Sept. 12, 1961 H. ZEIMER 2,999,455

METHOD OF AND APPARATUS FOR INCREASING THE EFFICIENCY OF PRINTING MACHINES

Filed April 7, 1958

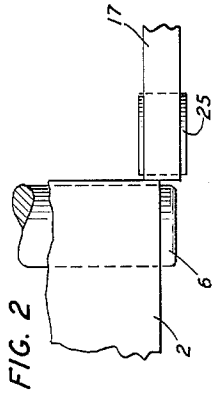


FIG. 2

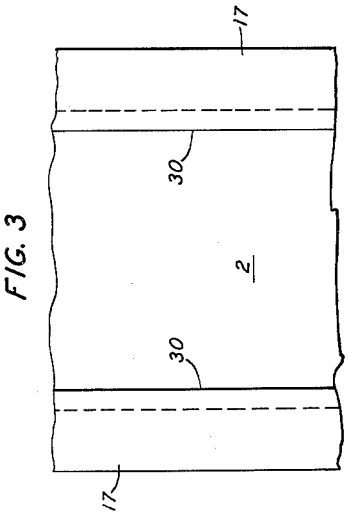


FIG. 3



FIG. 4

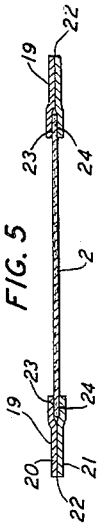


FIG. 5

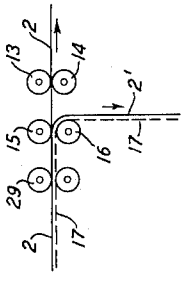


FIG. 7

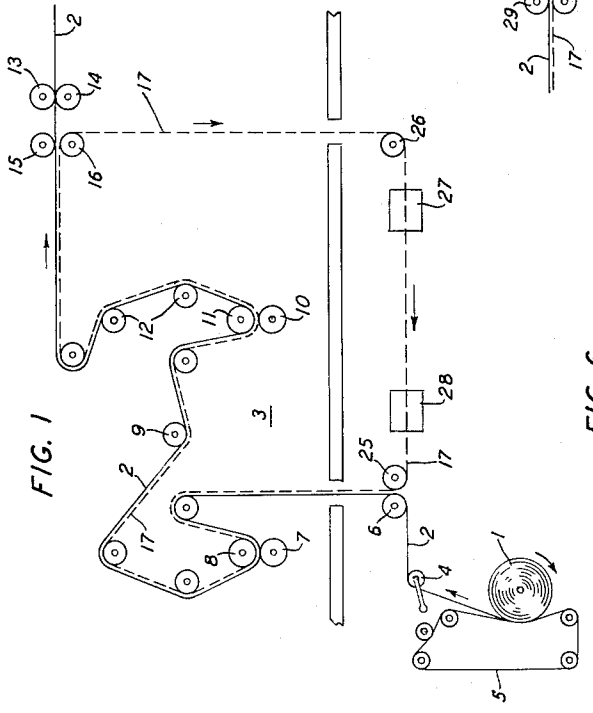


FIG. 1

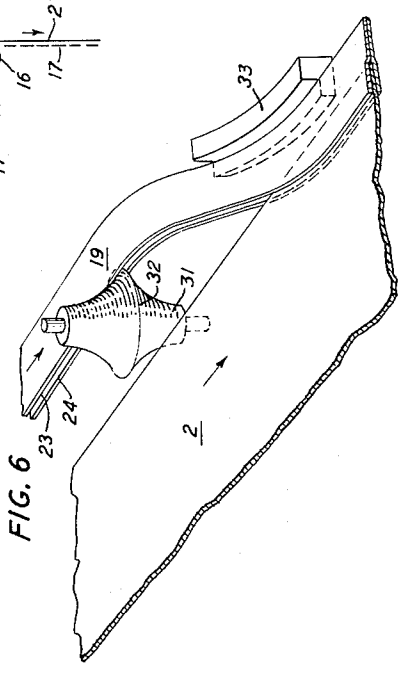


FIG. 6

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METHOD OF AND APPARATUS FOR INCREASING THE EFFICIENCY OF PRINTING MACHINES

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The instant invention relates to a method of, and apparatus for increasing the efficiency of printing machines, particularly high speed web printing presses in which printing is upon continuous paper strips supplied to the press from rolls of paper.

