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ANGLE BAR WEB TENSION CONTROL MEANS

Filed March 28, 1955

2 Sheets-Sheet 1

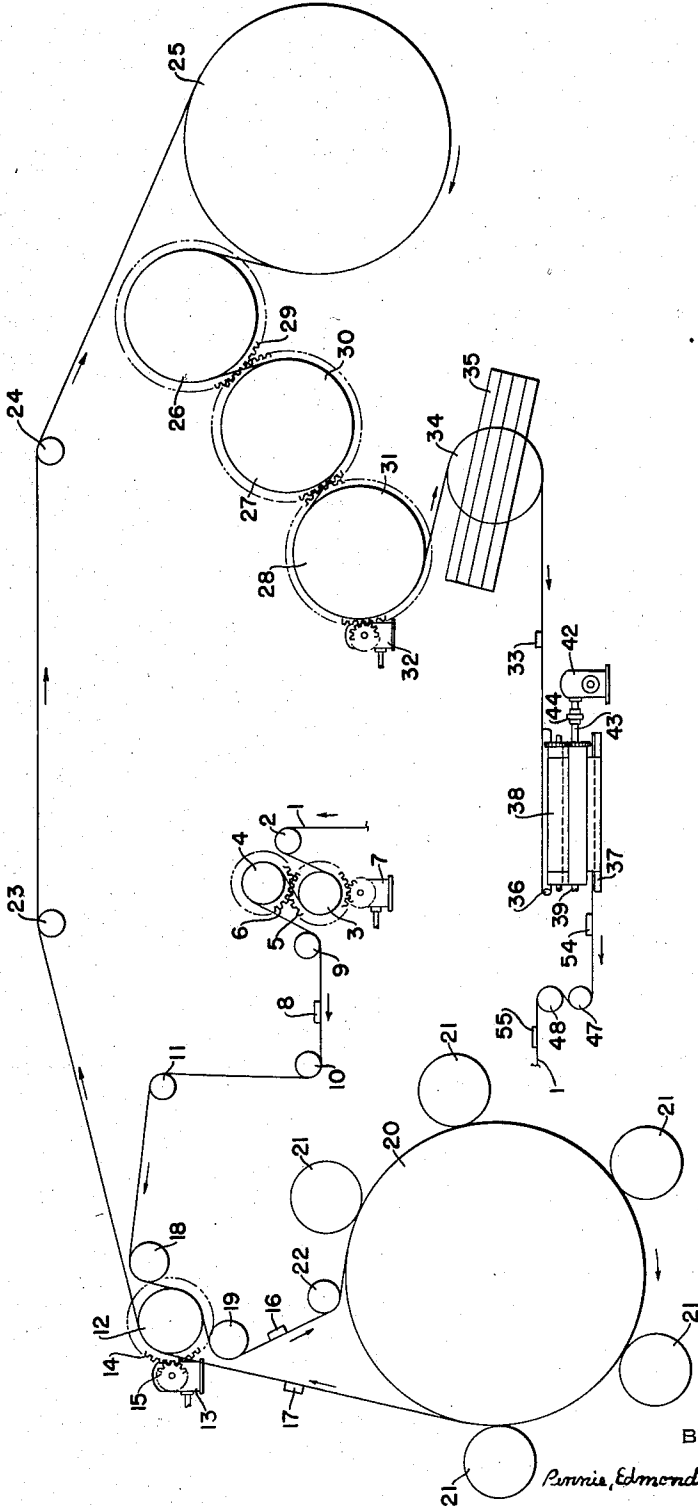


FIG. 1

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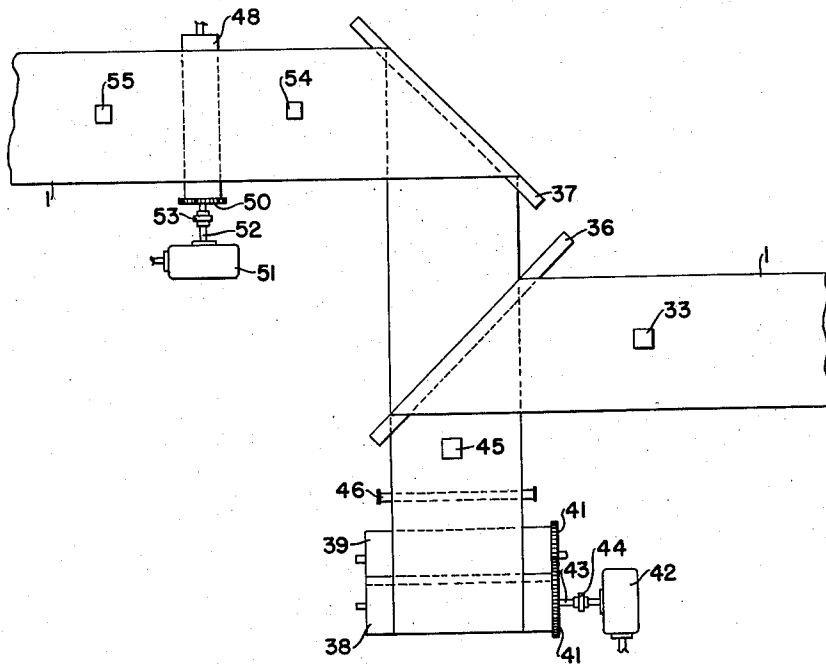


FIG. 2

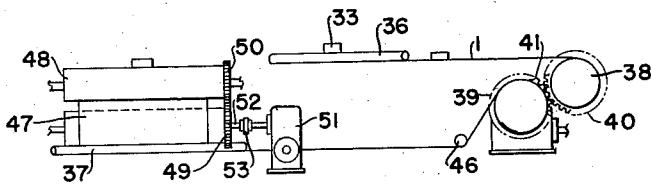


FIG. 3

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ANGLE BAR WEB TENSION CONTROL MEANS

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5 Claims. (Cl. 101—179)

This invention relates to improvements in rotary web-fed printing presses and more particularly to a method and means for maintaining tension of the web more nearly uniform as it passes over and between the various elements of the press.

Presses of this type usually comprise numerous rollers and cylinders, angle bars, drying drums and other auxiliary equipment over which the web must pass, as is well understood in this art.

For instance, the web on entering the press may pass around an impression cylinder while being printed on one side. It may then pass over a drying drum. Where the web is to be printed on both sides, it is customary to reverse the web after it leaves the drying drum and pass it to a second impression cylinder for printing on the reverse side. The turning of the web is usually accomplished by passing it over a pair of angle bars. Angle bars may also be used to adjust the web sideways to assure proper page and marginal alignment.

The major drums and cylinders over which the web passes are ordinarily power driven. But the web will usually be passed over a number of intermediate idler rollers which are caused to rotate only by means of friction between the peripheries of these idler rollers and the surface of the web.

Thus, the web in passing through the press, and especially in passing about the angle bars, is subjected to considerable frictional resistance which tends to place the web under uneven strain and tension at various stages along its path.

