Feb. 21, 1961 V. S. DE MARCHI 2,972,299

VARIABLE VELOCITY DIFFUSER

Filed Aug. 21, 1956 3 Sheets-Sheet 1

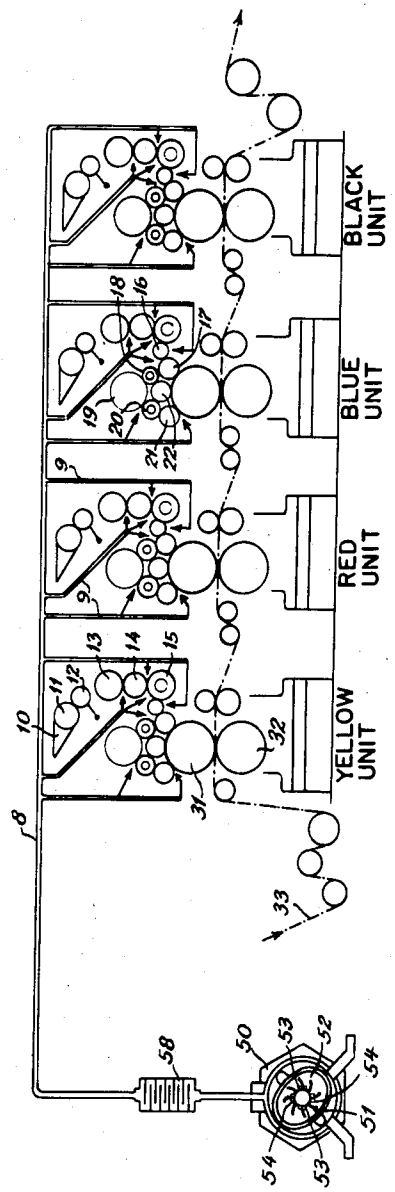


Fig. 1.

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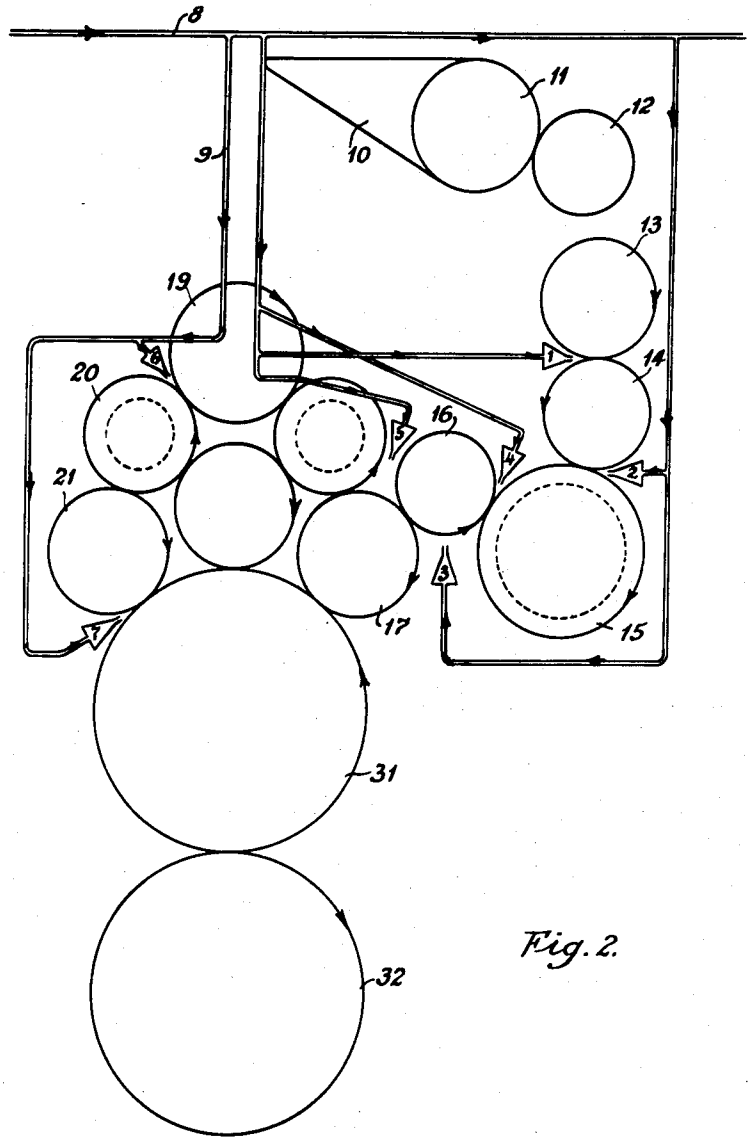


Fig. 2.

