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(56) Documents Cited
GB 2271080 A GB 2248423 A GB 2217653 A
GB 2189744 A GB 1569961 A EP 0518559 A1
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(58) Field of Search
UK CL (Edition O) B6C CBNX CBX CVAA CVT CWE
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(54) Printing press operator aide

(57) A method is provided for aiding a printing press operator to determine the amount of ink flow for each zone valve 32 of a printing press 30 for an image to be printed. The printing press is divided into a multiplicity of zones for each ink color. The method includes determining, from the image to be printed, representative ink densities for each zone and for each separation, and presenting the press operator with at least visual indications of the representative ink densities.

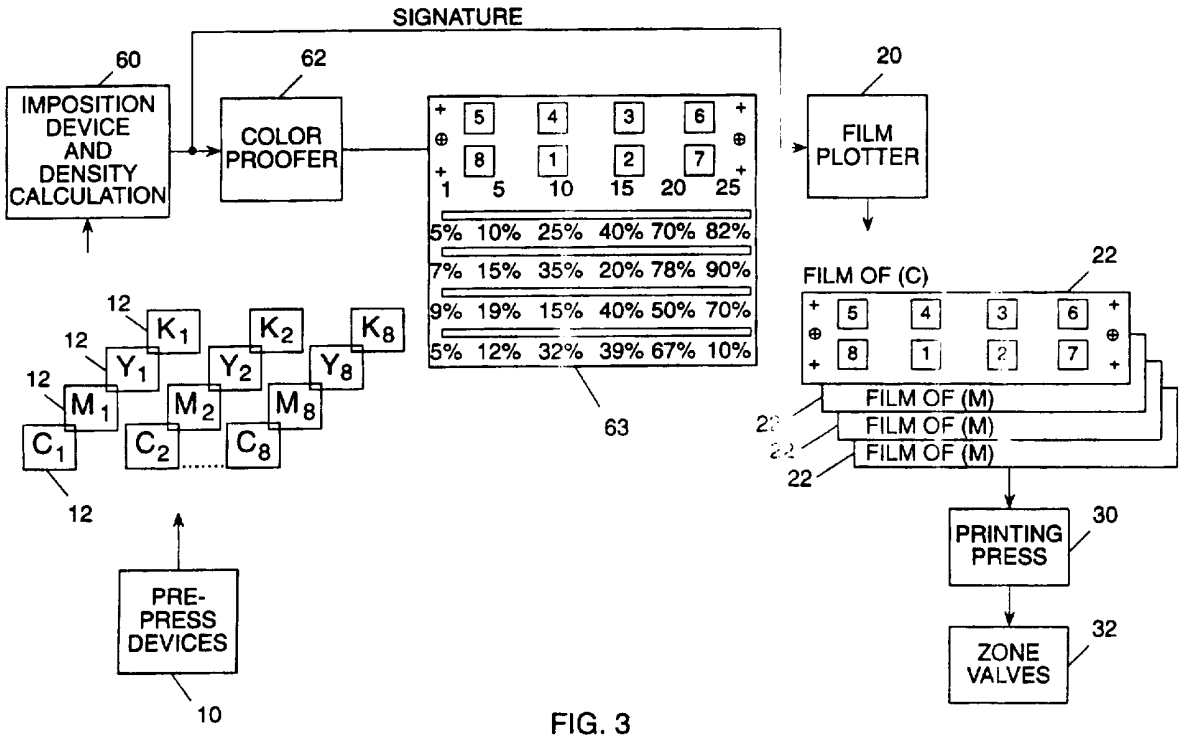

FIG. 3

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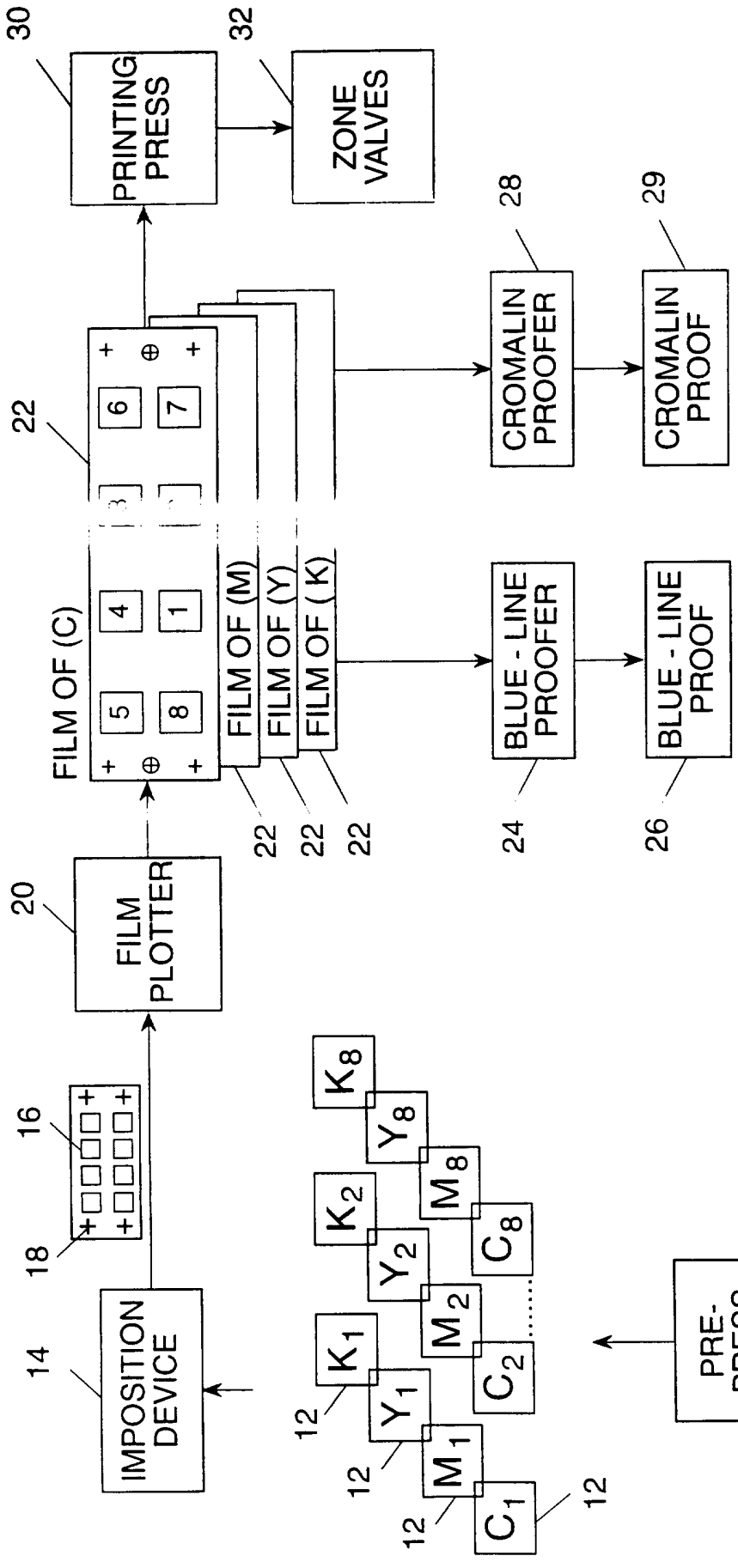
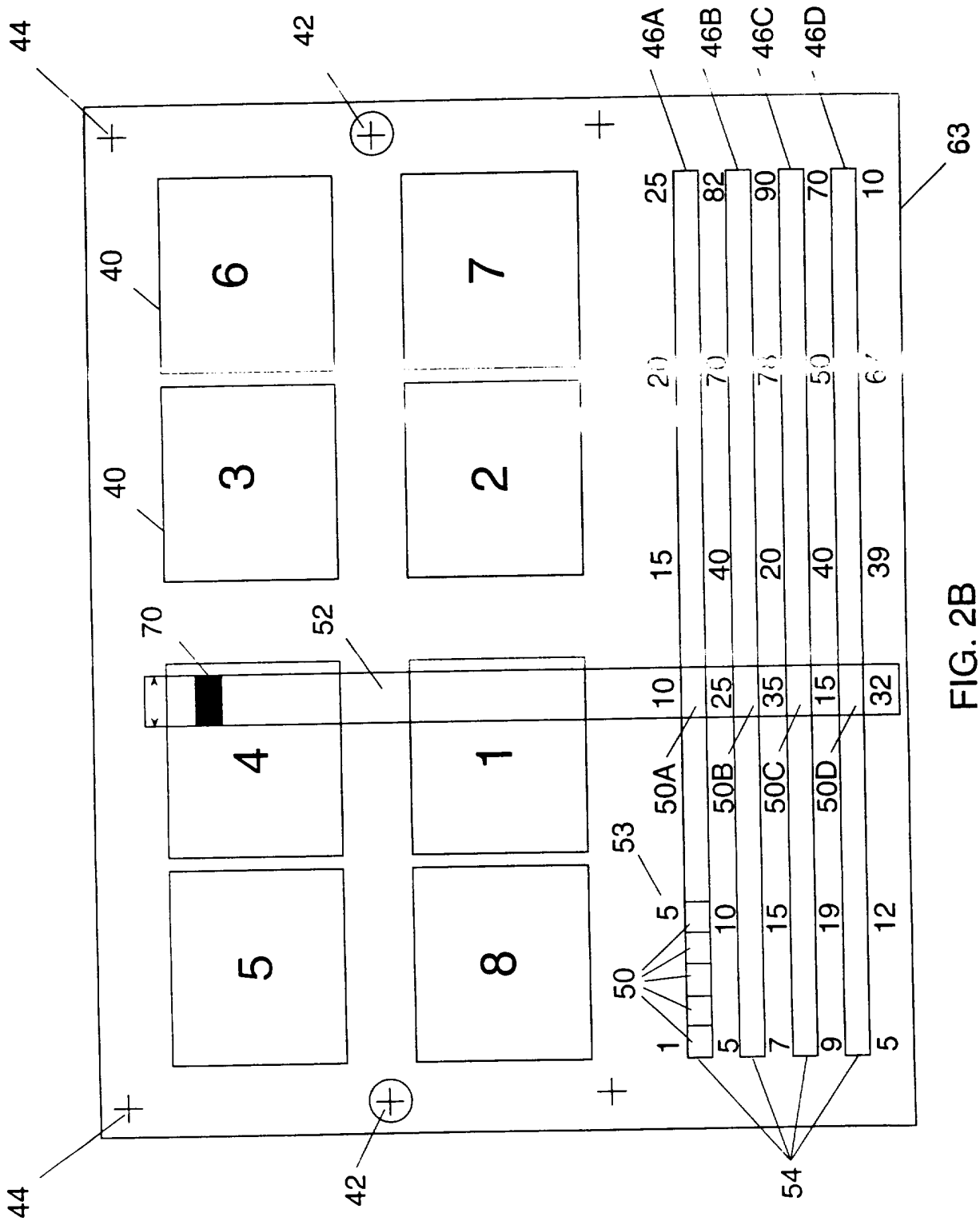


