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(54) **METHOD AND MOUNTER FOR MOUNTING PRINTING PLATES**

VERFAHREN UND VORRICHTUNG ZUR MONTAGE VON DRUCKPLATTEN

PROCÉDÉ ET DISPOSITIF DE MONTAGE DE PLAQUES D'IMPRESSION

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**US-A- 4 743 324 US-A- 5 850 789**

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**EP 2 428 360 B1**

## Description

**[0001]** The invention relates to a method of mounting printing plates on a plurality of cylinders for multi-colour printing.

**[0002]** When a rotary printing press is prepared for a multi-colour print job, one or more printing plates which define a colour separation image are mounted on a printing cylinder in a corresponding colour deck of the printing press. In order for the colour separation images to be superposed on the print substrate (e. g. a web)) in exact registry, it is important that the printing plates are mounted on the printing cylinders in well-defined positions, the side register of the printing cylinders is precisely adjusted in the printing press, and the angular positions of the printing cylinders are precisely controlled so as to obtain the correct longitudinal register. In the present specification, the term "cylinder" shall encompass both, printings cylinders and so-called sleeves that are to be mounted on mandrels that remain in the printing press.

**[0003]** In a conventional print process, the printing plates typically have dimensions corresponding to the size of an entire printing format, i.e. the image that is formed in a complete revolution of the printing cylinders. Each printing plate has two reference structures, e. g. microdots, formed on the opposite sides of the printing plate and in the same longitudinal position. The printing plate is secured to the peripheral surface of the printing cylinder by means of adhesive tape or a re-useable adhesive layer, while the printing cylinder is supported in a mounter. The mounter has two cameras each of which defines a target position for one of the microdots and captures an enlarged image of the microdot and its surroundings while the printing plate is mounted on the cylinder. By observing the images captured by the two cameras, the printing plate is manually adjusted such that each microdot is aligned with a target mark, e. g. a hair-cross in the image of the corresponding camera.

**[0004]** Since the printing plates for the different colour separation images have the same size and the microdots are formed in the same positions, the camera positions in the mounter may be left unchanged while the printing plates are mounted on the various cylinders. This assures that the positional relation between the printing plate and the cylinder will be the same for all cylinders.

**[0005]** EP 1 916 102 B1 discloses a printing system, wherein each printing cylinder has a reference mark, and the mounter includes a sensor which can detect this reference mark and can measure the longitudinal and angular offset of the reference mark relative to the cameras in the mounter. Thus, when the microdots on the printing plate are adjusted relative to the cameras, it is possible to determine the exact longitudinal and angular positions of the microdots relative to the reference mark on the printing cylinder. Once the cylinder has been mounted in the printing press, the reference mark is detected with another sensor in the printing press, so that the longitudinal register and the side register can be appropriately

adjusted.

**[0006]** In large format printing, the printing plates will have a considerable size, and inevitable size variations in the printing plate production process may lead to significant deviations in the distance between the two microdots on the printing plate. This limits the positional accuracy with which the printing plates can be mounted on the cylinders. In order to mitigate this problem, it has been known to reduce the size of the printing plates by dividing the printing format into several tiles, so that the entire format may be composed of a plurality of smaller printing plates that are mounted on the same cylinder. However, this is possible only on condition that the image to be printed is divided into distinct areas, e. g. several frames which all include the same image contents, as is frequently the case in the packaging industry. Otherwise, butting seams between the different plates would be visible in the printed image.

**[0007]** EP 1 990 193 A2 discloses a method and a mounter according to the preamble of claims 1 and 9.

**[0008]** US 4 743 324 A and US 5850 789 A describe methods in which the printing plates are positioned on a flat table and are then transferred onto the cylinder surface.

**[0009]** It is an object of the invention to provide a method and a mounter for carrying out said method of mounting printing plates which permits a high positional accuracy and also permits to save printing plate material and adhesive tape that is necessary from mounting the plates on the cylinder.

**[0010]** In order to achieve this object, the invention proposes a method and a mounter as defined in claims 1 and 9.

**[0011]** According to the invention, the positions of the reference structures on printing plates for different colours may be selected independently from one another. A positional relationship between the plates is established only by the coordinate positions of the reference structures in a common coordinate system. The number of printing plates to be mounted on the same cylinder or, more generally, to be used for the same colour, may be selected differently for each colour, and the printing plates may have different sizes. The invention has the advantage that the number and the sizes of the printing plates for each colour may be optimized depending upon the nature of the respective colour separation image. For example, when a certain colour occurs only in a relatively small portion of the printing format, the size of the corresponding printing plate may be reduced so that it just covers the necessary portion of the image. This significantly reduces the costs for the printing plates and for the adhesive tape. Moreover, when a colour separation image is divided into distinct clusters, separate and relatively small printing plates may be used for each of these clusters, notwithstanding the fact that the colour separation image for another colour covers several of these clusters and therefore requires a larger printing plate. The size reduction of the printing plates will not only reduce the required amount of printing plate material and

tape but will also help to mitigate the problems related to size variations in large-size printing plates that have been discussed above.

