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PRINTING PRESS AND SHEET CONTROL DEVICE THEREFOR

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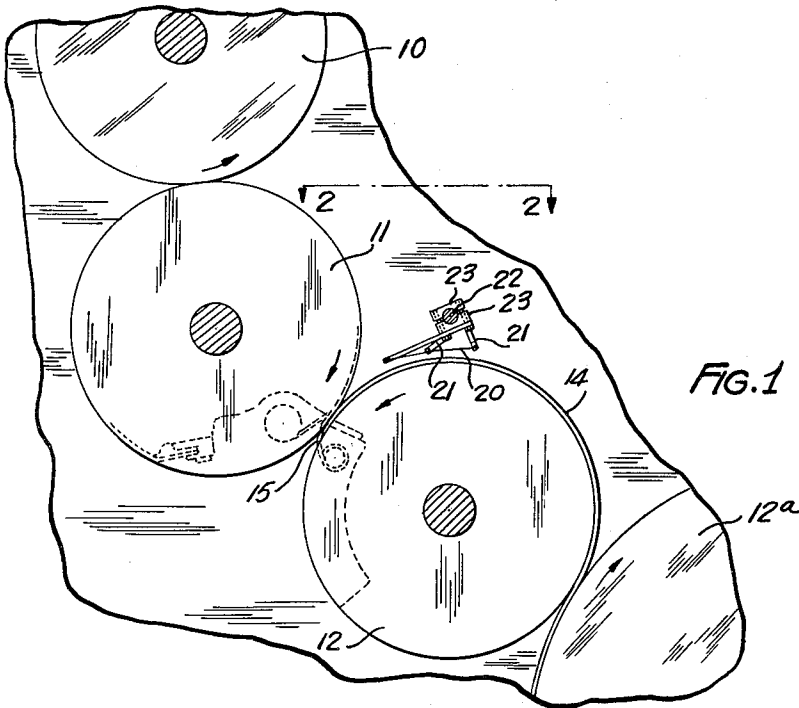


FIG. 1

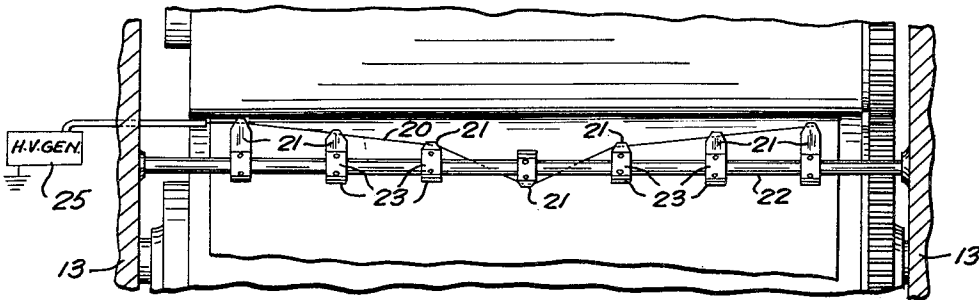


FIG. 2

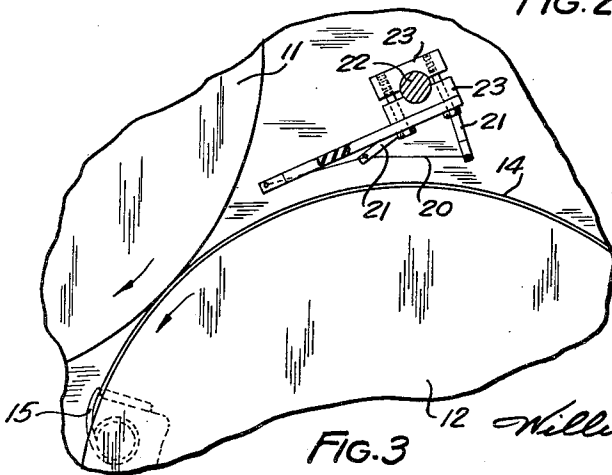


FIG. 3

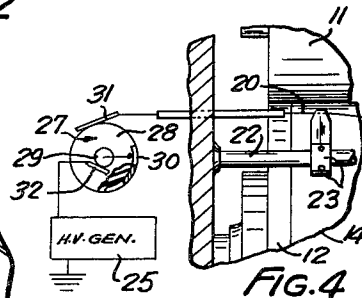


FIG. 4

INVENTORS
GOTLIEB H. BRANDT
WALTER J. WOJCIECHOWSKI
BY *Hudson, Boughton,*
Williams, David & Hoffmann
ATTORNEYS

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PRINTING PRESS AND SHEET CONTROL DEVICE THEREFOR

Godlieb H. Brandt, Cleveland Heights, and Walter J. Wojciechowski, Cleveland, Ohio, assignors to Harris-Intertype Corporation, Cleveland, Ohio, a corporation of Delaware

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The present invention relates to printing presses, and similar machines, wherein a sheet of material, such as paper, is carried by a rotating cylinder or drawn between a pair of cylinders that cooperate to form a nip and, more particularly to means and method for causing the sheet of material, or a particular portion of the sheet, to hug one of the cylinders.