An object of the invention is to reduce the material and time losses resulting from a rupture of the paper web fed from the roll during its passage through the press.

A further object is temporarily to reinforce the paper supplied from the roll thereof during its passage through the printing press to eliminate, and, as a minimum, to decrease the occurrences of ruptures of the paper during the printing as the paper web passes through the press.

Still another object is to provide devices in a rotary printing press for applying the reinforcement to the paper as the paper is fed into the press, and other devices to remove the reinforcement after the paper has been printed, which latter devices are positioned at or near the output end of the press.

It will be recalled that when the paper strip tears apart during the printing, even though the press is stopped, usually automatically, as quickly as possible after a tear occurs, the printing is defective for an extended length beyond the tear, depending mainly on the speed at which the paper is printed and the inertia to be overcome in stopping the press. Not only is an appreciable length of printed paper before and after the rupture lost, but printing is interrupted for an interval comprising the time taken for the press to stop, the time to remove any crumpled paper and rethread the supply paper roll into the press, and the time to bring the press to speed on restarting. Particularly in the printing of metropolitan newspapers is such wastage and stoppage serious in that it runs into really high annual monetary figures and results in not meeting dead lines for issues of the newspapers which may, and generally do, result in further loss from papers, which were printed but delivered late, remaining unsold.

The really fundamental reason for the tearing apart of the paper strip, fed from the rolls thereof as furnished by the paper mills into the web rotary presses of the high speed type, is that it acts as its own conveyor or advancing medium. The force propelling the paper forwardly in its path through the press is transmitted the length of the paper strip. However, as is known, paper generally does not lend itself too readily, because of its relatively low tensile strength, to transmission of the forces involved in interconnecting powerful drive elements with idler rollers and cylinders. It is not only that paper is but poorly resistant to tearing, but also it lacks homogeneity and has numerous localized defects. Not only do inherent defects in the paper itself result in the adjacent and sound regions of the paper being subjected to an increased share of the propelling force, but subjection to increased forces of sound paper portions may also result from defects in rolls of perfectly sound paper, such as rolls which have been unevenly wound at the mill or perhaps with creases or wrinkles within the roll, or rolls which have been cut or bruised in transit, or have developed a flat side in their cylindrical surface in storage, or have become wet, or were wet and have dried leaving ripples and wrinkles, etc. The strain imposed on the sound and tension transmitting longitudinal portions of the paper strip under such, and other conditions, such as uneven or unbalanced driving rollers, may become more than the

sound portions can bear and result in tearing the paper strip apart.

I accomplish the foregoing, and other, objects of my invention by providing at least one reinforcing band at one edge of the paper strip as it passes through the printing press. Preferably a reinforcing strip is applied to each edge of the paper strip and is so positioned that it will not interfere with any part of the paper surface within the usual printing area thereof. Each reinforcing strip may be a thin, narrow strip of supple, synthetic or natural material, for example rubber, metal, webbing, etc. One type of such strip is coated on one of the wider longitudinal surfaces with an adhesive and is caused to adhere to the unprinted edge region of, for example, ⅛" width, at each lateral edge of the paper, a substantial portion of the reinforcing strip overhanging, that is, extending beyond, the edge of the paper strip. In the alternative, each reinforcing strip may consist of two layers or strips, of metal or other pliable and supple material, superimposed on each other and joined to each other the entire length of the strips at one side, and forming, at the other side, a pair of longitudinal lips which can be opened to receive the edge of the paper strip and which close upon the paper strip edge to clamp it firmly between the lips. Or a single strip of, for example, rubber of appropriate thickness may have a cut the length of the strip into one of its lateral faces to a depth so to receive and clamp the paper strip edge.

