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Saueressig

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[45] ***May 27, 1975**

[54] **PRINT MACHINE AND METHOD**

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[*] Notice: The portion of the term of this patent subsequent to June 12, 1990, has been disclaimed.

[22] Filed: **Mar. 29, 1973**

[21] Appl. No.: **345,873**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 210,064, Dec. 20, 1971, Pat. No. 3,738,265, which is a continuation-in-part of Ser. No. 23,564, March 30, 1970, abandoned.

[30] **Foreign Application Priority Data**

Apr. 29, 1969 Germany 1916359

[52] **U.S. Cl.** **101/181;** 101/152; 101/178; 101/351; 101/375; 101/211

[51] **Int. Cl.** **B41f 9/02**

[58] **Field of Search** ..... 101/178, 181, DIG. 12, 101/416, 420, 352, 363–364, 228, 416, 211; 33/184.5

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Primary Examiner—Edgar S. Burr
Assistant Examiner—Edward M. Coven

[57] **ABSTRACT**

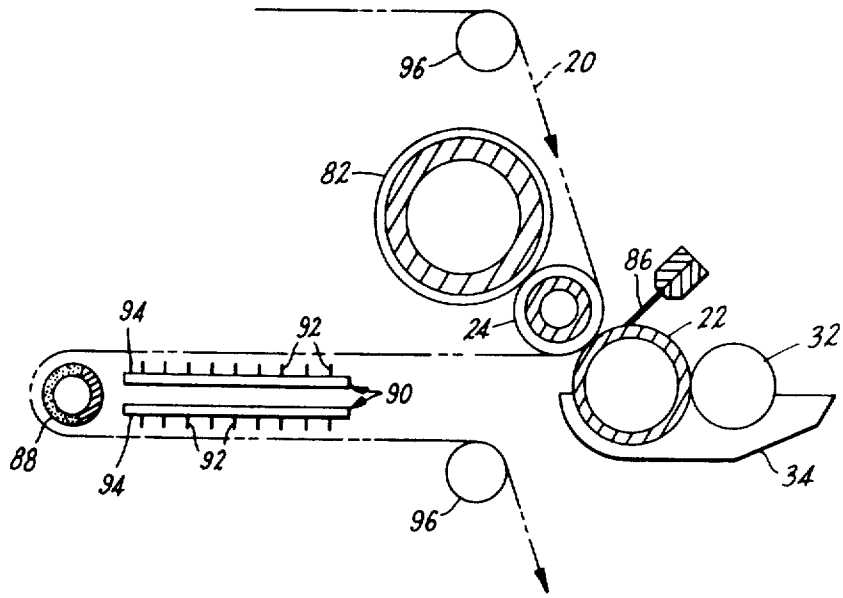
A print machine for multicolor operation utilizes a multiplicity of pairs of print rolls and press rolls rotatably supported on the machine frame and a vertical gate member pivotally mounted on the frame and supporting a multiplicity of inking units for supplying ink to the surface of the print rolls. The print rolls have their axes lying in a common vertical plane and the press rolls have their axes lying in a common vertical plane.

The print rolls desirably have measuring indicia spaced about the circumference thereof and the machine includes means for sighting upon the measuring indicia to effect rotation of the several rolls to compensate for differences between the center-to-center spacing of the rolls and the circumference of the rolls so as to ensure precise alignment.

In one embodiment of the machine, there is included path deflecting means which produces movement of the web horizontally of the machine between adjacent pairs of print and press rolls. This deflecting means desirably includes a porous roll about which the web travels and is spaced therefrom by means of compressed air or other gaseous medium expelled therethrough. The deflecting means may include other drying means to facilitate removal of solvent.

The machine may include means for driving the ink rolls and means for driving the web independently of the rotation of the print and press rolls. It may include a backup roll for the press roll and means for lowering the ink troughs upon the ink gate.