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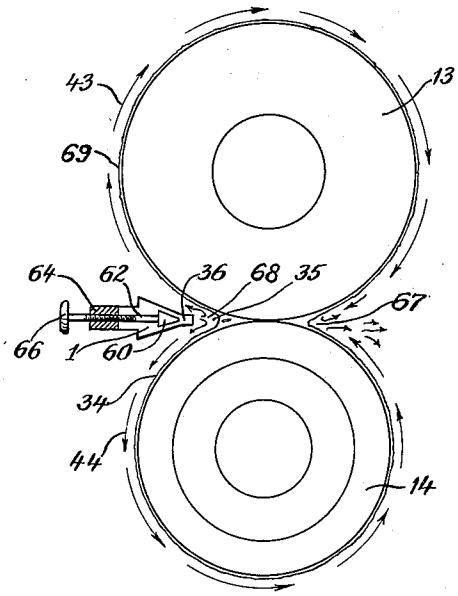


Fig. 3.

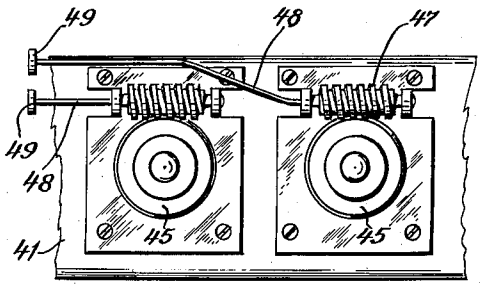


Fig. 4.

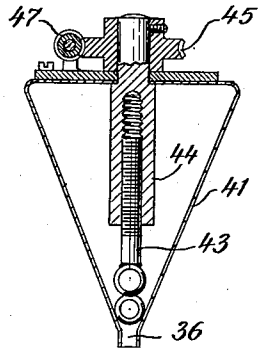


Fig. 5.

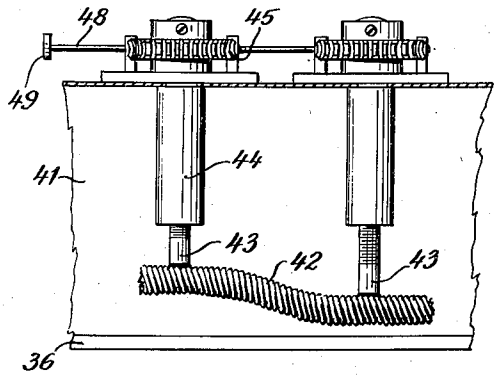


Fig. 6.

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VARIABLE VELOCITY DIFFUSER

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Filed Aug. 21, 1956, Ser. No. 605,357

1 Claim. (Cl. 101—349)

This invention relates to devices for controlling the atmosphere about a group of rotating rollers, and is particularly directed at apparatus in which a blanket of gas is formed about the rollers by feeding the gas into the advancing nips between the rollers of the distribution system, as described in my copending application, with Albert E. Gessler and William Van Kirk, Serial No. 549,349, filed November 28, 1955. My present invention is directed at apparatus and methods which permit the blanket of gas to be varied at will across the width of a roller.

As described in the above identified copending application Serial No. 549,349, filed November 28, 1955, my co-workers and I discovered that in a roller system for distributing ink and the like, it was possible to use ink which was unstable under ordinary ambient conditions, by maintaining about the rollers a thin blanket of a gas in which the ink was stable, for the time required to distribute it; and that such a blanket could be maintained by feeding the desired gas into the advancing nips between the rollers at a rate sufficient to form a thin blanket.

I have now discovered that in such a system it is possible to maintain gas blankets of differential thickness across the width of a single pair of rollers, or across the width of an entire distribution system, by varying the amounts of gas fed to the advancing nips of the rollers at the desired points across the width of the rollers. The gas blankets diffuse sidewise relatively slowly, so that in an operating roller system, rather sharp lateral zones are established.

