April 26, 1932. C. J. MacARTHUR 1,855,525

WEB FED GRAVURE PRESS

Filed July 19, 1930 2 Sheets-Sheet 1

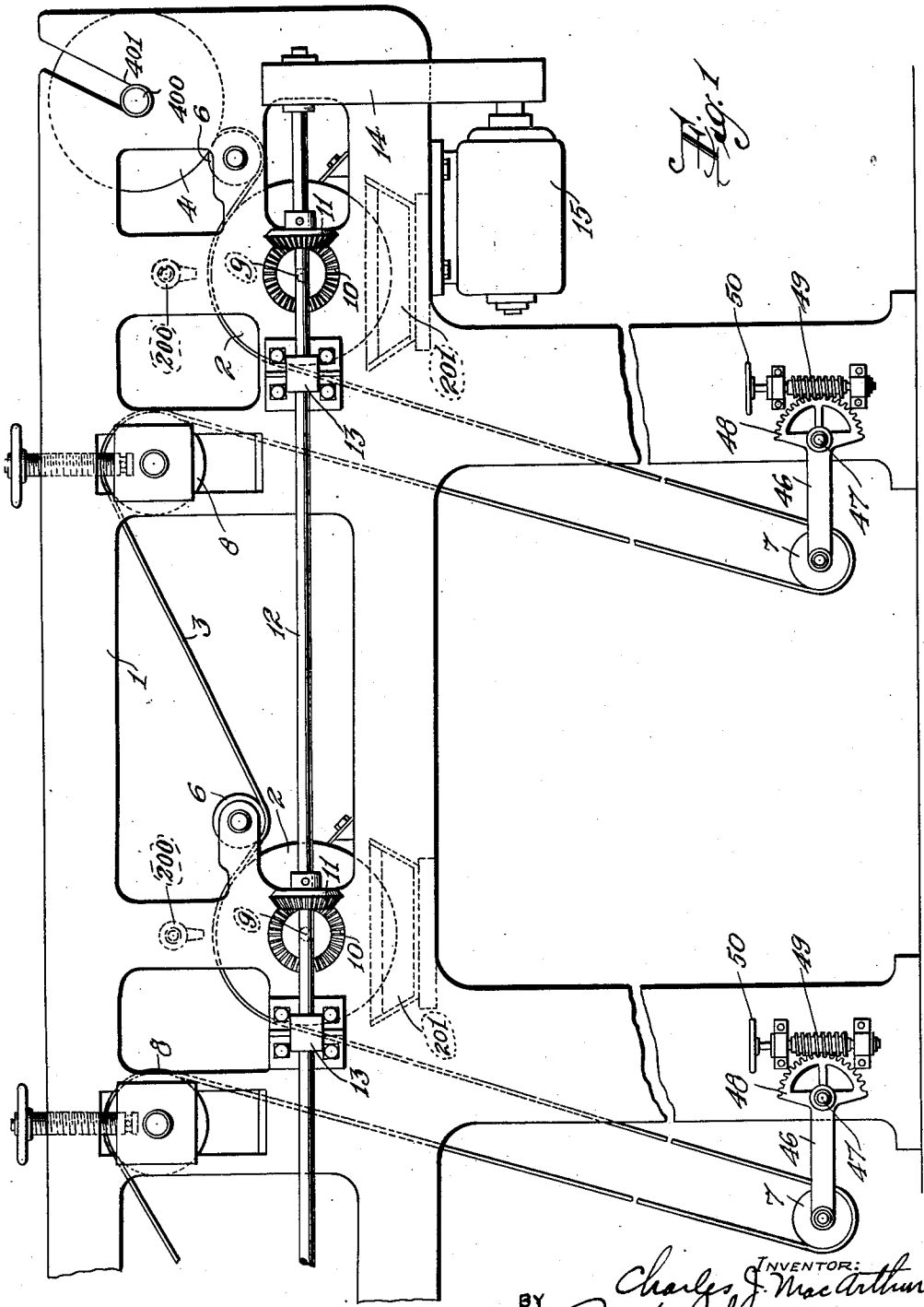


Fig. 1

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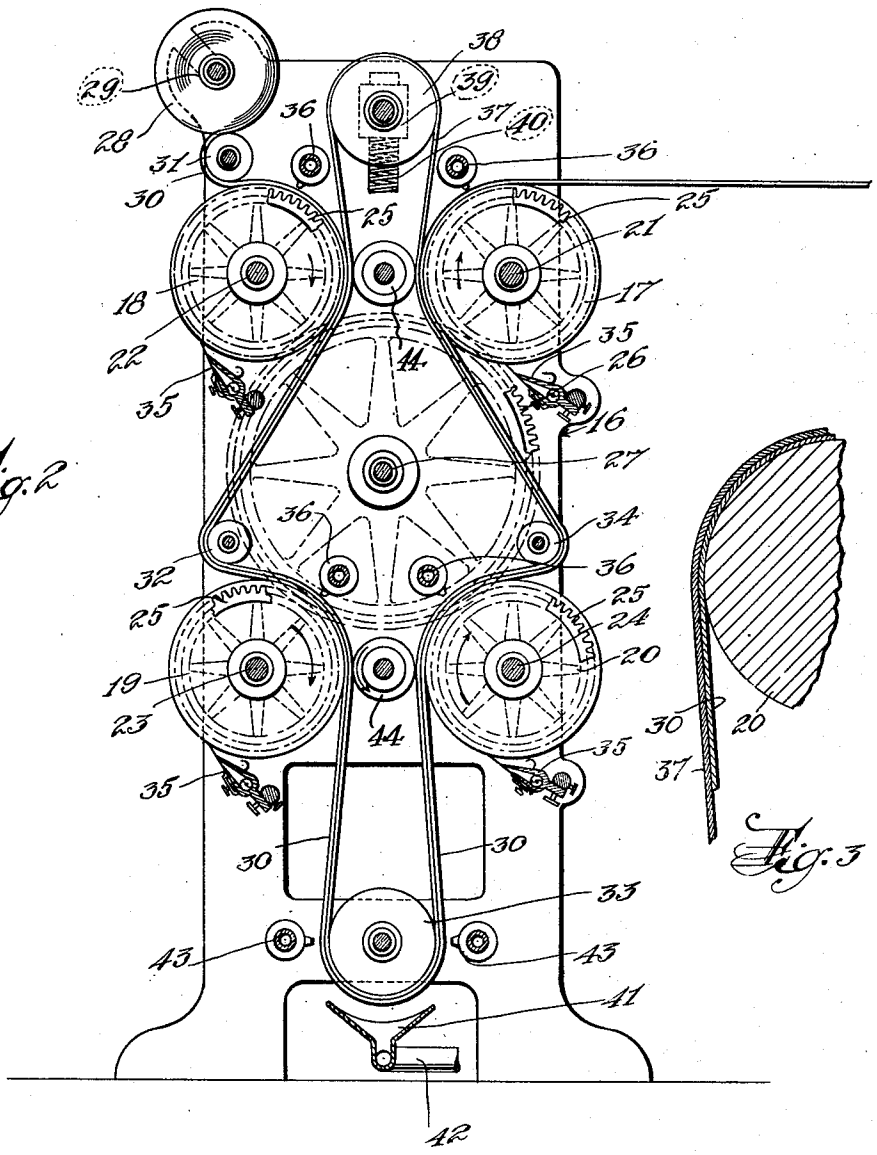


Fig. 2

Fig. 3

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UNITED STATES PATENT OFFICE

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WEB-FED GRAVURE PRESS

Application filed July 19, 1930. Serial No. 469,031.

This application is a continuation in part of my application filed July 5, 1929, Serial No. 376,030.

The present invention relates in general to rotary gravure printing presses wherein the printing is done by intaglio engraved cylinders, and particularly to such presses in which the material to be printed upon is in the form of a web which travels through the press over the engraved cylinders. In these presses superimposed printing or impressions are made upon the web in one or a plurality of colors, and it is necessary to secure and maintain proper register of the impressions both longitudinally and laterally of the web.

One object of the invention is to cause the web to travel in unison and in contact with the engraved cylinder so as to utilize the tensional pressure exerted by the web upon the cylinder as the web is conveyed through the press for making the impression or printing upon the web, and provide novel and improved additional means for forcing the web into printing contact with said cylinder.

Other objects are to provide novel and improved means for directing compressed air or like fluid against the web to force the latter into close printing contact with the printing cylinder and expel air pockets between the web and the printing cylinder; and to obtain other advantages and results as will more fully appear from the following description.

In the accompanying drawings I have shown fragmentarily and more or less schematically a web-fed gravure press embodying my invention, but it should be understood that this is primarily for the purpose of illustrating the principles of the invention and that the details of construction of the press may be modified and changed by those skilled in the art without departing from the spirit or scope of the invention.