22 Claims, 12 Drawing Figures



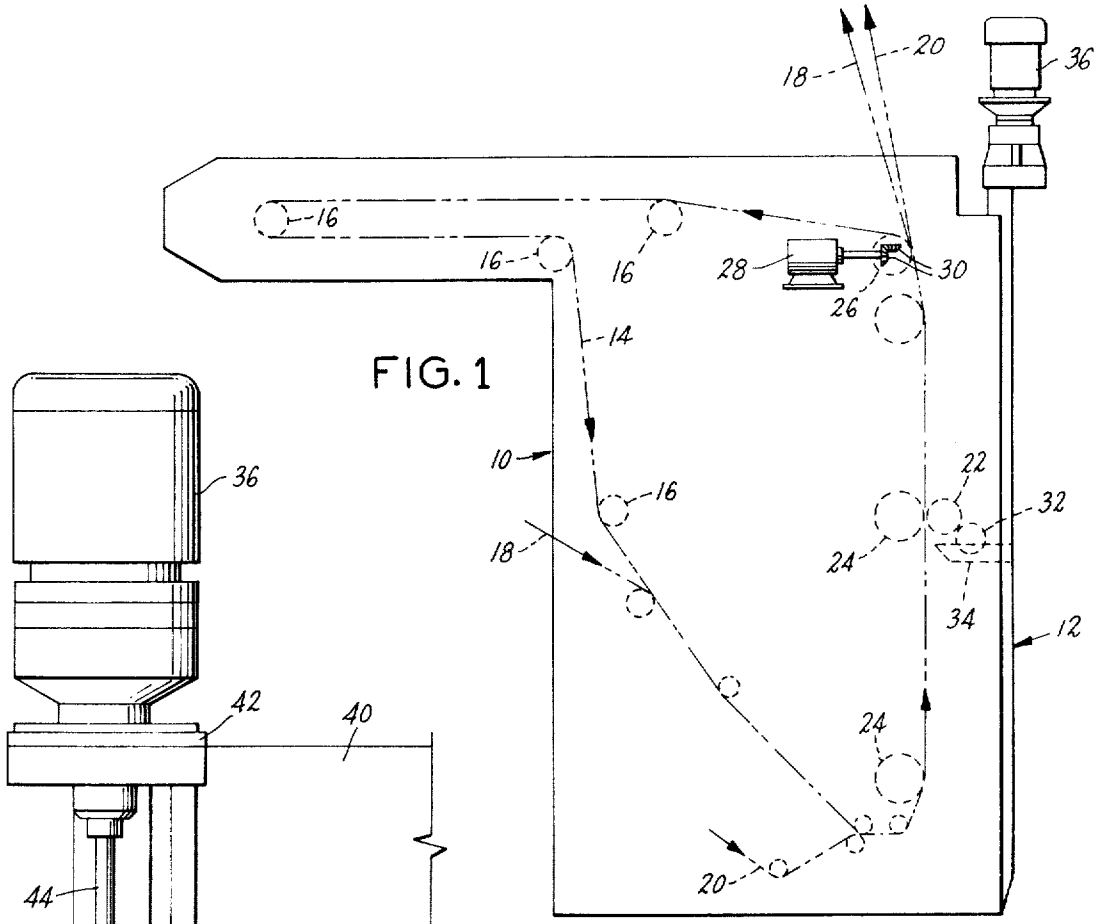


FIG. 1

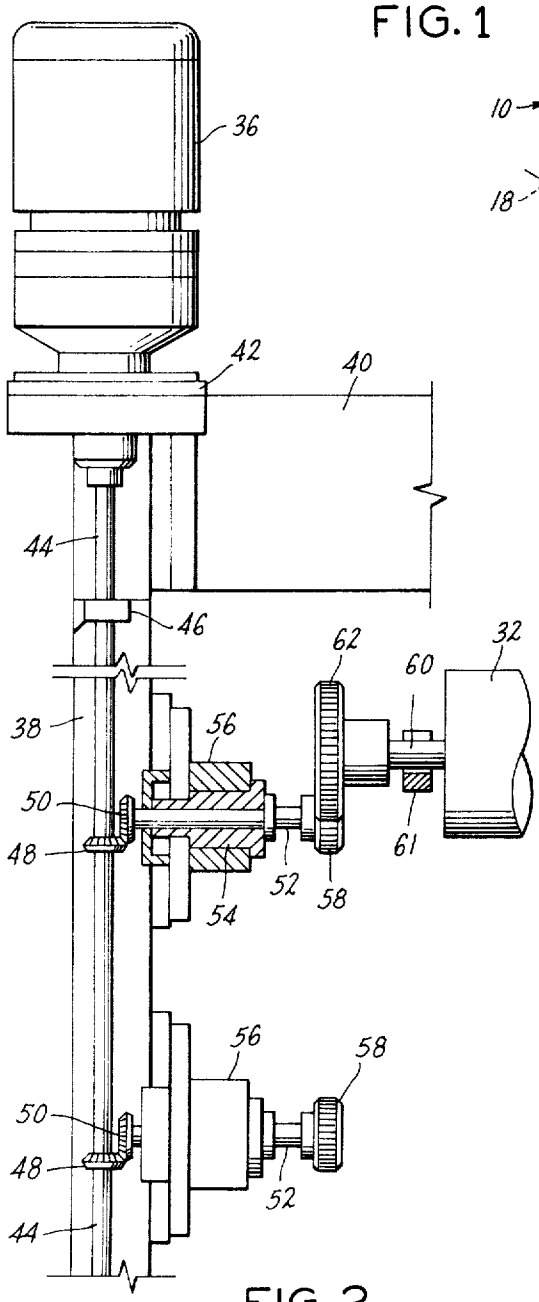


FIG. 2

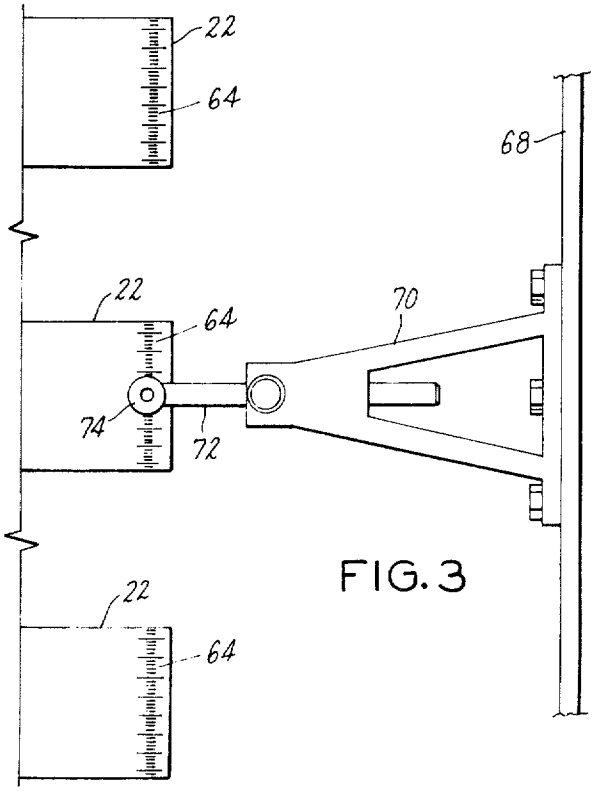


FIG. 3

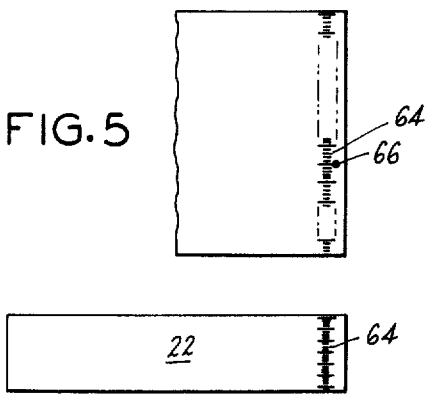


FIG. 5

FIG. 4

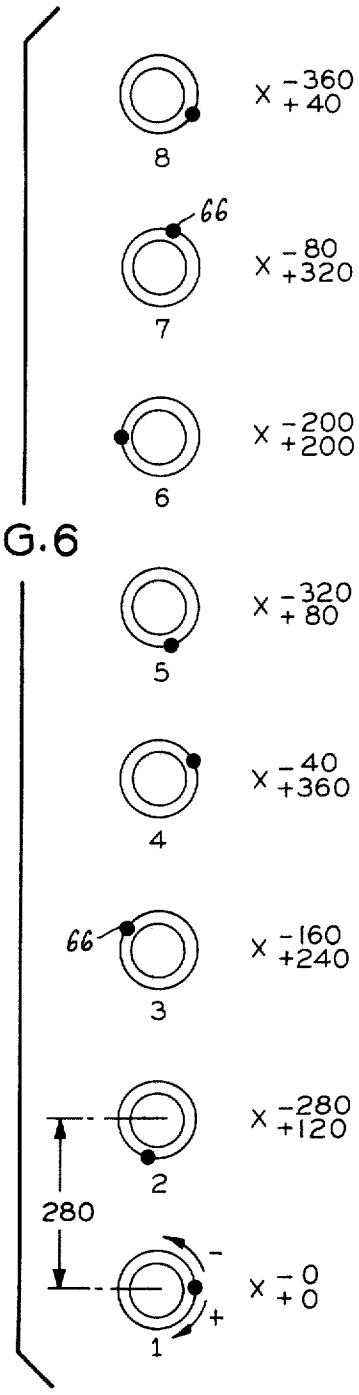


FIG. 6

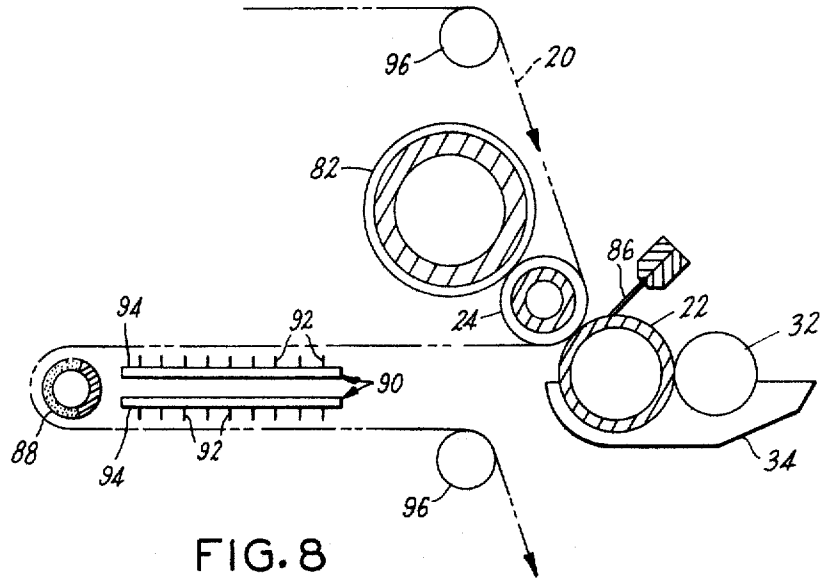

96
20
82
86
94
92
24
22
32
90
88
94
92
96
34

FIG. 8

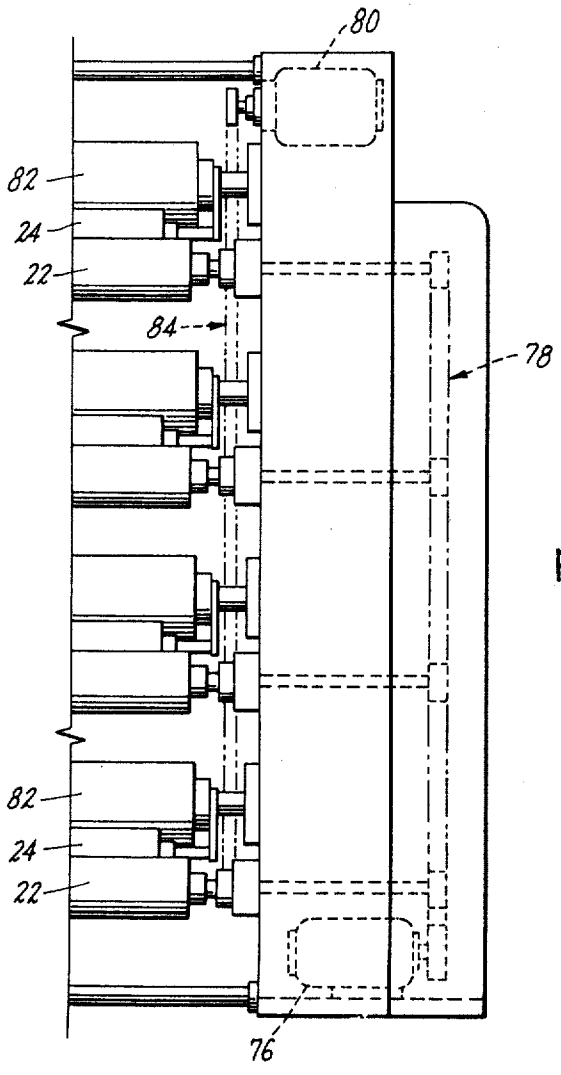

80
82
24
22
84
78
82
24
22
76

FIG. 7

FIG. 9

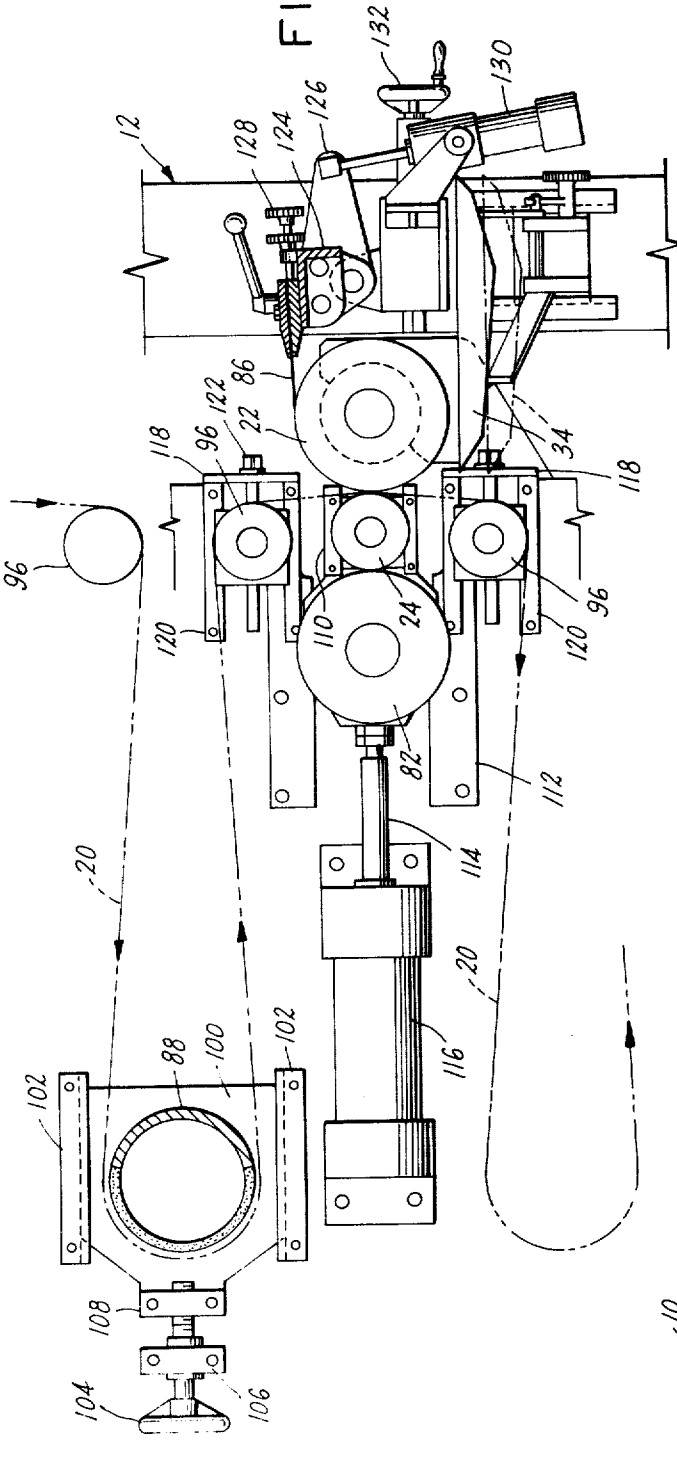


FIG. 11

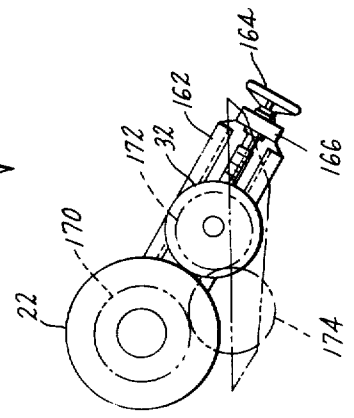
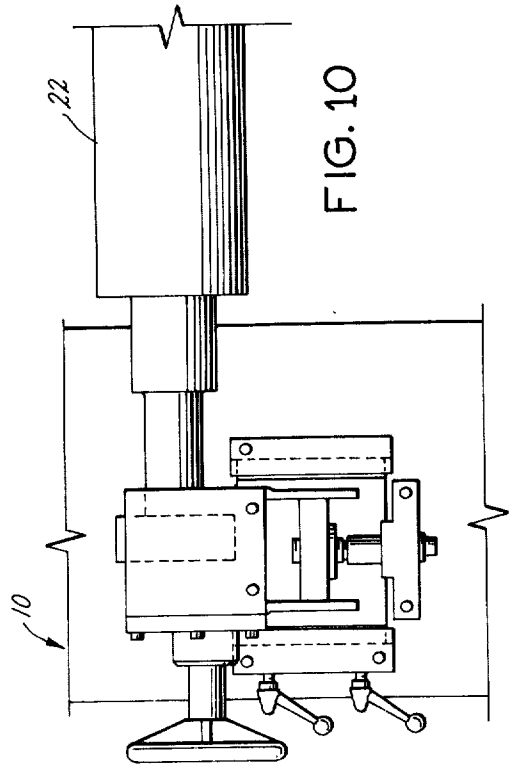


FIG. 10



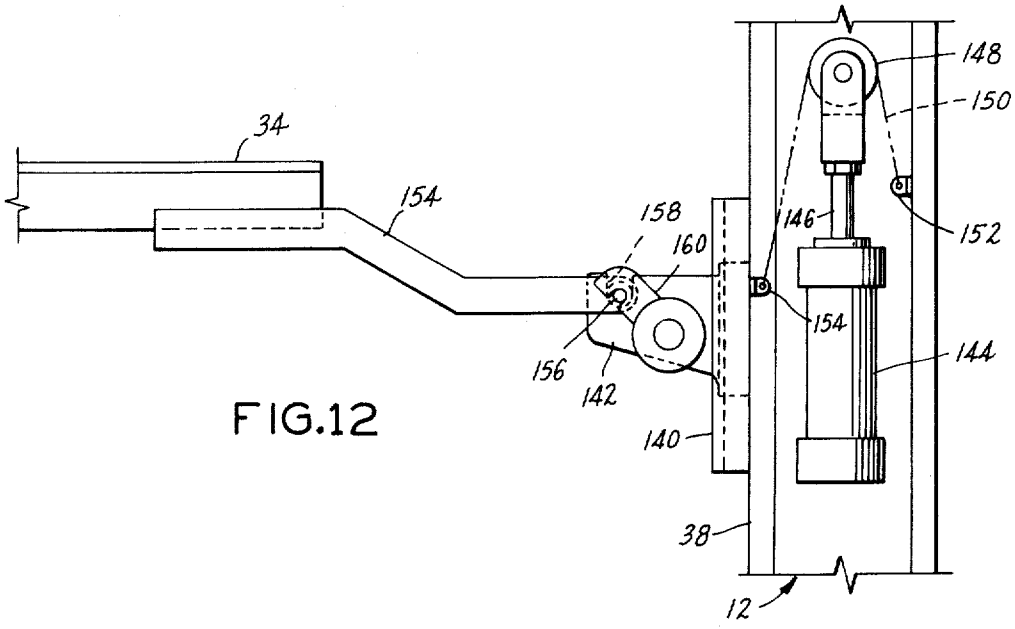


FIG.12

PRINT MACHINE AND METHOD

CROSS REFERENCE TO RELATED APPLICATION

The present application is a continuation-in-part of U.S. application Ser. No. 210,064 filed Dec. 20, 1971 entitled INTAGLIO PRINT MACHINE AND METHOD, now U.S. Pat. No. 3,738,265, granted June 12, 1973, which in turn is a continuation-in-part of U.S. application Ser. No. 23,564 filed Mar. 30, 1970 entitled COLOR INTAGLIO PRINTING MACHINE MORE PARTICULARLY FOR PRINTING TEXTILES, now abandoned which is based upon an application filed in the Federal Republic of Germany on Mar. 29, 1969, Ser. No. 19 16 359.