PRIOR ART
FIG. 1


44
42
46A
46B
46C
46D
63
40
6
7
3
2
70
52
4
1
5
8
53
50
50A
50B
50C
50D
54
25
82
90
70
10
15
40
20
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35
15
32
5
10
15
19
12
1
5
7
9
5

FIG. 2B

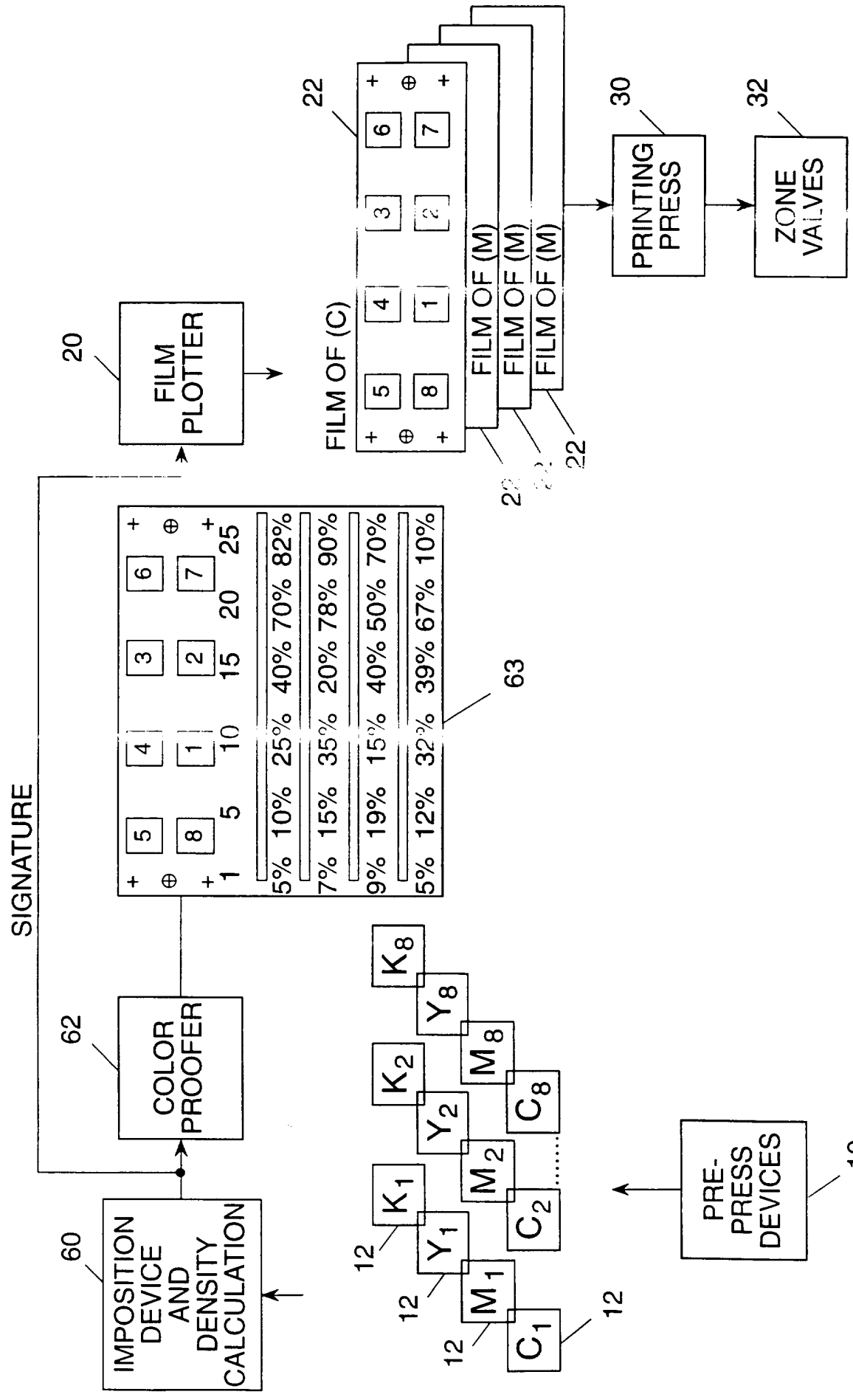
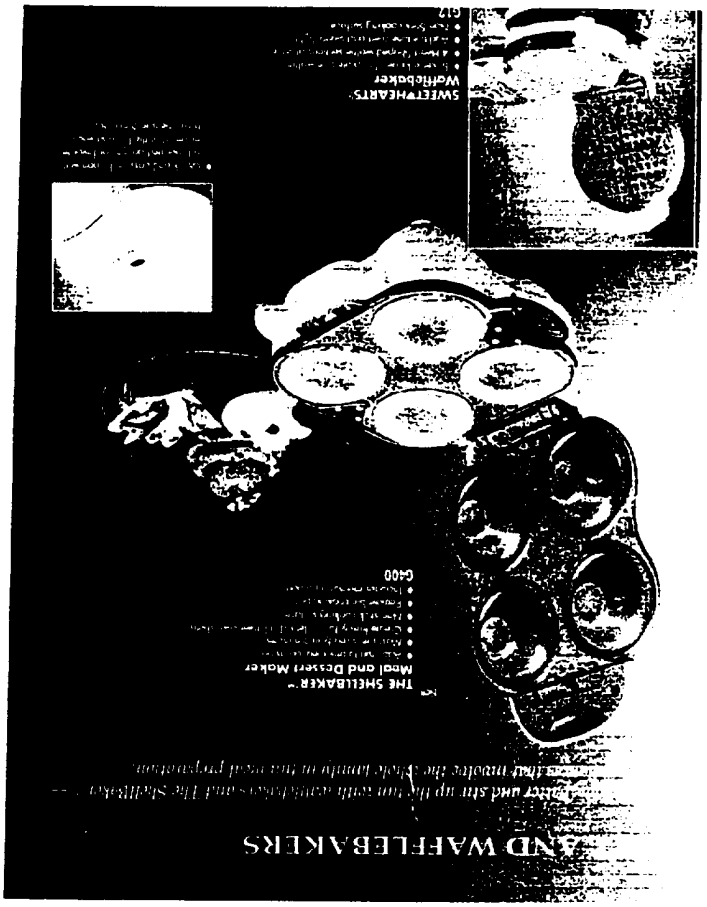
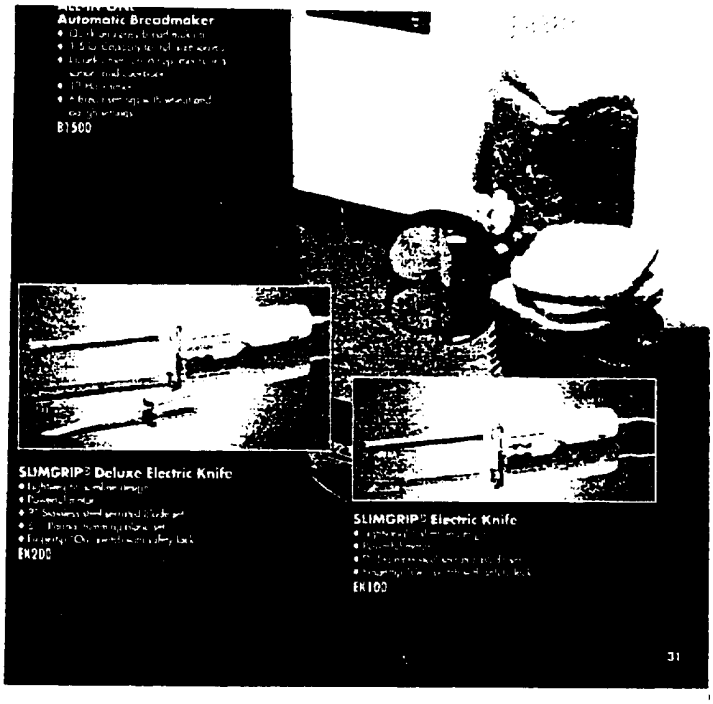