This invention permits the use of inks etc. of varying film thickness, or of varying composition, on a single set of rollers. This variation is often desirable on large presses such as are used to print magazines, where a number of pages are printed at one time, and the copy on the various parts of the plate differs radically in content.

The invention can be best understood by reference to the accompanying drawings, in which,

Fig. 1 is a schematic representation of a four color press equipped for the practice of our invention, equipped with a device for saturating air with ink solvent vapor;

Fig. 2 is a schematic diagram of the distribution system of a single unit;

Fig. 3 is a close up view of a single nip, with ink flow and gas flow indicated, and one method of controlling flow indicated;

Fig. 4 is a rear elevation of another form of my flow control device;

Fig. 5 is a section through this form of flow control device;

Fig. 6 is a broken section of Fig. 5.

Referring to Fig. 1 a press having four separate color units, identified in the drawing by the color which is ordinarily printed by the unit, may be used for the practice of the invention. Each unit consists of a printing cylinder **31** having a printing plate mounted on it, and an impression cylinder **32**. A web **33** of paper is fed

through the press by appropriate rollers; passing from an unwind through the four printing units, out of a dryer of an appropriate design, and then to another similar press to print the other side, or to a rewind, sheeter or folder.

The printing plates are inked by a distribution system which carries the ink down to the plate from fountain **10**. A fountain roller **11**, of metal, rotates with an intermittent jerky movement, to present a series of freshly inked spots to the ductor roller **12**. This roller is alternately passed against the fountain roller **11** and moves with it to pick up a dab of ink, and against the roller **13** to deliver ink to that roller. The ink films on **11** and **12** are thick, and neither roller rotates rapidly, so that there is no serious problem of evaporation on these rollers.

Distribution of the ink, and beating of the film down to printing thinness of under .001 inch, comes on the remaining rollers. At the advancing nip between the metal roller **13** and the rubber-covered roller **14**, the first source of gas **1** is placed.

Referring to Fig. 3, the roller **13** carries an ink film **69** into the nip **67** between it and the roller **14**. At the emerging end **68** of the nip, this ink film distributes between the rollers **13** and **14**, being first strung out into strings **35** (here exaggerated) which split to reform the film **69** and an ink film **34** on roller **14**.

The source of gas **1** is a hollow triangular pipe fitted close to the nip, with an opening **36**, feeding gas directly into the nip. This gas blankets the nip, providing the splitting film with an adhering blanket which keeps ambient air out of the nip. This gas cushion is drawn along the rollers **13** and **14** to form gas blankets **43** and **44**, overlaying and protecting the films **13** and **14**, and preventing evaporation or precipitation.

The amount of gas fed through the opening **36** may be controlled by a triangular plug **60**, mounted on a screw shaft **62** threadedly engaged in a threaded extension **64** on the rear of the pipe **1**. A head **66** permits the shaft **62** to be moved from a position where the plug **60** closes the opening **36**, to a point where gas may pass freely through the opening. By dividing the pipe **1** into a series of compartments it is possible to individually control each zone across the width of the roller pair **13—14**.

Similar action to that obtained with the pipe **1** is obtained with diffusion outlet **2**, between the roller **14** and the cooled metal roller **15**. It is possible at this point to vary the temperature of the ink film, by control of the cooling water, to vary the saturation of the gas blanket with respect to heat-drying ink; since the vapor pressure of the solvent of the ink depends on the ink temperature, it will evaporate solvent into the gas blanket, or condense solvent from it, depending on the relationship of ink vapor pressure to solvent vapor pressure in the gas. This permits a pressman to adjust ink body, by controls at this point, and on the two later water cooled rollers in the system.

Diffuser **4** controls the nip between metal roller **15** and rubber roller **14**. From this point on, most of the remaining nips are inaccessible and partially enclosed by rollers etc., so it is necessary to improvise. Roller **16** meets the first rubber roller **17**, which inks the plate **31**, but passes most of its ink to cooled metal roller **18**. This in turn inks rubber roller **19**, and the second form roller **22**; roller **19** inks roller **20**, which inks both the form rollers **21** and **22**. The only open advancing nip is the **19—20** nip; diffuser **6** feeds gas into this port.