BACKGROUND OF THE INVENTION

Generally, there are numerous different types of print machines for use in printing various types of webs including textiles, paper, plastic and metal. Some machines utilize a large cylindrical drum or backing cylinder about the circumference of which are disposed the engraved rolls. Still other machines have been proposed in which the engraved and press rolls are arranged vertically or horizontally depending upon the desired path of the web therethrough. Such machines have use for intaglio printing and for relief printing; when the former technique is employed, it is common to have a doctor blade for removing excess color from the surface of the engraved print roll.

Various techniques are utilized for feeding the color to the surface of the print roll, and most commonly, an ink roll rotates in a trough to pick up the color or ink and carries the color on its surface into contact with the print roll. In some machines, it has been proposed to rotate the engraved print roll directly in the ink trough with attendant problems from the standpoint of effecting desirable color distribution and rapid reassembly of the apparatus.

Among the problems encountered in printing of various webs is the necessity or desirability of effecting drying of the coating applied by one print station before the web passes into the nip of the next print station in order to avoid bleeding or smudging of colors. This problem is particularly significant in printing upon plastics which do not possess the inherent porosity of woven or nonwoven fabric or even of paper.

Another problem which is constantly encountered in print machines is the amount of down time required to effect cleaning or changing the elements of the apparatus. Moreover, if the elements of the apparatus are altered, considerable difficulty is generally encountered in effecting reregistration of the patterns on the several print rolls. In addition, there is also a frequent need to minimize slippage of the web as it passes through the several printing stations.