Each reinforcing strip is applied to the cooperating edge of the paper web at the press input by appropriate roller systems guiding the reinforcing strip into proper position relative to the edge of the paper web, and by means for producing intimate contact between the paper web and the reinforcing strip. The intimate contact producing means may be pressure actuated when the reinforcing strip is of the adhesive coated type, and may be of the lip spreader and release and clamping type where the strip is of the alternative type above described. The lip spreader is preferably in the form of a cuspate roller with a circumferential cusp at about half the height of the roller, the roller being rotatable about an axis perpendicular to the direction of the feed of the web and positioned laterally of the web so that the cusp engages between the lips of the two-layer strip to separate them a sufficient amount to permit the marginal portion of the web to pass between the lips, whereupon the strip is guided laterally itself to the web with the lips over the adjacent marginal portion thereof, the lips then closing under tension as the web and strip leave the region of strip application and clamping the web marginal portion between them.

The paper web and the applied reinforcing strips remain in intimate contact through the press to the output or delivery side thereof by the tension advancing the web through the press. The reinforcing strips or bands, while subject to all or a part of the driving force and inertia of the various elements assuring the transport of the paper web, nevertheless have, and should have, no contact with any such element. To make certain that this is the case, such web transporting elements are designed, or modified in their design, to permit free and facile passage of the reinforcing strips and at the same time, preferably, to assure correct guidance of the strips. At the delivery end of the press, the reinforcing strips are removed from the web by means which differ in accordance with the particular reinforcing strips utilized. Where the reinforcing strip is coated with a weak adhesive, the separating means may comprise a roller pulling the strip from the web and imparting a path to the strip at an angle to that of the web. In the alternative, a wedge may be positioned in their combined path at their interface to peel the reinforcing strip from the web. If the reinforcing strip has a coating of strongly adhering adhesive, the separating

means may be a rotary or stationary cutting edge in the path of the paper web which continuously severs the edge portion of the paper web to which the reinforcing strip adheres from the body portion of the paper web. Where the reinforcing strip is of the clamp type, the separating means is preferably a single cuspate roller with a flat base, rotatable about an axis perpendicular to the path of the web and strip at the output side of the press, the base of the roller being closely adjacent to, and over, one face of the web, so that the cusp circumferential peripheral region, entering the lip side of the strip, raises the lip from that face of the web so that the web is unclamped and the reinforcing strip released. The released strip is guided about a roller laterally of the path of the web and positioned opposite such one face of the web.

Where reinforcing strip separating means of the first and last types are utilized, the unimpaired removed reinforcing strip may be reused indefinitely and preferably is returned at once upon separation to the means applying it to the web in a continuous cycle. With all three separating means above discussed, the reinforcing strips after separation from the web may be wound on rolls or bobbins and reused. Where the separated reinforcing strips include the marginal web portion, as in the case of the strip with the strongly adherent adhesive, before reuse of the strip the adhering marginal web portion is first removed by obvious means, or the other marginal portion of the strip used the next time, and thereafter both marginal web portions adhering thereto removed before the strip is used a third time.

It will be noted that while the web, after the reinforcing strips are removed, may tear as the results of defects in, or injury to, the web, such tears are localized to the region at, or beyond, the output of the printing press per se. Hence, there can be no loss of extensive printing time since the printing is completed, and only the cutting and folding operations still remain.

