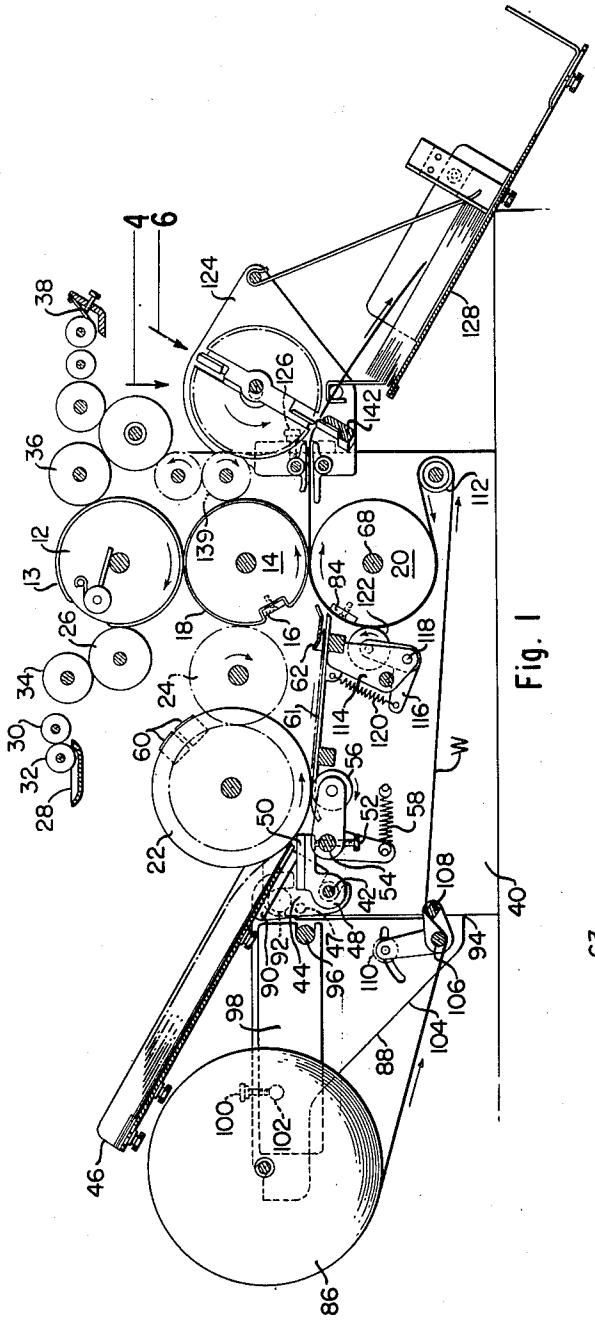


Fig. 1

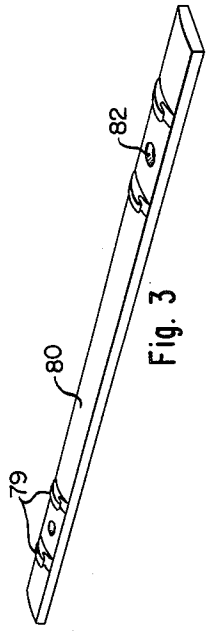


Fig. 3

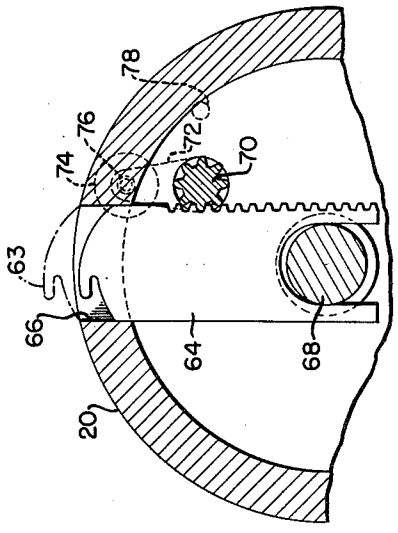


Fig. 2

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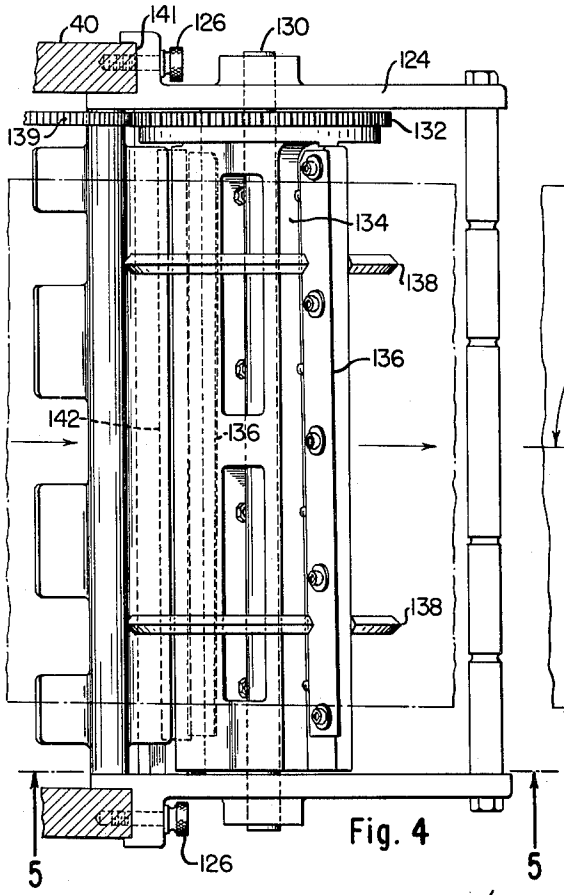


Fig. 4

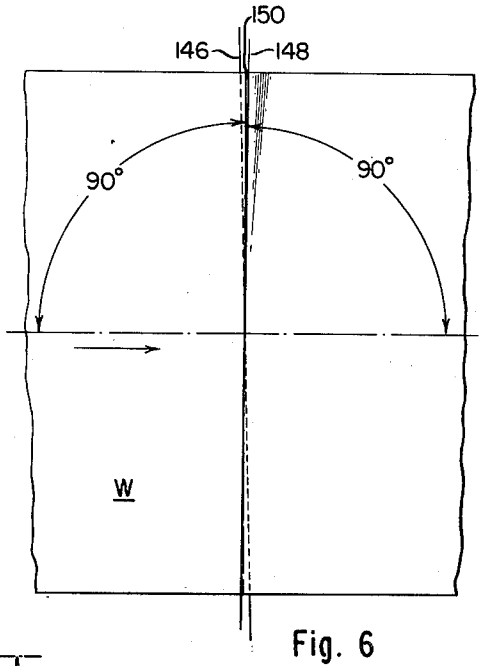


Fig. 6

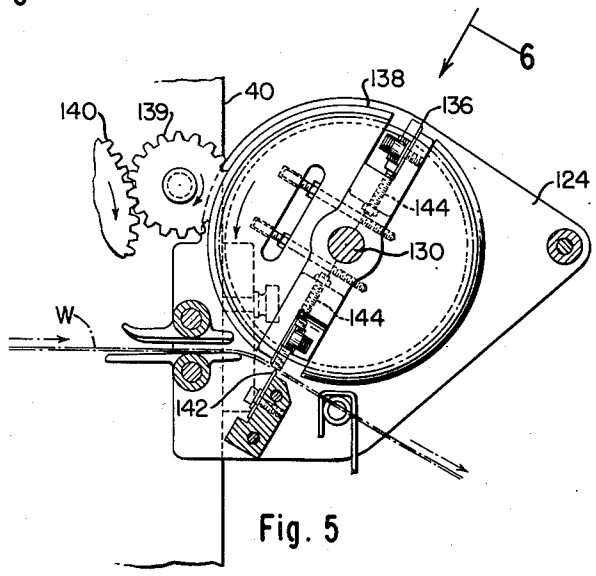


Fig. 5

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United States Patent Office 2,782,712 Patented Feb. 26, 1957

2,782,712

SHEET OR WEB FED ROTARY PRINTING PRESS

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Application December 22, 1952, Serial No. 327,390

4 Claims. (Cl. 101—144)

The present invention relates to a lithographic press for printing by offset lithography, and more particularly to a simple and compact offset press embodying provision not only for automatic sheet feed but also, when desired, for continuous web feed from a roll, with automatic cut-off into sheets following the printing.