It is an object of the present invention to provide an improved printing machine in which the inking units may be readily disassembled from the print rolls and in which the several elements may be readily adjusted relative to each other.

It is also an object to provide such a machine in which the color or printing ink within the ink troughs may be maintained in an agitated state even when the ink rolls are disassembled from the print rolls.

Another object is to provide such a machine in which the color applied to the web at one station may be substantially completely dried before the web passes into the succeeding print station.

Still another object is to provide such a machine in which there is included means for effecting precision alignment of a predetermined circumferential point upon the pattern of the print rolls.

A further object is to provide such a machine in which drying of a high solvent color or ink upon the surface of the print roll is minimized.

A still further object is to provide such a print machine in which the web is independently driven so as to minimize slippage relative to the print rolls.

An additional object is to provide such a print machine in which the press roll assembly includes a backing roll of considerably greater resistance to deflection so as to ensure uniformity of pressure at the nip roll across the entire axial length thereof.

SUMMARY OF THE INVENTION

It has now been found that the foregoing and related objects can be readily obtained in a print machine for the substantially continuous printing of a web traveling therethrough which includes a machine frame and a vertical gate member pivotally mounted on the frame and moveable between an open position and a closed position. Rotatably supported on the frame in vertically spaced alignment are a multiplicity of pairs of cooperating print and press rolls with the print roll of each pair being disposed outwardly adjacent the gate member and having their axes lying in a common vertical plane. The press rolls in turn have their axes lying in a parallel vertical plane. The print rolls each have a circumferential pattern of measuring indicia about the circumference thereof dividing the circumference into measuring units. A multiplicity of inking units are supported on the gate member in vertically spaced alignment and each cooperate with one of the print rolls for applying a coating of ink to the circumferential surface of the associated print roll as it rotates during operation of the machine. Each inking unit includes an ink trough, an inking roll and means for moving the ink trough relative to the print roll. A plurality of path deflecting means is provided and each includes a supporting means on the frame spaced inwardly of the press rolls relative to the gate member whereby the web issuing from the nip of one pair of rolls is directed inwardly of the machine about the support member and thence outwardly into the nip of the next adjacent pair of rolls along the path of web travel.

A plurality of pitch adjustment means each includes an alignment element cooperating with the measuring indicia of the print rolls and means for adjusting the print rolls to effect registry of a preselected measuring indicium with the alignment element. Drive means is included for rotating the print and press rolls and an auxiliary drive roll is provided for the web, together with means for driving the roll.

The print machine desirably includes drive means on the gate member and a gear mechanism interconnecting the drive means and the ink rolls to effect rotation thereof independently of the position of the gate member. It also may include gear means interconnecting the ink rolls and the print rolls to provide controlled relative rotation thereof. The alignment element preferably includes a reticule for effecting visual alignment for the print roll measuring indicia.

The support member of the path deflecting means will normally comprise a porous tube and will include means for supplying air under pressure to the interior of the porous tube for escape of the air therethrough to provide an air cushion between the tube and the web. The deflecting means may also include dryer means spaced inwardly of the print and press rolls for directing gas under pressure onto the surface of the web passing thereby. The path deflecting means may also include idler rolls above and below each pair of press and print rolls to facilitate redirection from the upstream print roll to the support member and thence from the support member to the downstream pair of print and press rolls.

The means for moving the ink troughs desirably includes slide means on the gate member, support elements on the trough slidably seated in the slide means and pneumatic means for slidably moving the trough support elements vertically in the slide means.

The press roll assembly may include a backup roll of larger diameter disposed to the opposite side thereof from the print roll and which facilitates uniform pressure over the axial length of the press roll and minimizes deflection thereof. Desirably, the drive mechanisms for the print rolls, press rolls, and ink rolls are provided by pneumatic rotation so as to permit utilization of the apparatus with flammable solvent systems.

BRIEF DESCRIPTION OF ILLUSTRATED EMBODIMENTS

FIG. 1 is a schematic elevational view of a print machine embodying the present invention with some of the internal components illustrated in dotted line;

FIG. 2 is a fragmentary front elevational view to an enlarged scale of the upper portion of one side of the gate assembly with portions removed and broken away for clarity of illustration;

FIG. 3 is a fragmentary front elevational view of the opposite side of the gate assembly showing the pitch mark scale and sighting device to effect registry of the print rolls;

FIG. 4 is a front elevational view of a print roll showing the pitch mark scale about the circumference thereof;

FIG. 5 is a fragmentary top view of the print roll surface in planar form;

FIG. 6 is a diagrammatical view of the print rolls of the machine with the key works of the various print rolls rotated into the predetermined positions to bring the patterns into alignment;

FIG. 7 is a fragmentary front elevational view of the print machine with the working gate opened and showing various parts in dotted line;

FIG. 8 is a partially diagrammatical sectional view of the rolls and elements of one of the several printing stations;

FIG. 9 is a fragmentary sectional view of the rolls and printing elements of an alternate embodiment of printing station and with the inking roll omitted for clarity of illustration;

FIG. 10 is a fragmentary front elevational view of a roll adjustment mechanism in the embodiment of FIG. 9.

FIG. 11 is a partially diagrammatical end view of a print roll and inking roll assembly with a common drive gear and ink trough shown in phantom line; and

FIG. 12 is an elevational view of mechanism for raising and lowering the ink troughs.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Turning now in detail to FIG. 1 of the attached drawings, therein partially diagrammatically illustrated is a print machine embodying the present invention and generally comprised of a frame generally designated by the numeral **10** and a gate generally designated by the numeral **12** which is pivotally mounted at one side upon the frame **10.** In the embodiment of this particular illustration, the frame **10** comprises a substantially closed housing which is vented and connected to an exhaust system (not shown) to remove solvent fumes. As illustrated, the machine is set up for the printing of fabric and includes a rubber blanket **14** extending about a series of rollers **16.** The backing gray **18** and the textile fabric **20** are introduced from suitable feed rolls and extend along a straight line path between the nips of cooperating pairs of print rolls **22** and press rolls **24.**

As will be pointed out hereinafter in greater detail, the fabric is driven through the machine by its engagement in the nip between the print rolls **22** and press rolls **24** and also by action of the fabric drive roll **26** which is powered by the drive motor **28** through the gear mechanism **30.** Ink is supplied to the print rolls **22** by the inking rolls **32** which rotate in the ink troughs **34.** The ink rolls **32** in turn are driven by the drive motor **36** mounted upon the gate **12** as will be described in greater detail hereinafter.