Various means have been proposed for lessening the friction and uneven tension of the web. For instance, means have been provided for forming an air-cushion between the web and the angle bars to lessen frictional resistance at the points where the web passes about the angle bars, but this has not eliminated the uneven tension.

In addition to frictional resistance, the tension of the web may be caused to vary at different points along its path due to shrinkage. The amount of shrinkage and also friction vary considerably with different types of paper. For instance, there is a wide difference in these respects between the English-finished type, rough surfaced paper, and a coated paper having a gloss finish. Similarly the strength of the web varies considerably with different types of paper. Thus, the problem of maintaining uniform tension on the web is further complicated by the fact that several different types of paper may be run through the press in a single day.

If the tension on the web is too low, there is a tendency of the web to sag, and it may lead to the snapping and breaking of the web. If the tension is too high, there is a tendency for many papers to skid sideways on the rollers, or to "walk" back and forth between the press frames. It is important, therefore, that the tension on the web be maintained as uniform as possible throughout the press and that means be provided for readily adjusting the tension at various points and to suit the particular type of paper being printed.

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The present invention provides a novel and highly effective press design and method of operation whereby substantially uniform web tension can be maintained throughout the press, regardless of the character of the paper stock being printed.

This is accomplished by my present invention by providing at intervals along the path of the web, especially at points where tension changes are most apt to occur, driven rollers adapted to be rotated at variable speeds, independently adjustable. It is particularly advantageous to place such variable speed rollers at points preceding and following each angle bar.