The various features of this invention have particular utility when incorporated in a small-scale press adapted for printing on stock having a width of the order of or narrower than the width of standard office stationery. By reason of the simplified and improved construction and mode of operation, it has been found possible to reduce the weight to the point where such a press may be readily portable, yet capable of printing a very substantial number of high quality reproductions at relatively high speed.

By providing such features in a press operating by offset lithography and utilizing plates of thin, non-metallic material, it becomes possible for the first time to provide a machine by which many hundreds of copies of text, drawings, or other matter may be reproduced with an ease and simplicity comparable to that afforded by conventional duplicating machines.

Accordingly, among the several features of the invention is the provision of means for automatically supplying the machine with sheet stock during operation, and alternatively, for employing a web of paper which is fed to the machine for printing, followed by accurate cut-off in proper registration with the printed matter.

More specifically, a feature of the invention resides in the arrangement of web feeding rolls and related parts in a manner substantially independent of but in compact relation to the sheet feeding parts so as to permit effective operation of either mechanism with minimum interference, and without the necessity for removing either mechanism when the other is in operation.

Another feature involves the provision of simplified automatic cut-off means for severing the web, said cut-off means involving one or more cutter bars disposed in a quickly detachable, rotatable assembly, to provide a shearing ninety degree cut across the web with a minimum of moving parts.

Another feature involves the use of retractable fingers within the impression roll to aid in handling the paper stock during individual sheet feed, yet readily retractable beneath the periphery of the roll when a continuous web is to be fed.

Other objects and features of the invention will be more clearly understood with reference to the following description, taken in conjunction with the accompanying drawings.

Fig. 1 is a partial side elevation in section of the principal working parts of a preferred form of press embodying the invention.

Fig. 2 is a sectional view of the impression cylinder showing the retractable sheet-engaging fingers and their actuating means.

Fig. 3 is a view of an alternative form of sheet-positioning means, adapted to be removable during continuous web feed.

Fig. 4 is a plan view of the automatic cut-off mechanism, partially in section, taken in the direction of the arrow 4 in Fig. 1.

Fig. 5 is a sectional elevation of the cut-off mechanism shown in Fig. 4.

Fig. 6 is a schematic plan view showing pictorially the method of cutting the sheets, taken in the direction of the arrow 6, in Figs. 1 and 5.

Referring to Fig. 1, it will be seen that the structure of the press including the principal cylinders and the moistening and inking rolls is of conventional design. A plate cylinder 12 provides the support for a flexible lithographic plate 13 bearing an image formed of a water-repelling substance, such as may be found in some typewriter inks, lithographic pencils, pens or crayons, or other greasy substances. A transfer, blanket, or offset cylinder 14 is supported for rolling contact with the plate cylinder, and is provided with a recess or gap 16 and means to secure therein the ends of a transfer blanket 18. This blanket is adapted to receive the inked images and to transfer them to the stock, which is held in contact with the transfer cylinder by an impression cylinder 20. Although the cylinders are adapted to function in rolling ocntact, they are preferably gear driven in a conventional manner, and in the embodiment described the driving shaft is that of a combing or feeding wheel 22 associated with the sheet feeding apparatus, the wheel transmitting motion through an intermediate gear 24 to the gear driving the transfer cylinder 14. The latter gear engages with and drives two gears of the same diameter and number of teeth, secured respectively to the plate and impression cylinders 12 and 20. The cylinders move in the directions indicated by the arrows in the figure.

A moistening roll 26, preferably bearing a felt or molleton covering, applies moisture, continuously or intermittently as may be desired, to the plate 13. The moisture is applied to the roll in a conventional manner from a water pan 28 by a ductor roll 30 adapted for oscillation between a fountain roll 32 immersed in the pan and a vibrator roll 34 continuously in contact with the roll 26. The roll 34 may be provided with means for axial oscillation as well as rotary movement in order to spread the moisture evenly over the roll 26.

In a somewhat similar manner, a form roll 36 applies ink selectively to the water-repelling, unmoistened portions of the plate from an ink fountain 38. The various inking and moistening rolls heretofore discussed may be driven in any conventional manner, for example by gears meshing with those of the three main cylinders.