PRE-PRESS DEVICES
10
PRINTING PRESS
30
ZONE VALVES
32
FILM PLOTTER
20
FILM OF (C)
FILM OF (M)
FILM OF (M)
FILM OF (M)
22
IMPOSITION DEVICE AND DENSITY CALCULATION
60
COLOR PROOFER
62
SIGNATURE
63
12

FIG. 3





	50							55					59
%	75%	71%	69%	73%	73%	67%	59%	52%	47%	44%	45%	44%	43%	20%
%	64%	61%	60%	65%	62%	56%	48%	43%	38%	37%	37%	34%	31%	15%
%	67%	65%	64%	69%	67%	59%	51%	45%	40%	40%	39%	33%	29%	14%
%	80%	74%	72%	77%	77%	69%	61%	54%	47%	44%	45%	41%	38%	18%

FIG. 2A

PRINTING PRESS OPERATOR AIDE

FIELD OF THE INVENTION

The present invention relates generally to control of the ink flow of a printing press.

BACKGROUND OF THE INVENTION

The prior art printing process is illustrated in Fig. 1 to which reference is now made. Each individual color page to be printed is prepared on a pre-press device **10**. When the designer finishes designing the page, the pre-press device **10** creates four digitized versions **12** of the page, one for each of the four color separations cyan, magenta, yellow and black (C, Y, M, and K). The digitized versions of the page will be known herein as "separation files" **12**.

When the designer has finished preparing all of the pages of the printed publication (magazine, newspaper, brochure, etc.) to be printed, he provides the separation files **12** for the entirety of pages to an imposition device **14** (such as provided within the WHISPER I/O Station manufactured by Scitex Corporation Ltd. of Herzlia, Israel) which "imposes" the pages into "signatures" **16**. Each signature typically has press marks **18** and eight pages on it where the order that the eight pages are laid out is a function of how the printing press will

fold the press sheet after printing. The imposition device **14** produces four data files of the signature, one for each color separation.

The four files representing the signature **16** are provided to a film plotter 20 (such as the DOLEV 800 plotter manufactured by Scitex Corporation Ltd.) which plots each version of the signature **16** onto a film. The result are films **22** of the separations of the signature **16**. Blue-line proofs **26** are provided from films **22**. Blue-line proofs **26** is a blue and white print of the signature **16** and is utilized to ascertain that the text is correct, that the placement of the various elements of the pages are correct and aligned and that the general impression of the pages is correct. If it is not, the designer needs to make changes at the pre-press device **10** and the process needs to be repeated.