Diffusers **3** and **5** are placed at a distance from their respective nips only because of mechanical considerations. The small clearance between rollers **16** and **18** prevents the diffuser **5** from being pushed closer to the

nip; in the case of diffuser 3, a frame bracket (not shown) prevents closer contact. However, in such restricted spaces blanketing is obtained even under these conditions.

Because of the clustering of the rollers beyond roller 16 in the system, the air space surrounded by the cluster becomes sufficiently full of ink-solvent vapor so that no trouble is encountered with evaporation in this space. Actually, good results are obtained without diffusers 3 and 4; in the relatively enclosed space, the air blanket forced off the rollers 14 and 15 with gas from port 5 provide a source of gas sufficient to protect these rollers during normal press operations.

Each one of the diffusers is divided into compartments like diffuser 1 and similar provision is made for varying the amount of gas coming from each section. It is not essential that each matching section on the various diffusers be set identically; the results obtained are additive, it being only necessary that the combined effect of the various diffusers produce the desired end effect.

The gas which is fed into the diffusers is obtained from a line 9, which feeds down into each unit from a manifold 8. This manifold in turn is connected with a source of gas.

In the case of heat-drying inks, this is provided, as shown in Fig. 1, by a saturator 50, which may comprise a liquid sealed compressor consisting of a vaned rotor 51, operating in a liquid seal 52 of ink solvent. To pass from the inlet ports 53 to the outlet ports 54 of the saturator, air feeding into the compressor must pass through the liquid solvent, and thus becomes substantially saturated with solvent vapor at the temperature and pressure in the pump chamber. There is preferably employed a baffled trap 58 in the line from the saturator to the manifold 8 to prevent liquid from being entrained in the gas. Complete elimination of mist is not essential, although desirable.

Instead of operating the keys from the back of the diffuser, I may operate them from the side of the press, as shown in Figs. 4, 5 and 6. The diffuser 41, with the opening 36 therein, is provided with a coiled unit or ribbon 42 which may be circular or pear shaped and runs the length of the diffuser, and is capable of closing the opening 36. It is mounted on a series of rods 43, each of which is threaded inside a shaft 44, keyed to a worm gear 45, which is operated by a worm 47 and mounted on a flexible shaft 48. All of the shafts 48 are carried to the side or sides of the press, where they may be operated independently by handles 49. On rotation of any handle, the corresponding shaft 48, operates the worm 47, which turns the gear 45, which turns the shaft 44; the rod 43, which is held by the coil 42, will then move up or down in the diffuser, opening or closing the opening close to it with the coiled wire or ribbon 42. Because this coil is flexible, it can vary the opening 36 of the diffuser as determined by the operator.

It is possible to operate the various sections as desired. Where no ink is used on a section, the gas may be cut off completely; where a very thin ink is used, which tends to dry rapidly, a thicker gas film may be provided than where the ink coverage is such that drying is slower.

It is desirable to provide means to insure constant velocity of gas through such portions of a diffuser as are not throttled down. For this purpose, I may provide a pressure regulator for each diffuser which maintains the pressure constant. Alternatively, hand operated valves may be used to reduce total gas flow when one or more sections of a diffuser are cut down, thereby maintaining constant gas velocity through the open sections.

As pointed out in application Serial No. 549,349, the gas films used may vary in thickness, about .001 inch representing a useful minimum where there is ink on the rollers. But the amount actually will vary with the particular operation, and may be much heavier where thin films of ink are being protected, and shut off completely where it is not desired to protect the ink, or there is no ink on a portion of the plate.

The particular methods of controlling gas flow may, of course, be varied without departing from the scope of my invention as defined in the claim.

I claim:

In a printing press with an extended distribution system comprising a set of rollers, means for producing a gas other than the ambient atmosphere, a series of diffusers with openings for directing the gas so produced into a plurality of the advancing nips of the roller couples to blanket the rollers, valves in the opening capable of changing the amount of gas coming from the openings, said valves comprising a continuous elastic coil adapted to close the opening, mounted on a series of individually operable valve stems, and means to operate the valves at differential settings across the diffusers whereby the amounts of gas coming from the diffuser may be varied across its width.

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