The foregoing objects and features, as well as others, will more readily appear from the following illustrative embodiments of my invention in conjunction with the appended drawing, in which:

FIGURE 1 is a highly simplified overall diagram of a high speed rotary printing press with the added mechanism to practice the method of applying reinforcing strips to the paper web and removing therefrom in accordance with my instant invention;

FIGURE 2 is a bottom view detail of the input side of the press at the region where a reinforcing strip of the adhesive coated type is applied to the web;

FIGURE 3 is a plan view of a portion of a paper web with reinforcing strips applied to both lateral marginal regions in accordance with my invention;

FIGURE 4 is an elevational section of FIGURE 3 with adhesive coated reinforcing strips;

FIGURE 5 is an elevational section of FIGURE 3 for two-layer clamping reinforcing strips;

FIGURE 6 is a simplified perspective of the cuspated roller and lateral guide for applying the two-layer clamping reinforcing strip to the web; and

FIGURE 7 is a detail of FIGURE 1 at the output side of the press showing the separating means for the reinforcing strip coated with a strongly adhering adhesive.

Referring to the drawing, the roll of paper **1** is rotated to feed the web **2** into the printing press **3**, which is shown greatly simplified and merely by some of its printing, pressure and idler rollers. The web tension is controlled by the tension controlling roller **4** cooperating with the driving system **5**, the web being fed by idlers, including roller **6** for example, to the driven printing roller **7**, and its cooperating driven pressure roller **8**, for printing on one face of the web. Then the web is transported by a system of rollers to the driven printing roller **10**, and its cooperating pressure roller **11**, for printing on the opposite face of the web; whereupon, by a system of idler rollers **12**, the web is conveyed to the output side of the press at which it travels substantially horizontally to, and between, a pair of pressure drive and sliver cutting rollers **13** and **14**. In advance of rollers **13** and **14**, in the direction of travel of the web, a pair of pressure rollers **15** and **16** are provided for the purpose hereinafter explained.

Two types of reinforcing strips are shown in FIGURES 3 through 5, both of which are shown in plan view in FIGURE 3, in which two reinforcing strips are applied to web **2**, one reinforcing strip individual to each lateral marginal portion of the web. The dimensions of the strips are severely exaggerated in FIGURES 3 through 5 relative to web width for greater facility and clearness of illustration. Thus the web width may well be of the order of 60 inches, the width of the reinforcing strips of the order of two inches, and the overlap of each strip and the marginal region of the web of the order of ⅛ inch in width.

Reinforcing strips **17** of FIGURE 4 have a coating of weakly or strongly adherent adhesive **18** coated on the face thereof which is to be applied to the web. Adhesive coating **18** may extend over the entire width of the strip or may be applied only at one marginal region thereof as shown, or at both marginal regions. The reinforcing strips **19** of FIGURE 5 may comprise two layers **20** and **21** superimposed on each other and joined longitudinally their entire length at one edge region thereof **22**, the other edge region of the layers forming a pair of lips **23** and **24**. In an alternative, not shown, this type of strip may be but a single layer of which one longitudinal lateral face has a continuous slit about midway the strip thickness.

When utilizing a strip **17**, the strip is supplied to the web with its coated surface **18** facing and partially overlapping a narrow lateral marginal region of the web, as shown in FIGURE 2. A pressure roller **25** presses such overlapping region of strip **17** against the web as the latter passes over roller **6**. In its passage beyond roller **6**, the web thus carries the strip along with it, and thus the adhering strip is maintained in intimate contact with web throughout its passage through the press and under tension to beyond the pressure rollers **15** and **16**. Beyond such pressure roller pair, **15** and **16**, but before the web enters between drive pressure rollers **13** and **14**, the leading end of strip **17** is separated from the web in the system diagram of FIGURE 1, assuming here that the adhesive coating **18** is relatively weak and permits of peeling the strip from the web without applying a force which might tear the edge of the web. Such separation of the leading end of strip **17** may be manually, or by a wedge, not shown, positioned just beyond pressure rollers **15** and **16** with its narrow edge facing and registering with the interface of the web and the strip. The separated strip end is then brought about a winding bobbin, not shown, but preferably about a roller **26** to provide a continuous system as depicted in FIGURE 1, and then back to applying pressure roller **25**. In its path from roller **26** back to applying roller **25**, one or more cleaning, scrubbing or adhesive removing devices **27** may act on the strip **17**, as also a recoating device **28** for applying fresh adhesive to the strip.