**[0012]** Useful optional features and further developments of the invention are indicated in the dependent claims.

**[0013]** According to the invention, each cylinder has a reference mark being detected by a sensor in the mounter. By measuring the offset of the reference mark relative to the mounter for each of the plurality of cylinders, it is possible to define the coordinate positions for the reference structures on the printing plates in a unique coordinate system for all colour separations. Thus the correct positional relationship between the printing plates for different colours can be assured regardless of any possible deviations in the positions in which the cylinders have been installed in the mounter. This will improve the positional accuracy even in cases where the numbers of printing plates, the dimensions of the printing plates, and the coordinate positions of the reference structures (microdots) thereon are the same for all colours.

**[0014]** As an alternative, the reference mark may be formed on the cylinder when the cylinder has been installed in the mounter, and, instead of measuring an offset, the reference mark is placed in a position that has a well defined relation to the coordinate positions of the reference structures on the plates.

**[0015]** The reference structures on the printing plates are not limited to microdots or any other structures that are provided on the printing plates in addition to the printing pattern for the image to be printed. Rather, the invention includes the possibility that any suitable structures in the printing pattern are defined as reference structures, and a coordinate position of the reference structure will then be defined as a coordinate position of a reference image that shows the selected structure in the printing pattern at an enlarged scale. This reference image will then be superposed on a display which also shows the image captured by the camera, and the adjustment of the printing plate is achieved by making the structure in the printing pattern, as captured by the camera, coincide with the reference image.

**[0016]** Preferred embodiments of the invention will now be described in conjunction with the drawings, wherein:

Fig. 1 shows a simple example of a multi-colour printing format that will be used for illustrating the principles of the invention;

Fig. 2 to 4 show configurations of printing plates and reference structures for different colour separations of the printing format shown in Fig. 1;

Fig. 5 is a table showing the contents of a data file that specifies the numbers of printing plates and the coordinate positions of the

reference structures of the printing plates for all colours;

Fig. 6 is a schematic view of a mounter adapted for the method according to the invention;

Fig. 7 shows a display image for assisting an operator in adjusting a printing plate on a printing cylinder in the mounter;

Fig. 8 shows a printing plate configuration corresponding to the one shown in Fig. 2, but with reference structures defined according to another embodiment of the invention; and

Fig. 9 shows a display image similar to the one shown in Fig. 7, but with reference structures as defined in Fig. 8.

**[0017]** Fig. 1 illustrates an example of a printing format 10, i.e. an image that is printed per complete revolution of printing cylinders in a rotary printing press. In this example, the printing format 10 is composed of four frames 12 with identical image contents. The image is a colour image with five colour separations in yellow, red, green, blue and black and is accordingly printed with printing plates on five printing cylinders of the printing press. The yellow colour separation forms the background a rectangular region that covers almost the entire area of the frame 12. The red colour separation is composed of a triangle 16 in the upper left corner of the frame and a square 18 in the left bottom part of the frame. The green colour separation is a circle 20 in the center of the frame, partly overlapped by the red square 18, and the blue colour separation is a triangle that overlaps the green circle 20. The black colour separation is formed by bar code 24 in the bottom right corner of the frame 12.

**[0018]** In a pre-press stage in which the print process is prepared, the printing format 10 may be available in the form of an image file in any suitable image format such as PDF and may be displayed on an interactive monitor screen, so that an operator may define the sizes and shapes of the printing plates for the different colour separations.

**[0019]** Fig. 2 shows the printing format 10 in dot-dashed lines and, superposed therewith, the contours of printing plates 26, 28 and 30 for the yellow and red colour separations, as defined by the operator.

**[0020]** The printing plate 26 for the yellow colour separation covers the entire printing format 10, as it is conventional in the art. As reference structures, the printing plate 26 is provided with two microdots 32 on the left and right margins of the format 10. The coordinate positions of the microdots 32 are defined in an X-Y-coordinate system in which the X-axis corresponds to the transverse direction of a web on which the image is to be printed, and the Y-axis corresponds to running direction of the

web. The two microdots 32 have the same Y-coordinate.