For purposes of clarity of illustration, only the general outline of some of the structural elements have been indicated. Specific components of the machine will be described more completely with reference to the more detailed figures of the drawings. General details of the gate structure and of a highly desirable mandrel assembly for mounting the print rolls in the machine may be found in applicant's copending U.S. application Ser. No. 210,064 filed Dec. 20, 1971 and entitled "Multicolor Intaglio Printing Machine with Pivotable Gate Support for Inking Units."

Turning now in detail to FIG. 2, therein fragmentarily illustrated is the gate assembly **12** and the drive mechanism for rotating the inking rolls. The gate **12** is generally comprised of vertical sideposts **38,** a top cross member **40** and a bottom cross member (not shown). The drive motor **36** is supported upon a bracket **42** at the top of the frame and it is drivingly engaged with a vertical shaft **44** which is journaled in pillow blocks **46** carried by the vertical sideposts **38.** Spaced along the length of the vertical shaft **44** are series of bevel gears **48** which mesh with bevel gears **50** on the outer ends of stub shafts **52.** These stub shafts are rotatably mounted in bearings **54** disposed in the mounting blocks **56,** and they carry at their inner ends ring gears **58.**

The ink rolls **32** have shafts **60** rotatably mounted in the brackets **61** on the gate **12** and which carry at their ends ring gears **62** which are in meshing engagement with the ring gears **58** on the stub shafts **52.** As a result, operation of the drive motor **36** will impart rotation to the shaft **44** and the bevel gears **48** which in turn will effect rotation of the stub shafts **52** through the bevel gears **50.** The ring gears **58** will in turn produce rotation of the ring gears **62** and thereby the ink rolls **32** so

as to maintain agitation of the printing ink in the troughs **34** even when the gate is opened.

Turning now to FIGS. **3–6**, therein illustrated in detail is the mechanism employed to insure proper circumferential alignment of the patterns on the several print rolls **22**. Each of the print rolls **22** has at one end thereof a scale or measuring indicia **64** engraved or otherwise formed about the circumference thereof dividing the circumference into units of measure. Conveniently these units of measure may comprise millimeters of circumference although it is possible to utilize units of arc if so desired by altering the computations which will be described in detail hereinafter. As best seen in FIGS. **4** and **5**, the measuring indicia **64** include a reference point or pitch mark **66** indicating the beginning of the engraved pattern upon the print roll **22**. Mounted upon the support bar **68** at the side of the frame **10** are a plurality of brackets **70** in which are slidably seated rods **72** which carry at their ends sighting eyepieces **74** including reticules (not shown) for insuring accurate alignment. As seen, the axes of the rods **72** lie in a common horizontal plane with the axes of the cooperating print rolls **22**.

Turning now to FIG. **6** of the drawings, therein schematically illustrated is the method of determining proper circumferential alignment of the several rolls of the print machine. For purposes of explanation, the rolls will be assumed to have a circumference of 400 millimeters and a center-to-center spacing of 280 millimeters. Thus, there will be a circumferential variation of 120° from one roll to the next in terms of the desired alignment of the pitch mark or beginning of the engraved pattern. Utilizing a series of eight print rolls, it will be appreciated that the pitch mark must be varied from roll to roll in the sequence and in accordance with the following calculations:

Roll 1 = X ∓ 0	−280
Roll 2 = 400-280 =	+120
	−160
Roll 3 = 400-560 =	+240
	−40
Roll 4 = 2.400-840 =	+360
	−320
Roll 5 = 2.400-1120 =	+80
	−200
Roll 6 = 3.400-1400 =	+200
	−80
Roll 7 = 4.400-1680 =	+320
	−360
Roll 8 = 4.400-1960 =	+40

Turning now to FIG. **7**, therein illustrated is mechanism for independently driving the print and press rolls. At the bottom of the frame **10** is provided a conventional drive motor **76** which is connected to the shafts of the print rolls **22** by conventional drive mechanism generally designated by the numeral **78**. At the top of the frame **10** is provided a drive motor **80** which imparts rotation to the backing rolls **82** through conventional drive mechanism generally designated by the numeral **84**. As the backing rolls **82** rotate, they in turn effect rotation of the press rolls **24** through their tangential frictional engagement therewith. In accordance with a preferred embodiment of the invention for utilization with color systems containing flammable and volatile solvents, the drive motors **76** and **80** are desirably pneumatic motors. As noted in FIG. **1**, a separate drive motor **28** is provided for the blanket **14** if employed or the web **20** if no blanket or backing gray are employed. This motor is similarly desirably pneumatically driven, as is the motor **36** for driving the ink rolls **32**.

FIG. **8** semi-schematically illustrates a preferred embodiment of the present invention in which the web is deflected from a relatively straight line path vertically through the machine along the several nips of the cooperating pairs of the print and press rolls.

As can be seen, the web **20** is passing downwardly through the machine about the idler roll **96**. In this embodiment the print roll **22** and ink roll **32** are both rotating within the ink trough **34** and a doctor blade **86** is disposed to contact the uppermost surface of the print roll **22** as it rotates thereby. The press roll **24** is disposed with its axis spaced above that of the print roll **22** so that it is in tangential contact therewith adjacent the upper portion of its circumference at a point closely spaced relative to the doctor blade **86**. The backing roll **82** may be seen to be substantially larger in diameter than the press roll **24** and is disposed with its axis in the common plane defined by line drawn through the axes of the print roll **22** and press roll **24**.

Spaced inwardly on the frame **10** of the several rolls **22, 24** and **82** is the porous deflection tube **88** which is adjustable in its spacing from the rolls **22, 24** by means which will be described more fully with respect to FIG. **9**. The axis of the deflection tube **88** is parallel to the axes of the rolls **22, 24** and it is generally spaced below the level of the nip between the rolls **22, 24** and desirably below the axis of the print roll **22**. The deflection tube **88** is desirably constructed of a sintered metallic material so as to provide substantially uniform porosity along its length. That half of its circumference which is spaced from the web **20** desirably is nonporous so as to limit the escape of air or gas to that portion of the circumference which will provide the desired air cushion. This may be done by coating the porous roll with a suitable blocking agent or by fabricating the roll into pieces from different materials and then assembling the tubular semi-circular halfs. Air or other gaseous medium under pressure is introduced into the hollow center of the tube **88** and escapes at a rapid rate substantially uniformly throughout the entire length of the tube **88**. As will be appreciated, the air or gaseous medium escaping through the wall of the tube **88** maintains a spacing between it and the web **20** passing thereabout and thereby functions to provide a cushion of gaseous medium avoiding frictional contact therebetween. This same gaseous medium serves to effect evaporation of solvent from the printed coating upon the surface of the web **20** which has been applied at the preceding print roll nip. In order to minimize pressure drop across the length of the deflection tube **88**, air or other pressurized gas may be introduced through both ends of the porous tube **88** and it may also be supplied to the center portion of the porous tube **88** by an inner conduit (not shown).