The speed of these respective rollers may be adjusted manually. However, they may be automatically controlled, responsive to tension meters or other means of determining tension of the web passing to or from critical points in its path and particularly at points preceding and following the angle bars and power driven cylinders.

These variable speed rollers are, with advantage, used in pair so as to obtain a good wrap-around and geared together so as to operate at equal peripheral speeds. In some instances, it is desirable to use a greater number of cooperating variable speed rollers but usually no more than 3 need be used to accomplish my purpose. In many instances, a single variable speed roller may be used where adequate wrap-around to avoid slippage can be obtained.

Each such roller or cooperating set of rollers is independently driven through a variable speed unit which in turn may be driven from the primary press drive. The variable speed unit should be of the type which is infinitely variable so that nice adjustments of speed may be obtained. Units of this type are readily available to the trade, for instance those known as PIV gear units, and need not here be described in further detail. As previously noted, these variable speed units may be manually adjustable or they may be automatically adjustable responsive to one or more web tension indicators positioned at critical points along the web to be controlled by the particular variable speed roller or set of rollers.

The invention will be more fully described and illustrated with reference to the accompanying drawings which represent conventionally and diagrammatically a particularly advantageous embodiment of the invention and of which

Fig. 1 is a side elevational view of a rotary web-fed printing press adapted to multicolor printing,

Fig. 2 is a somewhat enlarged plan view of an angle bar arrangement and associated variable speed rollers and tension meters, and

Fig. 3 is a side elevational view of Fig. 2 looking from the left.

Referring more particularly to Fig. 1, the web 1 on entering the press passes about idler roller 2 and from thence about variable speed rollers 3 and 4 which are geared together by cooperating gears 5 and 6 to operate at equal peripheral speeds, gear 4 being driven by an independent variable speed unit 7, the speed of which is regulated either manually or automatically responsive to a web tension meter indicated at 8.

On leaving the variable speed rollers, the web passes about idler rollers 9, 10, and 11 and from thence about variable speed roller 12 driven through the variable speed unit 13 by means of cooperating gears 14 and 15, the speed of the variable speed unit being independently controlled responsive to tension meters indicated at 16 and 17.

Adequate contact between the web and the periphery of roller 12 is obtained by means of the idler rollers 18 and 19.

The web then passes about the power driven impres-

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sion cylinder 20 in contact with the peripheral printing surface of the cylinders 21 which may either be plate cylinders or blanket cylinders, as well understood by the art.

In passing to the impression cylinder, the web passes around the idler roller 22 and on leaving the impression cylinder passes in frictional contact with the variable speed roller 12, previously described, and from thence over idler rollers 23 and 24 and about the drying drum 25 whereby the ink is dried in order to prevent offset or marring of the printing sheet.

On leaving the drying drum, the web passes about a set of three variable speed rollers 26, 27 and 28 geared together by means of cooperating gears 29, 30 and 31 so as to rotate at equal peripheral speeds, gear 31 being driven by the variable speed unit 32 at a speed responsive to the tension meter 33.

The web then passes about the idler compensating roller 34 rotatably supported at each end by a rack 35 whereby shrinkage of the web in passing over the drier may be compensated for, in part, by manually adjusting the axis of roller 34 along the racks 35.

The web has now been printed on one side and must be reversed for printing on the opposite side. This reversal of the web is accomplished, as more clearly shown in Figs. 2 and 3, by passing it over a pair of angle bars 36 and 37, one of which, for instance 36, is, with advantage, adjustable, as is well understood in the art, so as to cause the web to move sideways to obtain accurate page and marginal alignment.

Since these angle bars do not rotate, there is considerable friction between their surface and the surface of the web. Further, any shift of position of either angle bar, to correct alignment of the web, will normally either increase or decrease the length of the web path and therefore changes the web tension.

Various means have been proposed to alleviate such tension changes in the vicinity of the angle bars. In lieu of or in conjunction therewith, I provide in accordance with my present invention, an independently variable speed roller, or a cooperating pair of variable speed rollers, following the adjustable angle bar and advantageously following each angle bar, as more fully shown in Fig. 2 of the drawings.