The inking and moistening rolls as well as the cylinders may be supported in one or more frames or sub-frames equipped with hangers, hinges, eccentric supports, or other devices adapted for rapid assembly or disassembly, and for adjustment of the pressures of the cylinders in accordance with well known techniques.

For sheet feeding, the frame 40 of the press is provided with lugs 42 adapted to receive a slotted bracket 44 secured to the underneath side of a feed table 46. The table is supported in inclined position by means of the lugs 42 and the action of detent members 47, one on each side, which engage spherical recesses in the outside walls of the bracket 44 by springs secured to the frame 40. Thus, the table 46 may be readily removed when the press is converted for roll feeding.

A bracket 48 secured to the frame 40 bears a retard rubber 50 in close proximity to the wheel 22 and provides means for retarding each sheet prior to feeding

in an accurately defined position. The position of the retard rubber may be adjusted by a screw **52** bearing upon the underneath surface of the bracket **48**. An L-crank lever rotatable about a fixed lug **54** projecting from the frame **40** bears an idler roll **56**, which is held in contact with the roll **22** by a spring **58** urging the lever in a counter-clockwise direction. Inserts **60** of rubber or similar material project slightly above the surface of the wheel **22** and provide means for urging the sheets successively towards the roll **56**, each sheet being thereafter passed along a set of guide rails **61** and beneath a guide plate **62**.

In accordance with well known techniques, the impression cylinder is provided with a set of sheet-positioning fingers which protrude from its surface and, during rotation of the impression cylinder, enters the recess or "gap" in the transfer cylinder in which the blanket is secured. The positions of the rubber inserts **60** on the feed wheel **22** are adjusted so as to cause a sheet to be fed through the guide plate **62** at approximately the moment when the fingers are in the line of centers of the two cylinders, so that the sheet is advanced into contact with the underside of the hook portion **63** of the fingers **64** (see Fig. 2), and such contact is maintained as the fingers move on and the roll bite is regained.

When the machine is utilized with a continuous web of paper as the supply, the sheet engaging fingers are not needed and must be moved out of the way. Accordingly, to permit rapid conversion to roll feeding, means are provided for moving the fingers to a position out of engagement with the web without actually requiring the fingers be removed from the roll. In Fig. 2, one form of retractable finger is shown in a sectional view of the impression cylinder **20**. A set of fingers **64**, each having a rack along one edge, is supported for movement in a radial direction by guide slots **66** in the cylinder, the inner ends of the fingers having U-shaped slots adapted to straddle the roll shaft **68** passing through the cylinder. A long pinion **70** engages all of the racks, and is secured to a lever **72** and knob **74** projecting from the side of the cylinder. The knob **74** is held by a spring in a detent **76**, and may be manually lifted from this detent and swung over to a second detent **78** to cause the fingers to project out from the periphery of the cylinder for engagement by the leading edges of the sheets.

An alternative arrangement is shown in Fig. 3, wherein the fingers **79** are carried on a bar **80** provided with screw holes **82** to permit securing within a hollow recess in the cylinder **20**. When the bar **80** is removed it is replaced by a similar plate **84** having no projecting finger means, as shown in Fig. 1.

Referring again to Fig. 1, it will be seen that the press is readily converted from sheet feeding operation to web feed from a roll of paper by the removal of the feed table **46** as described above and by the rapid assembly of a roll support and web severing means as hereinafter described. The paper supply, in the form of a continuous web or roll **86**, is supported on a shaft carried in a pair of slots on a bracket **88**, and the bracket is provided with a pair of hooks **90** engaging lugs **92** on the main frame **40**. The weight of the roll causes the bracket to rest firmly against the frame at **94**. A bar **96** supported in the bracket **88** engages a pair of slotted plates **98**, one on each side of the roll. The plates **98** are adapted for movement axially with respect to the roll and within the bracket to provide means for adjusting the alignment of the roll. Set screws **100** passing vertically through the bracket **88** engage outwardly extending lugs **102** on the plates **98** to retain the plates in the proper positions.

In the lower portion of the support for the roll of paper a lever **104** is supported on a shaft **106** extending transversely of the frame. The lever carries a square-edged decurler bar **108** spaced from and parallel to the shaft **106**, and the lever may be rocked by a knob **110** movable in a slot in the bracket **88** to adjust the angle through which the web W is bent as it passes under the shaft and over the decurler bar in its transit from the roll to the impression cylinder.