Where the adhesive coating **18** is strongly adhesive, the output end of the system may be modified as shown in FIGURE 7. In advance of the pressure rollers **15** and **16**, at which both the web and the strip are still under tension, a cutting device **29**, which may be rotary as shown, or in the alternative stationary, is positioned to intercept the web at the inner edge **30** of the adhering strip, cutting the marginal portion of the web and the adhering strip from the printed body of the web. The body of the web, as also the severed marginal portion, continue through pressure rollers **15** and **16**, where the severed marginal portion adhering to strip **17** is likewise rolled on a bobbin or passed around pulley **26**, as above stated.

When utilizing a strip **19** of the marginal lip type, the

applying device shown in FIGURE 6 may be used. This comprises essentially a cuspate roller 31 rotating about an axis perpendicular to the path of the web at the application region and having a circumferential cusp 32 at its central portion. The cusp is so positioned as to enter between the lips 23 and 24 to spread them apart a distance sufficient to receive the web marginal region between them at the actual region of lateral deflection of the path of strip 19 to apply the strip to the web. Such lateral displacement is obtained, for example, by a guide 33 which bears against the opposite edge of the strip just beyond, in the direction of travel of the web and strip, to deflect the strip an amount sufficient to cause the still open lips of the strip to overlap the predetermined marginal region of the web. As the overlapping region of the web and strip advance, the lips close on the web clamping it between them. It will be noted that the lip opening by the cuspate roller extends for quite an appreciable distance forward and backward along strip 19 from the cusp of the roller 31.

Similarly to remove reinforcing strip 19 from the web at the output side of the press, a single cuspate roller having a flat base with the cusp formed at the intersection of the base and the outwardly curved conical surface of the roller, is used. However, the separating cuspate roller is not, like roller 31, positioned laterally of the web but is above the web and closely adjacent thereto so that the cusp can enter between the upper lip 23 of the strip and the upper face of the web, for example, and thus unclamp the web and permit the loosened reinforcing strip to be moved downwardly, as shown for strip 17 in FIGURES 1 and 7, without interference.

It is stressed that the embodiments of my invention shown and described are by way of illustration only and in no sense by way of limitation. Various changes may suggest themselves to those skilled in the art without departing from the scope of the instant invention.

What I claim is:

1. The method of reinforcing paper webs in their passage through printing presses comprising the steps of adhering to at least one lateral marginal region of the web while at the input side of the press on a portion of the web surface contacted by no element of the web transport means of the press, a continuous strip of flexible material of greater tensile strength than the web and of a width less than that of the web so that the laterally inward portion of the strip covers the marginal region of the web but no portion of the area thereof to be printed upon and the remaining portion of the flexible strip extends beyond the web edge, guiding the web and adhered reinforcing strip as a unit through the press to the output side thereof, and severing the reinforcing strip and the thereto adhering lateral marginal region of the web from the web.

2. The method of reinforcing paper webs in their passage through printing presses comprising the steps of affixing at the web input of the press, to at least one lateral marginal region of the web on a portion of the web surface non-engageable by any of the web transport means of the press, a linear thin strip of flexible material of greater tensile strength than that of the web and of a width less than that of the web so that the whole of the printing area of the web remains exposed, maintaining the interconnection between web and strip and guiding them as a unit in the passage of the web through the press and during the printing on the web, and separating the strip from the web at the output side of the printing press.

3. The method according to claim 2 in which the linear strip of flexible material is continuous and is returned directly from the press output side after separation from the marginal region of the web to the press input side for application to the web.

4. The method according to claim 3 in which an individual linear strip of flexible material is affixed to each marginal region of the web.