The principal object of the present invention is to provide a new and improved printing press having simple and efficient electrical means, which is effective at high speed operation as well as at slower speeds, to cause a sheet of paper or other material to hug that cylinder of the printing couple which does not carry the image to be printed as the sheet approaches the nip of the printing couple.

Another object is to provide a new and improved printing press, or similar machine, in which a sheet of material is carried by one cylinder and in which the portion of the sheet of material approaching the nip is electrically attracted to one of the cylinders to cause it to hug the cylinder.

Yet another object is to provide a new and improved printing press, or similar machine, having a sheet-carrying cylinder and/or cooperating cylinders, one of which may be a sheet-carrying cylinder, between which a sheet is drawn and wherein electrical means is provided to induce an electrostatic charge on the sheet as it approaches the nip of the cylinders to cause it to hug the sheet-carrying cylinder or one of the cylinders forming the nip, the cylinder being hugged preferably being a grounded cylinder.

A further object is to provide a new and improved method for causing a sheet of paper or other material to hug a rotating cylinder of a pair of cylinders cooperating to form a nip into which the sheet is drawn or to hug any rotating sheet-carrying cylinder, which method comprises establishing an electrostatic charge on the material and attracting it to one of the cylinders by reason of the charge.

A still further object of the present invention is to provide a new and improved method of preventing a sheet from flapping against the image-carrying cylinder of a printing press as it is drawn between the image-carrying cylinder and the impression cylinder.

Further objects and advantages of the present invention will be apparent from the following detailed description of the preferred embodiment thereof made with reference to the accompanying drawings forming a part of the following specification, and in which:

FIG. 1 is a fragmentary vertical sectional view, partly schematic, of a printing press embodying the present invention and showing the plate, blanket, and impression cylinders of the press;

FIG. 2 is a fragmentary elevational view looking approximately from line 2-2 of FIG. 1 in the direction of the arrows;

FIG. 3 is an enlarged fragmentary view of a portion of FIG. 1 but showing the impression and blanket cylinders rotated from their positions shown in FIG. 1; and

FIG. 4 is a fragmentary view showing a modification of the present invention.

The present invention is susceptible of various constructions and modifications and of uses in combination with

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various machines where it is desirable to cause a sheet of paper or other material being drawn between two cooperating rolls or cylinders to hug one of the cylinders or, where it is desirable to cause a sheet to hug a cylinder carrying the same, but it is particularly advantageous when embodied in a printing press to prevent a sheet of material being printed by a printing couple from flapping against the image carrying cylinder of the couple as the sheet is drawn between the cylinders of the couple.

Referring to the drawings, FIG. 1 illustrates a portion of a printing press having a plate cylinder 10, a blanket cylinder 11 cooperating with the plate cylinder 10 and an impression cylinder 12 which cooperates with the blanket cylinder 11. The plate cylinder 10 is disposed above and to one side of the blanket cylinder, carries the printing plate which has the image to be printed formed thereon and is inked by conventional means, not shown in the drawings, to effect a transfer of the image on the plate to the blanket cylinder 11. The image on the blanket cylinder 11 is printed onto a sheet of material carried by the impression cylinder 12 disposed below and to the other side of the blanket cylinder, the sheet passing between the impression cylinder 12 and the blanket cylinder 11 as the cylinders are rotated. The cylinders 11 and 12 form a nip into which the sheet is carried and the sheet is printed as it is drawn between the cylinders 11 and 12. The cylinders 10, 11, 12 are rotatably supported on respective shafts which extend between and are journaled in the spaced side frames 13 of the press.

The sheet which is to be printed is indicated by the reference numeral 14 and is fed to the impression cylinder 12 from a conventional transfer cylinder 12a which may constitute part of any conventional feeding means not shown or described in the present application. Suffice it to say that the impression cylinder 12 is provided with gripper fingers 15 that grip the leading edge of the sheet as it is fed to the impression cylinder and clamp the same to the impression cylinder so that the sheet will rotate therewith. The sheet 14 is transferred to the impression cylinder 12 at a point in advance of the nip formed by the blanket cylinder 11 and the impression cylinder 12 and the fingers 15 are operated by conventional cam means to release the sheet thereon and to grasp a new sheet fed thereto. The cylinders 10, 11, 12 and 12a are rotated by conventional drive means in a manner well understood by those skilled in the art and not necessary for an understanding of the present invention. The printing press as thus far described is of conventional construction and the above description will be sufficient for those skilled in the art to understand the environment of the present invention and the manner in which it functions.