Referring to the accompanying drawings in which corresponding and like parts are designated by the same reference characters throughout the several views,

Figure 1 is a fragmentary side elevation of the end of a gravure printing press to which the web is initially fed, showing my invention embodied therein.

Figure 2 is a side elevation of another type of press embodying my invention with the near side of the frame removed for clearness in illustration, and

Figure 3 is a fragmentary transverse sectional view through one of the printing cylinders and the web and traveling tympan.

Specifically describing the illustrated embodiment of the invention, the press includes a frame comprising in general two side pieces 1 of any suitable construction upon which are journaled a plurality of engraved or printing cylinders 2 upon the surfaces of which are engraved the design or other inscriptions to be printed upon a paper or textile web 3 which is supplied to the machine from a roll 4. This roll has trunnions 400 arranged in diagonal slots 401 in the sides of the frame so that the roll has a frictional driving contact with and is partially supported by a guide roller 6 which cooperates with the first engraved cylinder 2 so that the web is unwound from the roll by bodily rotation of the roll. The web passes from the roll 4 around the roller 6, then upwardly over and in contact with a considerable portion of the periphery of the engraved cylinder 2, and then downwardly around a guide roller 7 which is preferably adjustable for securing and maintaining longitudinal register of the web. From the roller 7 the web passes upwardly around a roller 8 which is preferably but not necessarily adjustable as in known manner for securing lateral register of the web. From the lateral registering roller 8 the web is passed downwardly beneath a second guide roller 6 to the next engraved or printing cylinder 2. I have shown only two printing cylinders but as many of these cylinders are provided as are necessary to produce the desired number of superimposed impressions or printings, as is known to those skilled in the art. One of the lateral registering rollers 8 is arranged between each of the printing cylinders 2 to secure and maintain a predetermined and normal course of travel of the web 3 so that accurate register of the successive superimposed printings is obtained.

The slots 401 permit the roll to fall by gravity as the web is unwound so as to maintain contact with the impression roller 6, and this mounting of the roll 4 avoids the use of complicated compensating devices to prevent uneven strains and jerks on the web as it is pulled from the roll where the roll is mounted as usual near the floor and at a distance from the first impression roller.

Any suitable means may be provided for moving the web 3 through the machine, but for the purpose of illustration I have shown the shaft 9 of each of the printing cylinders 2 provided with a beveled pinion 10 which meshes with another pinion 11 on a horizontal drive shaft 12 which is journaled in bearings 13 on the frame. This shaft is driven by belt and pulley connection 14 from an electric motor 15.

With this construction the engraved printing cylinders 2 are utilized to convey and control movement of the web during consecutive printings, and this has the important result of reducing the tendency of the web to travel out of its normal course in such a way as to cause imperfect register of superimposed impressions. This is largely due to the perfectly true, smooth and hard peripheries of the cylinders which have a minimum tendency to throw the web out of register, as contrasted with the soft imperfect and easily deformable peripheries of impression rollers heretofore used to convey and control the web.

An ink fountain 201 for containing liquid ink is arranged beneath each of the engraved printing cylinders 2 so that the peripheral surface of said cylinder passes through the ink whereby the ink is applied to the cylinder for printing.

As is known to those skilled in the art, the peripheral surfaces of the printing cylinders 2 are engraved in intaglio and the ink is contained in small cells or recesses thus formed. The web 3 is maintained under considerable tension as it is drawn through the press, and this tension causes the web to be drawn into tight contact with the peripheries of the engraved printing cylinders. Also, as above described the web contacts with the engraved cylinders for considerable portions of their peripheries, and this prolonged dwell or contact of the web with the cylinders facilitates the capillary attraction by the web of the liquid ink. This absorption of the ink under pressure, reduces the time required for setting and drying of the ink. Accordingly, in many cases, the pressure of the web upon the engraved cylinder caused by the tension on the web as it is drawn through the press may serve to make the printing impression on the web, although if desired additional means for forcing the web into contact with the cylinder such as an air jet from a nozzle 200, may be utilized.

It will also be observed that the side of the web upon which the impression is made contacts with the lateral registering rollers 8. To prevent the ink on the web from adhering to these rollers or being blurred thereon, the surfaces of the rollers are preferably coated with an amalgam of silver and mercury which repels the ink.