To determine whether or not the colors to be printed are the desired colors, the films **22** are sent to a Chromalin proofer as produced by Dupont, Delaware, USA 28 for producing a color CHROMALIN proof **29**. The film creation process is repeated if the colors are in any way unacceptable.

If the blue-line proof **26** and the color chromalin **29** indicate that there are no problems, the films **22** are provided to a printing press **30** for printing. Each film **22** is utilized to create a press plate and the press plates are placed on separate units of the press, onto which the ink of the proper color (cyan, magenta, yellow or black) will be spread.

Since the color varies widely across a page and across a signature, each press unit is divided into a plurality of "zones" where each zone has a

separate ink flow regulator 32, known as a "zone valve". Each zone valve ensures that the amount of ink which is spread across its zone is compatible with the amount of color desired.

Usually, a press operator initially sets the zone valves 32 by looking at the colors in the Chromalin proof 29. He then prints one sheet with the initial settings, to view the final result. If the colors are smeared in one zone, there is too much ink available and he will have to adjust down the zone valve 32 for the problematic zone. Similarly, if the color is too light, he will have to open up the zone valve 32. The printing process is repeated for another sheet until the desired affect is achieved. After that, the printing press is operated with only spot checks to determine that the ink flow in each zone remains correct.

The Heidelberg Speedmaster 72 printing press, manufactured by Heidelberg Druckmaschinen AG of Germany, has a plurality of zone valves 32 (or fountain keys) which can be controlled directly or remotely. Presses may have 8 to 30 such zone valves.

It will be appreciated that, if the density of a given color is consistent across the zone, the setting for the zone valve 32 is straightforward. However, if the density of the color varies widely over a zone, it is difficult for the press operator to determine how much ink flow to provide.

U.S. Patent 5,128,879 describes a method and apparatus which acquires the zone valve states and adjusts them automatically. The settings of the zone valves are calculated from the color density values provided in the page

initially created by the pre-press devices **10**. The calculated zone valve settings are forwarded directly to the printing press, without intervention of the press operator.

European Patent Publication 495563 A2 describes an integrated computerized system for use in printing assigned to the common assignees of the present invention. The system includes apparatus for providing and digitally storing at least one digital representation of at least one page. The digital representation is imposed and arranged in accordance with a desired plate layout to define a plate image. Press set-up apparatus then extracts the digital representation and providing press set-up data to a printing press.

SUMMARY OF THE PRESENT INVENTION

This invention is useful in printing presses which are manually (or remotely) controlled. It is an object of the present invention to provide the press operator with positive indication of the initial setting for the printing press zone valves. This is achieved by creating a proof which provides, in addition to a proof of the signature (placement, text, graphics), ink density indications for each zone of each color separation.

According to a preferred embodiment of the invention, there is provided a method of aiding a printing press operator to determine the amount of ink flow for each zone valve of a printing press for an image to be printed. The printing press is divided into a multiplicity of zones for each ink color. The method includes determining, from the image to be printed, representative ink densities for each zone and for each separation, and presenting the press operator with at least visual indications of the representative ink densities.

The ink density indications can be provided in any way. In one embodiment, the ink density indications are provided in strips, one per ink color, below the signature. The strips are divided into sections, one per zone, and each section has both a listing of the ink density of the zone and a swatch of ink having the average color density.

Moreover, in accordance with the preferred embodiment of the present invention, the representative ink densities are determined by dividing the image to be printed into a plurality of image zones associated with the zones of the

press and determining a representative ink density of each ink color in each image zone. The operator is typically presented with a reproduction of the representative ink densities as color proofs or alternatively on paper.

Furthermore, in accordance with the preferred embodiment of the present invention, the reproducing of the representative ink densities includes the step of creating color strips of the representative ink densities. The color strips have strip zones each of which is associated with one of the image zones. The strip zone has the representative density of the associated image zone. Numerical indications of the representative ink densities can be included. The step of reproducing can include the step of plotting the representative ink densities on a color proof or onto color separation films from which a color proof is produced.