5. The method of reinforcing paper webs during their passage through printing presses comprising the steps of spreading apart the longitudinal free edges at one edge of a pair of superposed flexible strips of material of greater uniformity and strength than the paper of the web, which strips are longitudinally affixed to each other at the opposite edge regions thereof, guiding such superposed strips with its free ends spaced apart to an edge region of the paper web so that the paper edge region is between the free edge regions of the flexible strips, closing the free edge regions of the strips upon each other and clamping the web edge region between them in such manner that the printing portion of the web area remains exposed, maintaining such clamping during the printing passage of the web through the press, again spreading at least one free edge of the superposed strips from the web to unclamp the web edge region, and guiding the superposed strips in a path other than that in which the web is guided after the last-mentioned spreading.

6. The method according to claim 5 in which the superposed strips are continuous and are guided in a path from the output side of the press to the input side thereof.

7. Apparatus for reinforcing a paper web while in transport through a printing press and during the printing thereon by the press, comprising a continuous flexible strip of a material of greater resistance to tearing than the paper web, means for applying the strip to a lateral marginal region of the web to leave substantially the entire printing area of the web exposed, the strip being so attached at the input side of the press to the web that the strip is free of engagement with the web transport means of the press, and for maintaining the application of the strip to the marginal web portion through the passage thereof through the press, means for separating the strip and the web at the output side of the press, and means for transporting the separated strip from the press output side to the press input side.

8. Apparatus according to claim 7 in which the flexible strip is wider than a lateral marginal edge portion of the web and has one surface thereof coated with an adhesive, the strip applying means includes a system of guide rollers adapted to present the adhesive coated face of the strip to the web marginal portion so that the strip completely covers the web marginal portion and extends beyond the web edge, and pressure means to adhere the strip portion covering the web marginal portion thereto, and the web and strip separating means includes a roller laterally of the web path about which roller the strip is guided.

9. Apparatus according to claim 8 in which the separating means includes a knife edge facing the advancing web positioned transversely parallel to the plane of motion of the web and at the interface of the strip and web.

10. Apparatus according to claim 8 in which the separating means include a pair of rotary knives positioned perpendicular to, and intersecting, the plane of motion of the web at the press output side and aligned with the inner edge of the adhered strip on the web, and a pair of pressure rollers behind the knives in the direction of motion of the web.

11. Apparatus according to claim 8 in which the separating means includes a knife edge positioned perpendicular to, and extending through the plane of web motion at the press output side and aligned with the inner edge of the adhered strip on the web, and a pair

of pressure driving rollers behind the knife edge in the direction of web motion.

12. Apparatus in accordance with claim 8 in which in the return path of the separated strip from the output to the input side of the press, cleansing means are positioned to act on the strip to cleanse, roughen and remove in part the adhesive coating thereon.

13. Apparatus according to claim 8 in which in the return path of the separated strip from the output to the input side of the press, means are provided to remove the adhesive coating from the strip, and means for applying a new adhesive coating to the strip are positioned after the removing means in the direction of movement of the strip.

14. Apparatus according to claim 7 in which the flexible strip is wider than a longitudinal marginal portion of the web and comprises two elongated superimposed layers longitudinally joined at one side, the strip applying means including means guiding the other and free side of the layers to the adjacent edge of the web, first spacer means entering the free side of the layers to space them sufficiently apart to permit entry therebetween of the web marginal region, and first lateral displacing means simultaneously with the spacing of the layers to push the open sides over the web margin to clamp the latter between the layers, and the web and strip separating means includes a second spacer means entering the free side of the layers to space them sufficiently to unclamp the web margin, and second lateral displacing means to remove the strip from the web margin.

15. Apparatus according to claim 14 in which each the first and second spacer means is a cuspate roller, the first spacer cuspate roller having its circumferential cusp midway the height of the roller and rotating about an axis lateral of the web path, the second cuspate roller having its cusp at the base thereof and rotating about an axis in the web path, and both cuspate rollers axes being perpendicular to the web path.

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