In accordance herewith the web passing from angle bar 36 around the variable speed rollers 38 and 39, geared together by means of gears 40 and 41 so as to rotate at like peripheral speeds and driven through the variable speed unit indicated at 42 and shaft 43, on which there is shown a coupling 44. The speed of the variable speed unit 42 may be controlled, for instance, in accordance with the web tension indicated by the tension meter 45.

On leaving roller 39, the web passes about an idler roller 46 and from thence about angle bar 37 and then about the cooperating variable speed rollers 47 and 48 geared together to operate at like peripheral speeds by means of cooperating gears 49 and 50, in turn driven through variable speed unit 51 through drive shaft 52 on which there is shown a coupling 53. The speed of unit 51 is regulated and controlled in accordance with the web tension indicated by the tension meters 54 and 55 or either of them.

The web, now being ready for printing on the reverse side, may be passed about a second impression cylinder, either in the same press or constituting part of an adjacent press, advantageously provided with variable speed rollers arranged as previously described herein.

While in the foregoing description I have indicated particular positions of the tension meters for controlling the speed of the respective variable speed rollers or pairs thereof, it will be understood that the respective variable speed units may be controlled responsive to web tension at any other suitable point or points along the path of the web. Further, the speed of several speed units, in

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advance of, or following a point of undesirable web tension may be simultaneously adjusted so as to correct that condition responsive to tension meters positioned at one or more points of objectionable tension.

It is, however, more advantageous that each variable speed unit be adapted to be adjusted independently of the adjustment of all other variable speed units so as to compensate for the differences in frictional and shrinkage characteristics of different paper stocks.

Where speed adjustments are to be made automatically responsive to web tension, the respective tension meters may be electrically connected with one or more of the variable speed units, the former being adapted to control the flow of electric impulses to the latter and the latter being adapted, in response to those impulses, to change the speed of the associated rollers, by means well known to the art.

It will be understood that, my invention is not restricted to the particular location, arrangement or distribution of the variable speed roller, specifically described, but that various modifications, apparent from my foregoing disclosure, are contemplated, as defined by the appended claims.

I claim:

1. In conjunction with a rotary web-fed printing press comprising an impression cylinder and having an angle bar positioned in the path of the web through the press toward the impression cylinder, a driven roller in the path of the web immediately following the angle bar and about which the web passes on leaving the angle bar, and variable speed means for driving said roller, whereby the speed of rotation of the roller may be independently varied to maintain the desired tension of the web passing over the angle bar.

2. In conjunction with a rotary web-fed printing press comprising an impression cylinder and having a pair of angle bars positioned in the path of the web through the press toward the impression cylinder, a driven roller in the path of the web immediately following each angle bar and about which the web passes on leaving the respective angle bars and variable speed means for separately driving said rollers whereby the speed of rotation of the respective rollers may be independently varied to maintain the desired tension on the web passing over the respective angle bars.

3. In conjunction with a rotary web-fed printing press comprising an impression cylinder and having an angle bar positioned in the path of the web through the press toward the impression cylinder, a pair of driven rollers in the path of the web immediately following the angle bar and about which the web passes on leaving the angle bar, said rollers being geared together to operate at identical peripheral speeds and variable speed means for driving said rollers whereby the speed of rotation of the rollers may be varied independently of the press speed to maintain the desired tension on the web passing over the angle bars.

4. In conjunction with a rotary web-fed printing press so constructed and arranged that the entering web passes successively around an impression cylinder, as one side of the web is printed, from thence to a drying drum and over a pair of angle bars, whereby the web is reversed for printing on the opposite side, a driven roller in the path of the web immediately following the first angle bar of the pair and about which the web passes on leaving said angle bar and variable speed means for driving said roller whereby the speed of rotation of the roller may be independently varied to maintain the desired tension of the web passing over the angle bar.

5. In conjunction with a rotary web-fed printing press so constructed and arranged that the entering web passes successively around an impression cylinder, as one side of the web is printed, from thence to a drying drum and over a pair of angle bars, whereby the web is reversed for printing on the opposite side, a driven roller following

each angle bar about which the web passes on leaving the respective angle bars and variable speed means for driving said rollers whereby the speed of rotation of the respective rollers may be independently varied to maintain the desired tension on the web passing over the respective angle bars.

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