Furthermore, in accordance with a second preferred embodiment of the present invention, there is provided a method of setting the amount of ink flow for each zone valve of a printing press for an image to be printed. The method includes determining, from the image to be printed, representative ink densities for each zone and for each separation, visually reproducing the representative densities and setting the amount of ink flow of each zone valve in accordance with the color of the corresponding representative ink density. Setting the amount of ink flow can provide the initial setting of the zone valves.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be understood and appreciated more fully from the following detailed description taken in conjunction with the drawings in which:

Fig. 1 is a schematic block diagram illustration of a prior art work flow for creating and printing color documents;

Fig. 2A is a color illustration of a part of a color proof having ink density strips thereon, said ink density strips being constructed in accordance with preferred embodiments of the present invention;

Fig. 2B is a schematic illustration of the complete proof of Fig. 2A, providing reference numerals to the elements of Fig. 2A; and

Fig. 3 is a schematic block diagram illustration of a first work flow for creating the color proof of Fig. 2A.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention provides a press operator with indications, typically on a portable sheet of paper, of the representative ink flow to be set in each of the zones of the press. The representation of the ink-flow, to be initially set in each zone, is provided as a swatch of ink, which has the desired density, accompanied by a percentage showing the initial setting of valve **32**. Since the press operator generally knows the relationship between the swatch color and the setting of the zone valves, he can set each valve **32** in accordance with the percentage marked, using the corresponding ink-swatch as confirmation. The press operator typically then fine tunes the zone valves **32** as in the prior art. It will be appreciated that the visual indications of the present invention can be utilized at any point during the operation of the press.

Reference is now made to Figs. 2A and 2B. Figs. 2A and 2B provide an example of the present invention. Fig. 2A is a color illustration of part of a color **63** proof of a signature which also comprises strips of ink swatches having the representative density for each zone of the signature and Fig. 2B is a schematic illustration of the entire proof **63** of Fig. 2A indicating its elements and reference numerals.

It will be appreciated that the present invention is operative for all types of "pages" to be printed; thus, it can be implemented for a signature of many pages, as described hereinbelow, or it can be implemented for printing a poster of a single page.

As shown in Figs. 2A and 2B, the proof has signature elements and color strips. The signature elements include eight pages **40**, registration marks **42** and folding marks **44**. There are four color strips, labeled **46a**, **46b**, **46c** and **46d**, one for each ink color, cyan, magenta, yellow and black, respectively. If other ink colors are utilized, the strips **46** will have the approximate colors of the inks utilized.

The color strips **46** are typically placed below or above the signature and the strips **46** are typically aligned with one another. Each color strip **46** is divided into swatches **50** where each swatch **50** of each strip **46** corresponds to a zone **52** of the signature thereabove or below. One zone **52** is illustrated in Fig. 2B and is shown associated with swatches **50a**, **50b**, **50c** and **50d** of strips **46a**, **46b**, **46c**, and **46d**, respectively. The number of swatches correspond to the number of zone valves of the specific press in use.

Swatch **50a** has a density of cyan which is the representative density of cyan in zone **52**. For the purposes of this description, "density" may be defined as the ink coverage as a percentage. Similarly, swatches **50b**, **50c** and **50d** have densities of magenta, yellow and black, respectively, which are the representative densities of magenta, yellow and black in zone **52**. The representative densities can be determined in any of a number of ways, some of which are described hereinbelow.

Over the color strip area is a notation **53** representing the number of the zone valve **32** to which each swatch refers. Below each zone of each color strip are numerical indications **54**, representing the zone valve positions as a

percentage of the full open position. Alternatively, the indications **54** can indicate the ink density of the swatch **50** thereabove. Thus, swatches **50a**, **50b**, **50c** and **50d** have numerical indications, for example, of 25%, 28%, 70% and 2%, respectively.

It will be appreciated that the press operator can determine, from both the visual indications of the representative color density and the numerical indications, what the appropriate initial setting for the zone valves **32** of each zone should be.

Reference is now made to Fig. 3 which is a schematic block diagram illustration of a first work flow for creating the color proof **63** of Fig. 2A. Elements which are similar to those of Fig. 1 have the same reference numerals.

As in the work flow of Fig. 1, the pre-press devices **10** produce color separations **12** of a plurality of pages. In the present invention, the color separations are provided to an imposition device and density calculation unit **60**. As in the prior art, unit **60** imposes the pages into a signature. However, in accordance with a preferred embodiment of the present invention, unit **60** also determines the representative density for each color and each zone of the imposed signature, as detailed hereinbelow. From the representative density information, unit **60** prepares the color strips, placing a swatch of the calculated density above or below the associated zone and the numerical indications. Unit **60** then provides the signature and color strip information to a color printer **62**, such as the 650C color plotter manufactured by Hewlett-Packard Company of Boise, Idaho, to produce the color proof of Fig. 2A. If the color proof of Fig. 2A

is acceptable, unit **60** also provides just the signature information to film plotter **20** which then plots the films **22**. The films are converted into plates which are then placed on the printing press **30** for printing. With the color proof **63** of Fig. 2A, produced by proofer **62**, the press operator can set the initial setting of zone valves **32**.