Any suitable additional means may be utilized for securing and maintaining longitudinal register, for example by the rolls 7 which may be mounted in bearing yokes 46 journaled at 47 upon the frame and carrying worm gear segments 48 which mesh with worms 49 journaled on the frame and rotatable by hand wheels 50. Rotation of any hand wheel 50 will cause corresponding vertical movement of the roller 7 so as to move the web 3 longitudinally with respect to the next successive lateral registering roller 8.

It will be understood that the web 3 may be any suitable material upon which it is desired to print, for example, paper, textile fabric and the like, and either printing ink or dyes, according to the character of the web, may be used.

Another embodiment of my invention is shown in Figure 2 of the drawings which illustrates a gravure printing press including a frame 16, in which are journaled four printing cylinders 17, 18, 19 and 20 upon the respective shafts 21, 22, 23 and 24. These printing cylinders are driven by gears 25 on the respective shafts which mesh with a main driving gear 26 on a shaft 27.

The web supply roll 28 is journaled at 29 at the top of the frame in a manner similar to which the supply roll 4 is mounted in the construction shown in Figure 1, and the web 30 from the supply roll passes around a guide roller 31 and over a large portion of the periphery of adjacent printing cylinder 18. From the printing cylinder 18 the web passes over a guide roller 32 and thence around a considerable portion of the periphery of the printing cylinder 19. From the printing cylinder 19 the web passes around a guide roller 33 adjacent the bottom of the press and then upwardly around the printing cylinder 20 from where the web passes around a guide roller 24 and upwardly around the last printing cylinder 17. The web is taken from the cylinder 17 to a similar machine, or relief printing machine, or to a folder as may be desired. The printing cylinders 17, 18, 19 and 20 are inked by any suitable inking mechanism, such as combined ink fountains and doctors 35 similar to that described in my copending application Serial No. 465,307, filed July 2, 1930; and it will be observed that with this construction the printing cylinders may print the web in different colors, if desired.

The web is entirely conveyed and controlled by the printing cylinders themselves,

and therefore the tendency of the web to travel out of register is reduced to the minimum. Furthermore, the web contacts with the printing cylinders for considerable portions of their peripheries, and travels in unison with the printing cylinders. The web is drawn into tight printing contact with the printing cylinders by the tension created on the web as it is conveyed through the press, just as in the construction shown in Figure 1 of the drawings.

If desired, additional means to force the web into printing contact with the cylinders may be employed, for example, jets of air from nozzles 36 corresponding to the nozzles 200 of the construction shown in Figure 1. In addition, I may utilize pressure rollers 44, one of which may be arranged between each two adjacent printing cylinders.

Instead of supplying the web to the machine directly from the web supply roll 28, the machine may receive a web from another similar machine for printing upon one side of the web which has already been printed upon its other side by the first machine. Where this is to be done, I may utilize a traveling tympan in the form of an endless belt 37 which passes around the guide rollers 32, 33, 34, the printing cylinders and another guide roller 38 so as to receive the web between the tympan and the printing cylinders and guide rollers 32, 33 and 34. The tympan thus prevents offset or blurring of the first printed side of the web as the web passes through the press. The traveling tympan may be maintained under tension in any suitable manner as by adjustable bearings 39 under the influence of springs 40. Obviously the pressure exerted by the tympan upon the web will assist in forcing the web into printing contact with the printing cylinders, and the tympan is driven by the printing cylinders in unison therewith.

Preferably at the bottom of the press adjacent the guide roller 33 is arranged a nozzle 41 connected to a suitable vacuum pump or other suction producing means by a pipe 42 for withdrawing gases from the web as the latter passes around the roller. This vacuum also assists in drying the ink upon the web by rapidly removing the escaping volatile gases from the printed ink, which drying action may also be facilitated by the use of air blasts from nozzles 43 which are directed against the web as it passes over the guide roller 33.

Having thus described my invention, what I claim is:

1. In a web-fed printing machine, a web supply, an intaglio engraved printing cylinder for printing upon said web, means for feeding said web to said printing cylinder and around and in contact with a portion of the peripheral surface thereof so that the web travels in unison with said cylinder, means for applying ink to said cylinder, and fluid means for forcing said web into printing contact with the cylinder.

2. In a web-fed printing machine, a web supply, a printing cylinder for printing upon said web, means for feeding said web to said printing cylinder and around and in contact with a portion of the peripheral surface thereof so that the web travels in unison with said cylinder, means for applying ink to said cylinder, and means for directing a jet of air under pressure against said web to force the latter into printing contact with said cylinder.

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