To insure effective feeding engagement between the web and the impression cylinder, the web is fed forwardly of the impression cylinder over a roll **112**, then back into contact with the cylinder and around the cylinder into the bite of the rolls, as shown in the drawing. Thus, a substantial area of contact is created between the impression cylinder and the web, approximating one hundred and eighty degrees of the periphery of the impression cylinder. To increase the effectiveness of the frictional engagement, provision is made for holding the paper against the cylinder independently of the bite provided by the blanket cylinder.

A pair of plates **114** secured to the frame **40** support an L-crank lever **116**, rotatably mounted on a shaft **118** secured to the plates. A spring **120** urges a supplementary idler roll **122** against the portion of the web in contact with the impression cylinder.

With the above-described arrangement, certain features of the web feeding motion will become apparent. First, when the transfer and impression cylinders are in rolling contact, (i. e., when the "bite" is on the web) a substantial area of frictional contact exists between the paper and the impression cylinder. This area extends from the initial point of contact to the bite. Thus, frictional means are provided to supplement the feeding pull of the bite as long as the bite is sustained. However, when the bite is removed at periodic intervals by the arrival of the gap in the transfer cylinder at a position opposite the impression cylinder, the frictional driving force is effectively maintained by reason of the pressure of the supplementary roll **122** against the paper.

It is therefore clear that by reason of the above described arrangement the impression cylinder is able to perform the double function of providing the necessary pressure of the stock upon the transfer cylinder to transfer the ink to the paper, and also of feeding the web. As a result, special driven rolls for web feed are not necessary, resulting in a saving in weight and complexity. It will easily be appreciated that this saving is an important one in presses designed for portability and small size and weight.

It will also be observed that a convenient arrangement exists between the roll feeding and sheet feeding parts whereby the web is fed from a position substantially independent of, but in compact relation to, the sheet feeding parts so that the bulk of the sheet feeding apparatus need not be removed when the press is set up for roll feeding.

When the press is operating on the continuous web fed from the roll, means are provided for automatically cutting the web into sheets in exact predetermined relation to the printed matter. The cut-off mechanism is mounted on the press to receive the web from the bite of the blanket and impression rolls, and is supported within a cutter frame **124** secured by thumb screws **126** to the frame **40** to provide a readily detachable mounting. A downwardly slanting receiving table **128** for the severed sheets is also suspended from the cutter frame by hooks, as shown in Fig. 1. Referring to Fig. 4, a shaft **130** journaled in fixed bearings in the frame **124** carries a cutter assembly comprising a gear **132**, a bracket **134**, cutter bars **136**, and guide disks **138**, all in rigid relationship. The gear **132** is adapted to mesh with a driving gear **139** (see also Fig. 1) when the cutter frame is secured as aforesaid. The gear **139** is rotated by gear **140** (Fig. 5) alongside the blanket cylinder **14**.

As previously indicated, the motion of the web as it leaves the bite is substantially continuous. The cut-off mechanism is arranged to sever the sheets by a progressive cutting or shearing action, while permitting the web to continue to advance in the direction of feed during the cut. Also, the cut is made precisely at right angles across the sheet with respect to the longitudinal edges.

According to this arrangement, the shaft **130** is offset in a slightly oblique relation to the shafts in the main frame by providing one of the sides of the frame **124** with a slightly deeper bearing surface or recess **141**, where it fits against the main frame **40**, than is provided on the other side. In addition to the shaft **130**, the frame **124** also supports an anvil knife **142**. The axis of the shaft **130** and the cutting edge of the knife **142** are supported in parallel relation in the frame **124**, so that both are equally offset with respect to the web as a result of the asymmetrical frame mounting. The parallelism of the knife **142** and shaft **130** is indicated in Fig. 5, which is a view taken along the axis of the shaft **130**. It will be evident from the plan view, Fig. 4, that the offset of the cut-off mechanism as shown, is in a direction to cause the severing cut to start at the upper edge of the advancing web.