In one embodiment of the present invention, the representative densities are per color averages of the densities in each zone. The averages are determined by unit **60** as follows:

1. The imposed signature is divided into vertical zones **52** (Fig. 2B) according to the number of zone valves in the press on which the signature will be printed;

2. Each vertical zone **52** is divided into a multiplicity of squares **70** and the average ink density of the square, for each ink color, is determined from the information present in the computer files representing the separations **12**.

3. The ink densities of the swatches **50** are the per color averages of the per color average densities of the squares **70** of the zone **52**.

It will be appreciated by persons skilled in the art that the present invention is not limited to what has been particularly shown and described hereinabove. Rather the scope of the present invention is defined by the claims which follow.

CLAIMS

1. A method of aiding a printing press operator to determine an initial amount of ink flow for each zone valve of a printing press for a digital image to be printed, the printing press being divided into a multiplicity of zones for each ink color, the method comprising the steps of:

   a. determining, from said digital image, representative ink densities for each zone and for each color in each zone; and

   b. presenting said press operator with at least visual indications of said representative ink densities.

2. A method according to claim 1 and wherein said step of determining comprises the steps of dividing said digital image into a plurality of image zones associated with the zones of said press and determining a representative ink density of each ink color in each image zone and wherein said step of presenting comprises the step of reproducing at least said representative ink densities on a piece of paper.

3. A method according to claim 2 and wherein said step of reproducing comprises the step of creating color strips of said representative ink densities, said color strips having strip zones each of which is associated with one of said image zones and wherein each of said strip zones has therein said representative ink density of said associated image zone.

4. A method according to claim 2 and wherein said step of reproducing comprises the step of plotting said representative ink densities on a color proof.

5. A method according to claim 2 and wherein said step of reproducing comprises the steps of plotting at least said representative ink densities onto color separation films and creating a color proof from said color separation films.

6. A method according to any of the previous claims and wherein said at least visual indications include numerical indications of said representative ink densities.

7. A method according to claim 1 and wherein said visual indications are color strips, one per ink color of said press.

8. A method of setting an initial amount of ink flow for each zone valve of a printing press for a digital image to be printed, the printing press being divided into a multiplicity of zones for each ink color, the method comprising the steps of:

a. determining, from said digital image, representative ink densities for each zone and for each color in each zone;

b. creating a proof having a visual representations of said digital image and having swatches with said representative ink densities; and

c. setting said initial amount of ink flow of each zone valve in accordance with the color of the corresponding representative ink density.

9. A method according to claim 8 and wherein said step of creating produces said visual representation of said image on the same page as said swatches.

10. A method according to claim 8 and wherein said step of creating comprises the step of plotting said representative ink densities on a color proof.

11. A method according to any of the previous claims and wherein said digital image is an imposed signature.

12. A method according to to any of the previous claims and wherein said digital image is a single image.

13. A proof produced by the method of any of claims 2 - 7.

14. A proof produced by the method of any of claims 8 - 12.

15. A method of aiding a printing press operator substantially as hereinbefore described with reference to Figures 2A, 2B and 3 of the accompanying drawings.

The Patent Office

Application No: GB 9606588.3
Claims searched: 1-15

Examiner: R.A.Short
Date of search: 13 June 1996

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B6C (CBNX,CBX,CVAA,CVT,CWE).

Int Cl (Ed.6): B41F

Other: Online:WPI.

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2,271,080 A	(Tecscan Electronics) note use of monitor	1,8
X	GB 2,248,423 A	(Allen-Bradley) see page 11 lines 11-14.	1.
X	GB 2,217,653 A	(Allen-Bradley) see claim 4.	1.
X	GB 2,189,744 A	(Heidelberger) see page 2 lines 77-80.	1,8
X	GB 1,569,961 A	(Heidelberger) see page 3 lines 20-36.	1.
A	EP 0,518,559 A1	(Scitex)	-
X	EP 0,143,228 A1	(Albert-) note display screen 17.	1.
X	US 5,029,527 A	(Jeschke) see claim 1.	1.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.