When a sheet is fed to the impression cylinder 12 and the fingers 15 clamp to secure the sheet thereto, some air is inevitably trapped under the sheet 14. As the impression cylinder 12 is rotated to advance the sheet 14 so that the leading edge thereof enters the nip of the cylinders 11, 12, the air underneath the sheet 14 is pressed out as the sheet passes between the cylinders and the air builds up under the sheet and causes the same to float and tends to form a bubble of air immediately adjacent the nip. As rotation of the impression cylinder 12 continues, the air actually causes the sheet 14 to what may be termed "float" relative to the impression cylinder 12 and as the trailing edge of the sheet approaches the nip the air thereunder tends to "explode" and to cause, together with centrifugal force, the trailing edge to flap against the blanket cylinder 11. It has been found that this flapping may be prevented by electrically attracting the sheet to the cylinder 12.

In accordance with the present invention a conductor 20, which in the illustrated embodiment is in the form of a wire, is supported adjacent the nip of the cylinders 11,

12 and extends axially of the cylinders in juxtaposition to, but spaced from the impression cylinder 12 so that the portion of the sheet 14 approaching the nip is disposed between the conductor 20 and the impression cylinder 12. The conductor 20 is supported by a plurality of insulating arms 21 mounted on a bar 22 extending between the side plates of the press. The arms each have one end fixed to one block of a pair of clamp blocks 23 which cooperate to adjustably clamp the arm supported thereby to the bar 22. The arms 21 are spaced along the bar 22 and the ends thereof which support the wire 20 are so disposed that the central portion of the wire 20 forms a V as the wire is viewed in plan with the outer end portions of the wire 20 diverging outwardly from the outer ends of the legs of the V at a greater angle than the angle of divergence of the legs from apex of the V. The center arm 21 extends from the bar 22 in a direction away from the cylinder 11 to form the apex of the V in advance of the bar 22 with respect to the sheet 14 as it is carried by the cylinder 12 to the nip and the remaining arms 21 extend from the other side of the bar 22 and engage the wire 20 at increasing distances from the bar 22 when proceeding outwardly from the central block 21. The surface defined by the wire is preferably curved so that it follows the curvature of the cylinder 12 and so that all portions of the wire are substantially equidistant from the cylinder 12. By shaping the wire so that the end portions thereof diverge outwardly from the central portion of the wire in the direction of advance of the sheet 14, the wire will perform in a more satisfactory manner than when the wire is stretched parallel to the axis of the cylinder 12.

A high voltage generator 25, preferably a direct current voltage source although an alternating current source may be utilized, of any conventional construction has one terminal connected to the wire 20 and the other terminal grounded to establish a high voltage on the wire 20 with respect to ground and with respect to the cylinder 12, which is conductive and grounded in the preferred and illustrated embodiment. When a sufficiently high voltage is applied to the wire 20 a field is established between the wire and the cylinder 12 which effects ionization of the air and induces an electrical charge on the sheet 14 as it passes under the wire. This charge will electrically attract the sheet 14 to the cylinder 12 to cause it to hug the cylinder as it is drawn into the nip of the cylinders 11, 12 even through the trapped air thereunder tends to move it in the opposite direction. While the sheet 14 may lift some relative to the cylinder 12 as it is drawn into the nip to permit the escape of the trapped air, it has been found that this movement will not be sufficient to cause the trailing edge of the sheet to flap against the blanket cylinder 11.

It has also been found that the generally V-shaped configuration of the wire will cause the wire to function to smooth out the sheet beginning at the center of the sheet as it reaches the wire and progressing outwardly from the center to the side edges of the wire as successive portions thereof come under the influence of the wire 20 immediately thereabove.

Lightweight sheets sometimes tend to wrinkle if the voltage is applied as the whole of the sheet passes under the conductor 20. In such cases the voltage may be beneficial as the trailing portion only of the sheet is passing under the wire 20. In FIG. 4 a timer has been shown connected between the high voltage generator and the wire 20 to apply a voltage to the wire 20 only during the time when the trailing portion of the sheet is passing thereunder. It has been found that application of the high voltage for the last one-third of the sheet is often satisfactory to prevent wrinkling but yet prevent the trailing edge of the sheet from flapping against the cylinder 11.

The timer has been designated by the reference numeral 27 and comprises a rotor 28 on a shaft 29 which

is rotated, in the illustrated embodiment, in one-to-one relation to the rotation of the impression cylinder 12. The rotor 28 is made of nonconducting material and carries a conductive segment 30 connected to the shaft 29 and adapted to engage a brush 31 connected to the wire 20 to apply a high voltage to the wire for a portion of each revolution of the rotor 28. The terminal of the high voltage generator is connected to a brush 32 that engages the shaft 29 which, as mentioned above, is, in turn, connected to the segment 30. By properly choosing the length of the segment 30 and rotating the rotor 28 in the proper timed relationship to the rotation of the cylinder 12, it can be seen that the segment 30 can be made to engage the brush 31 to apply a potential to the wire 20 only during that time when the trailing portion of the sheet being fed is passing under the wire 20. The segment 30 may be adjustable relative to the rotor body to accommodate various size sheets or the rotor may be adjustably connected to the drive means by rotating it in timed relation to the cylinder 12.