To facilitate the removal of solvent and drying of the applied coating, elongated drying units **90** are provided along both the upper and lower horizontal segments of the path of travel towards and away from the porous deflection tube **88**. These drying units may comprise a series of spaced nozzles **92** through which air or other gaseous medium flowing into the header tubes **94** is distributed onto the surface of the web **20** passing thereby. Alternatively, the drying units may comprise porous tubular members operating generally similarly to the deflection tubes **88**.

It has been found that compressed air supplied to the tube **88** at a velocity sufficient to maintain an internal pressure of 1.5 to 6 atmospheres will be effective to provide the desired air cushion although it should be appreciated that this may vary. The air or gas may be heated if so desired. An idler roll **96** is provided in the return path of the web to maintain a generally horizontal direction and provide for changing into a vertical direction into the nip of the next succeeding print station.

Turning now to FIG. **9**, therein illustrated is a substantially complete assembly incorporating web redirection means, but wherein the print roll **22**, press roll **24** and backing roll **82** have their axes aligned on a common horizontal plane. In this embodiment, the axis of the deflection tube **88** is spaced vertically below the rolls **22**, **24** and backing roll **82**.

The deflection tube **88** is secured at its ends upon end plates **100** which are slidably seated in channel members **102**. As a result, the horizontal spacing of the axis of the deflection tube **88** relative to the nip between the rolls **22**, **24** may be adjusted through the action of the adjusting bolt **104** which is fixedly seated in the bracket **106** on the frame **10** and threadably seated in the bracket **108** on the end plate **100**.

In this embodiment, the press roll **24** and backing roll **82** are journaled in a slide **110** which is slidable in the channels **112** as a result of movement of the piston **114** effected by operation of the cylinder **116**. Variation of the horizontal disposition of the idler rolls **96** is readily effected since they too are journaled in end plates or blocks **118** which are slidable within the channels **120** and adjustable by means of the adjusting bolts **122** which are threadably engaged therein.

The doctor blade **86** is mounted upon a channel member **124** which is secured to the plates **126** and it may be adjusted inwardly and outwardly by means of the adjusting screw assembly **128** and be pivoted by means of the piston and cylinder assembly **130**. The entire doctor blade assembly may be moved inwardly and outwardly by the crank unit **132**.

As best seen in FIG. **12**, the ink trough **34** is movable vertically by a mechanism which includes slide channels **140** on the vertical sideposts **38** of the gate **12** in which are slidably seated the side blocks **142**. Also mounted upon the sideposts **38** are cylinders **144** having pistons **146** extending vertically upwardly therefrom with pulleys **148** at the end thereof. A cable **150** is fixed at one end to a bracket **152** upon the vertical sidepost **38** and extends about the pulley and is secured at its other end to a bracket **154** on the slide block **142**. As a result, vertical movement of the piston **146** caused by actuation of the cylinder **144** will produce vertical movement of the slide block **142** within the slide channels **140**. The inking trough **34** has support bars **154** extending from the outer end thereof with pins **156** which seat in recesses **158** formed in the upper surface of the slide blocks **142**. The pins **156** are secured in the recesses by the pivotal latch **160**. As a result, when the slide block **142** is moved vertically, the inking trough **34** will also be moved vertically, thus permitting rapid movement of the inking trough **34** into operative position and movement from operative position to inoperative position to facilitate opening of the inking gate.

Turning now to FIG. **11**, therein illustrated is the mechanism for moving the inking roll **32** inwardly and outwardly relative to the print roll **22** and this structure may be superimposed upon the structure illustrated in FIG. **9**. The ink roll **32** has its shaft **60** seated in a block (not shown) which is slidable in the slide channel **162** supported on the gate **12**. It can be moved along the length of the slide channel **162** by the adjusting screw **164** which is fixed in the block **166** and threadably engaged in the slide block (not shown) supporting the end of the shaft **60**. The ink roll **32** and print roll **22** in this particular embodiment are driven substantially synchronously by engagement of gear teeth **170**, **172** on end shafts with a common gear **174**.

Turning now to FIG. **10**, therein illustrated is the mechanism for adjusting the print roll **22** relative to the frame **10**. As will be appreciated, both vertical adjustment of the elevation of the print rolls **32** and circumferential adjustment is thus provided in the machine to facilitate maximum control over print registry.

From the illustrations of the several possible variations in the apparatus, it would be appreciated that the basic elements of the apparatus may be utilized for printing fabric, synthetic plastic, film, paper, metal and other continuous webs. The web redirection assembly with its drying action is particularly advantageous in the printing of nonporous materials since passage of the web into the next printing station while the previously deposited print coating is still wet would tend to produce smearing or running of colors and pattern. The machine may be used for intaglio printing in which case a doctor blade (or a pair of doctor blades) is employed or it may be used for relief printing. The print roll may rotate in the color within the ink trough itself or more generally it will be utilized with an inking roll rotating within the color of the ink trough.

In the illustrated embodiment, pneumatic means have been shown for moving the ink trough vertically relative to the print rolls to permit disengagement therefrom and opening of the inking gate; however, other means of effecting such vertical movement may be employed, including electrical motors and hand geared mechanisms.

Where a high degree of uniform pressure is desired, the use of a separate backing roll applying pressure across the axial length of the press roll has been found to be highly desirable and advantageous. Moreover, to minimize fabric slippage and optimize speed of printing, it is desirable to drive the print rolls, the press rolls and the fabric (or blanket or backing gray). Optimum registration of the patterns of the several print rolls may be readily effected through use of the sight members and the indicia imprinted upon the printing rolls.

As will be readily appreciated, the overall assembly is one which lends itself to rapid interchangeability, disengagement of individual roll units and variation in printing technique. In commercial practice its versatility and reliability of operation have been established.

The roll pattern alignment means may be utilized to effect registry of the patterns on the print rolls when the web travels directly vertically therebetween by use of the center-to-center spacing as the path travel distance may be determined for a deflecting path as shown in the embodiments of FIGS. **8** and **9** with similar computations being employed.