To bring about a shearing cut across the web at the exact rate to compensate for the oblique disposition of the anvil knife, the cutting edges of the cutter bars **136** are skewed slightly with respect to the axis of the shaft **130**, whereby the upper end of each cutter bar, as shown in Fig. 4, reaches the anvil knife first. The skewing of the cutter blades is very small, just enough to cause the cut to complete the traverse of the web in the time required for the web to advance the amount of the anvil knife offset. Adjusting screws **144** threaded in the bracket **134** (Fig. 5) provide means for exerting a thrust upon the inner edges of the cutter bars to permit minor adjustments of the contact along the length of each cutter bar.

Disks **138**, which may be of plastic material, are secured to the shaft **130** and serve to keep the severed sheets from becoming entangled with the cutter bars and instead, cause the sheets to advance onto the stack on the table **128** as shown in Fig. 1.

The peripheral speed of the cutter bars is preferably slightly in excess of that of the web as it passes over the anvil knife. This is shown diagrammatically in Fig. 6, which is a plan view of the web W at a moment when a cut is midway in its traverse. A line **146** represents the cutting edge of the anvil knife which is offset from right angles with respect to the longitudinal edges of the web, as above described. A line **148** represents the cutting edge of a cutter bar. The cut has advanced to the indicated position where the lines **146** and **148** intersect. It will be understood that the line **146** remains stationary, while the web W and the line **148** have components of motion in the direction of the arrow. However, the line **148** moves somewhat faster than the web, thus causing a slight gap **150** between the web and the severed portion of the sheet.

It will be understood that while the invention has been described with reference to a preferred embodiment, said embodiment may be modified, redesigned, and changed in various ways by one skilled in the art, according to particular and varying conditions of use, and that such modifications and changes would not constitute a departure from the spirit or scope of the invention.

Having thus described the invention, we claim:

1. A printing press for both roll and sheet feed, comprising a plate cylinder, a transfer cylinder and an impression cylinder rotatably disposed in a generally vertical row on spaced parallel axes with the plate cylinder at the top and the impression cylinder at the bottom, sheet feeding means comprising a generally horizontal sheet feed table substantially aligned with the bite of the transfer and impression cylinders, means for supporting a paper roll for web supply, and means for directing the web beneath the feed table from the roll into engagement with the underside of the impression cylinder remote from the transfer cylinder and then around the said impression cylinder in engagement therewith to the bite between impression and transfer cylinders to cause the web to embrace a substantial portion of the periphery of the impression cylinder prior to entry into the bite of the impression and transfer cylinders.

2. A printing press for both roll and sheet feed, comprising a plate cylinder, a transfer cylinder and an impression cylinder rotatably disposed in a generally vertical row on spaced parallel axes with the plate cylinder at the top and the impression cylinder at the bottom, sheet feeding means comprising a generally horizontal sheet feed table substantially aligned with the bite of the transfer and impression cylinders, means for supporting a paper roll for web supply, means for directing the web beneath the feed table into engagement with the underside of the impression cylinder and then around said cylinder in engagement therewith to the bite of the impression and transfer cylinders to cause the web to embrace at least approximately one-half the periphery of the impression cylinder prior to entry into the bite of the impression and transfer cylinders, and an idler roll underneath the feed table and between said table and the line of web advance to the impression cylinder to bear on the web engaging the periphery of the impression cylinder prior to web entry into the bite of said impression and transfer cylinders.

3. A printing press for both roll and sheet feed, comprising a plate cylinder, a transfer cylinder and an impression cylinder rotatably disposed in a generally vertical row on spaced parallel axes with the plate cylinder at the top and the impression cylinder at the bottom, sheet feeding means comprising a generally horizontal sheet feed table substantially aligned with the bite of the transfer and impression cylinders, means for supporting a paper roll for web supply, a roll disposed on an axis parallel to the axis of the impression cylinder and positioned adjacent the underside of said cylinder peripherally removed at least approximately 180° from the bite of the impression and transfer cylinders, and means for directing the web from the paper roll to and around the roll adjacent the impression cylinder and then to and around the impression cylinder in engagement therewith to cause the web to embrace a substantial portion of the impression cylinder before entry into the bite thereof.

4. A printing press according to claim 3 wherein an idler roll is disposed beneath the sheet feed table and above the line of web advance to the impression cylinder to increase the frictional contact of the web with the periphery of the impression cylinder.

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