It can now be seen that the objects heretofore enumerated and others have been accomplished and that the present invention provides a novel and improved machine having simple electrical means for causing a sheet of material, such as paper, to hug one of the cylinders, or rolls, between which the sheet is being drawn as the sheet approaches the nip defined by the cylinders or rolls. While the description of the invention has been limited to a printing press, it will be apparent to those skilled in the art that the invention would find utility in various machines in which sheets of paper or other dielectric material is drawn between cooperating cylinders. It will be further appreciated that if the sheets were of a magnetic material, they could be attracted magnetically to the cylinder.

While the preferred embodiment of the present invention has been described in considerable detail, further modifications, constructions and arrangements will be apparent to those skilled in the art and it is hereby our intention to cover all such modifications, constructions and arrangements which fall within the ability of those skilled in the art and within the scope and spirit of the present invention.

Having thus described our invention what we claim is:

1. In an operation wherein a rotating cylinder grips the leading edge of a sheet to advance the sheet with the cylinder as the cylinder is rotated, the method of causing the sheet to hug the cylinder which comprises applying a force to urge the sheet toward the cylinder at a fixed position adjacent the cylinder with the force being applied at the position first to the center of a section moving past the position and then progressively outwardly from the center of the section to the sides thereof thereby tending to iron the sheet against the cylinder outwardly from the central portion thereof toward the ends of the cylinder as the sheet is moved past the position.

2. In a machine comprising a rotatable cylinder adapted to grip the leading edge of a sheet to be fed to cause the sheet to move with the cylinder and means supported adjacent said cylinder for creating a force field between the means and the cylinder and acting toward the cylinder to cause the sheet portion moving therebetween to hug the cylinder as it comes under the influence of the field, said means establishing said force field along lines that extend inwardly from opposite ends of said cylinder and intersect at a longitudinally central point on the cylinder periphery to define an angle of less than 180°, with the included angle of said lines facing in the direction of sheet advance.

3. In a machine for performing an operation on a sheet, a rotatable sheet-carrying cylinder, conducting means extending across the periphery of said cylinder in juxtaposition to but spaced from the periphery thereof, said conducting means comprising a part disposed centrally of the ends of the cylinder and portions which extend

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from said part toward the ends of the cylinder and in the direction of sheet advance whereby the leading edge of the sheet first passes under portions of said central part as said sheet is advanced past said conducting means, and means for establishing a high voltage between said conducting means and said cylinder to effect the electrostatic attraction of said sheet to said cylinder.

4. In a machine, the structure as defined in claim 3, wherein said conducting means comprises a wire having generally a V-shaped configuration.

5. In an operation wherein a sheet of dielectric material is drawn between cooperating, rotating, nip-forming cylinders, one of which carries sheet-gripping means for gripping the leading edge of the sheet to carry the sheet into the nip and the nip squeezing the air from between the sheet and cylinders as the sheet enters the nip to form an air bubble between the sheet and the sheet-carrying cylinder on the sheet approach side of the nip, the method of preventing the sheet from flapping against the other cylinder which comprises applying a force to the sheet which urges it toward the cylinder carrying said sheet-gripping means by inducing an electrical charge on the tail portion only of the sheet as the tail portion approaches the nip and electrically attracting the tail portion of the sheet to the sheet-carrying cylinder, said force being applied to the sheet so that along any given section line of the sheet transverse to the direction of sheet advance the force is applied first to the central portion of the section line and then progressively to the portions along the line proceeding outwardly from the central portion toward the edges of the sheet.

6. In a machine for performing an operation on a sheet of dielectric material, a first cylinder and a second cylin-

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der cooperating therewith to form a nip for receiving a sheet to be drawn between the cylinders, electrical means capable of inducing on said sheet an electrostatic charge of a nature to attract the sheet to said second cylinder, means supporting said electrical means adjacent the nip and in a position such that the sheet being fed to said nip is disposed between the electrical means and said second cylinder and receives an electrostatic charge from said electrical means, and control means for said electrical means to render the latter effective to induce a charge on said sheet only while the tail portion of the sheet is passing said electrical means, said electrical means comprising electrically conductive means arranged in a generally V-shaped configuration to provide an electric field along lines that extend inwardly from opposite ends of said second cylinder and intersect at a longitudinally central point on the cylinder periphery to define an angle of less than 180°, with the lines extending from said point in the direction of sheet advance.

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