Having thus described the invention, I claim:

1. A print machine for the continuous printing of a continuous web traveling therethrough comprising:

a. a machine frame;

b. a vertical gate member pivotally mounted at least on one side thereof on said frame for pivotal movement about a vertical axis at said pivoted side from a closed position to an open position wherein the side opposite the pivotal axis is spaced away from said frame;

c. a multiplicity of pairs of cooperating print and press rolls rotatably supported on said frame in vertically spaced alignment, the print roll of each pair being disposed outwardly adjacent said gate member and having a circumferential pattern of a multiplicity of measuring indicia about its circumference adjacent an end thereof dividing the circumference into a multiplicity of measuring units, said print rolls having their axes lying in a common vertical plane and said press rolls having their axes lying in a parallel vertical plane;

d. a multiplicity of inking units supported on said gate member in vertically spaced alignment and each cooperating with one of said print rolls for applying a coating of ink to the circumferential surface of an associated print roll as it rotates during operation of the machine, each inking unit including an ink trough, an inking roll and means for moving said ink trough relative to said print rolls;

e. a plurality of path deflecting means on said machine frame each including a support member on said frame spaced inwardly of said press rolls relative to said gate member whereby the web issuing from the nip of one pair of rolls is directed inwardly of the machine about said support member and thence outwardly into the nip of the next adjacent pair of rolls along the path of web travel;

f. a plurality of pitch adjustment means each including an alignment element cooperating with the said measuring indicia of one of said print rolls and means for independently rotating each of a plurality of the print rolls to effect registry of a preselected measuring indicium with said alignment element;

g. drive means for rotating said print and press rolls; and

h. an auxiliary drive roll for the web and means for driving said auxiliary drive roll.

2. The print machine of claim **1** wherein there is included drive means on said gate member and a gear mechanism interconnecting said drive means and said ink rolls to effect rotation thereof independently of the position of said gate member.

3. The print machine of claim **2** wherein there is provided gear means interconnecting said ink rolls and said print rolls to provide controlled relative rotation thereof.

4. The print machine of claim **1** wherein said means for moving said ink troughs includes slide means on said gate member, support elements on said troughs slidably seated in said slide means, and pneumatic means for slidably moving said trough support elements vertically in said slide means.

5. The print machine of claim **1** wherein said alignment element includes a reticule for effecting visual alignment of said print roll measuring indicia.

6. The print machine of claim **1** wherein said support member of said path deflecting means comprises a porous tube and wherein there is provided means for supplying air under pressure to the interior of said porous tube for escape therethrough to provide an air cushion between said tube and the web.

7. The print machine of claim **6** wherein said path deflecting means includes idler rolls on said frame above and below each pair of press and print rolls to facilitate redirection from the upstream print roll to the support member and thence from the support member to the downstream pair of print and press rolls.

8. The print machine of claim **6** wherein said deflecting means includes dryer means spaced inwardly of said print and press rolls for directing gas under pressure onto the surface of the web passing thereby.

9. The print machine of claim **1** wherein there is included a doctor blade pivotably mounted on said inking gate and in contact with the surface of said print roll.

10. The print machine of claim **9** wherein the axis of said press roll is disposed upwardly from the plane of the axis of said print roll at a relatively steep angle and wherein said doctor blade contacts the surface of said print roll adjacent the uppermost portion thereof, whereby the distance of travel between the point of said doctor blade and the nip between said print roll and press roll is relatively short.

11. The print machine of claim **1** wherein there is included a backing roll of larger diameter than said press roll and disposed to the opposite side thereof from said print roll to provide substantially uniform pressure across the axial length thereof.

12. The print machine of claim **11** wherein said backing roll is driven and imparts rotation to said press roll.

13. The print machine of claim **11** wherein said ink troughs are vertically slidably supported upon said inking gate and wherein there is included pneumatic means for slidably moving said ink troughs vertically relative to said inking gate and said print rolls.

14. In a print machine for the continuous printing of a continuous web traveling therethrough, the combination comprising:

a. a machine frame;

b. a multiplicity of pairs of cooperating print and press rolls rotatably supported on said frame, the print roll of each pair being disposed outwardly and having a circumferential pattern of a multiplicity of measuring indicia about its circumference adjacent an end thereof dividing the circumference into a multiplicity of measuring units;

c. a plurality of pitch adjustment means on said machine frame and each including an alignment element cooperating with the said measuring indicia of one of said print rolls; and

d. independent drive means for independently rotating the print rolls to effect registry of a preselected measuring indicium of the rotated print roll with said alignment element cooperating therewith.

15. The print machine of claim **14** wherein said alignment element includes a reticule for effecting visual alignment of said print roll measuring indicia.

16. The print machine of claim **14** wherein said measuring indicia comprise a scale reflecting the distance about the circumference of said print rolls.

17. In a print machine for the continuous printing of a continuous web traveling therethrough, the combination comprising:

a. a machine frame;

b. a vertical gate member pivotally mounted at least on one side thereof on said frame for pivotal movement about a vertical axis at said pivoted side from

a closed position to an open position wherein the side opposite the pivotal axis is spaced away from said frame;

c. a multiplicity of pairs of cooperating print and press rolls rotatably supported on said frame in vertically spaced alignment, the print roll of each pair being disposed outwardly adjacent said gate member and having a circumferential pattern of a multiplicity of measuring indicia about its circumference adjacent an end thereof dividing the circumference into a multiplicity of measuring units, said print rolls having their axes lying in a parallel vertical plane; and

d. a plurality of path deflecting means each including a tubular support member on said frame spaced inwardly of said press rolls and means for supplying gas under pressure to said tubular support member, said tubular support member having gas passages therethrough over its length and over a substantial portion of its periphery, whereby the web issuing from the nip of one pair of rolls is directed inwardly of the machine about said support member and thence outwardly into the nip of the next adjacent pair of rolls along the path of web travel with the gas escaping through the support member providing a gas cushion between the web and support member.

18. The print machine of claim **17** wherein said tubular support member comprises a tube which is porous at least about a portion of the periphery thereof.

19. The print machine of claim **17** wherein said path deflecting means includes idler rolls on said frame above and below each pair of press and print rolls to facilitate redirection from the upstream print roll to the support member and thence from the support member to the downstream pair of print and press rolls.

20. The print machine of claim **17** wherein said deflecting means includes dryer means spaced inwardly of said print and press rolls for directing gas under pressure onto the surface of the web passing thereby.

21. In a method for continuous printing of webs, the steps comprising:

a. providing a multiplicity of print rolls each having cooperating patterns thereon with a multiplicity of circumferential indicia about the circumference of at least one end thereof dividing the circumference into a multiplicity of measuring units, said indicia including a pitch mark denoting a predetermined point on the pattern;

b. mounting said print rolls on the frame of a print machine with their axes lying in a common plane and with a predetermined spacing therebetween; and

c. independently rotating each of at least a plurality of said print rolls to orient said pitch marks at a predetermined point relative to a reference point on said frame about a circle having its center lying in said common plane in accordance with a predetermined length of path of travel of the web between the adjacent print rolls relative to the circumference thereof.

22. The method in accordance with claim **21** wherein said reference points are alignment devices on said frame adjacent said print rolls and wherein said print rolls are rotated to orient a predetermined circumferential indicium with said alignment devices.

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