**[0021]** Since the triangle and the square 18 forming the red colour separation are found only in the left half of each frame 12, the operator has decided to provide two separate printing plates 28, 30 for this colour separation. Each printing plate covers two frames in Y-direction but has only a width of approximately on half of the frame in X-direction, so that the material needed for forming the two printing plates 28, 30 is less than half of the material needed for the printing plate 26.

**[0022]** It would have been possible to further divide this colour separation into four printing plates, each of which would then only include the triangle 16 at the square 18 of a single frame.

**[0023]** However, the gain in additional plate material would have been relatively small and would not have paid-off for the additional work that is necessary for mounting a larger number of plates on the printing cylinder.

**[0024]** Each of the printing plates 28, 30 has two microdots 32 which, in this example, have the same Y-coordinate as the microdots of the printing plate 26.

**[0025]** As an alternative, microdots 32' may be provided in diagonally opposite corners of the printing plates 28, 30. This has the advantage that the accuracy in positioning the printing plates on the printing cylinder is improved, because the distance between the microdots is larger and especially the positions of the top and bottom ends of the printing plates can be defined with higher accuracy.

**[0026]** As is shown in Fig. 3, a single printing plate 34 has been defined for the four circles 20 forming the green colour separation. However, the dimensions of the printing plate 34 can be smaller than the those of the printing plate 26 for the yellow colour separation, so that plate material can be saved. The printing plate 34 has two microdots 32 located at the same Y-coordinate as the those of the printing plates 26, 28 and 30.

**[0027]** Fig. 4 shows the layout of printing plates 36, 38 for the blue and the black colour separations. As many as four separate printing plates have been defined for each colour, with the result that the printing plates can be made extremely small. Each of the printing plates 36, 38 has two microdots 32 which, however, need to have Y-coordinates different from those of the microdots of the printing plates 26, 28, 30 and 34 for the other colour separations. Yet, the printing plates 36 and also the printing plates 38 form pairs in which the microdots have the same Y-coordinates.

**[0028]** In case of the printing plates 36 for the blue colour separation, one of the microdots, designated as 32", falls within the blue triangle 22. This microdot is an inverse microdot, i.e. a white dot on the blue background. In flexographic printing, for example, this means that a small depression is formed in the printing pattern that defines the solid blue area. In general, such inverse dots are more difficult to see than normal "positive" dots.

**[0029]** Fig. 5 is a table which shows for each colour

separation the number of plates that have been defined for the respective colour separation, an identification (Plate-No.) for the individual plates that belong to the same colour, and the X- and Y-coordinates of the two microdots of each printing plate.

**[0030]** A data file with the contents of the table shown in Fig. 5 is sent from the pre-press stage to the plate production stage where it is used to prepare the plates with the respective printing patterns and the microdots thereon. The data file may also specify the shapes and positions of the different printing plates in the printing format. Although all the printing plates have a rectangular shape in the example shown, it would generally also be possible to use printing plates with non-rectangular shapes.

**[0031]** Fig. 6 shows a mounter 40 that is used for mounting the printing plates on printing cylinders 42. The mounter has a base 44 with releasable bearings 46, 48 for rotatably supporting the printing cylinder 42. A drive motor 50 is provided for rotating the printing cylinder. A high resolution displacement sensor 52 permits to control and keep track of the angular movements of the printing cylinder 42.

**[0032]** A guide rail 54 is rigidly mounted on the base 44 and carries two camera carriages 56 each of which is equipped with a camera 58 that faces the peripheral surface of the printing cylinder 42. The camera carriages 56 can be driven to move along the guide rail 54, and include displacement sensors for detecting the positions of the camera carriages with high resolution.

**[0033]** A magnetic reference mark 60 is embedded in the peripheral surface of the printing cylinder 42, and a sensor 62 (e.g. a Hall sensor) is rigidly mounted on the bed 44 for precisely measuring the position of the reference mark 60 in two dimensions.

**[0034]** The drive motor 50 and the displacement sensor 52 for the printing cylinder 42, the cameras 58 and the drive units and displacement sensors of the camera carriages 56, and the sensor 62 are connected to an electronic control unit 66.

**[0035]** The process of mounting a printing plate (e.g. the printing plate 28 shown in Fig. 2) on the printing cylinder 42 will now be explained in detail.

**[0036]** Once the printing cylinder 42 (in this case the one for the red colour deck) has been mounted in the bearings 46, 48 and locked in position, the sensor 62 detects the position of the reference mark 60 in both, the axial direction of the printing cylinder 42 and the direction normal to the plane of the drawing in Fig. 6. The axial direction of the printing cylinder 42 corresponds to the direction of the X-axis in Fig. 2, and the direction normal to the plane of the drawing in Fig. 6 corresponds to the Y-direction in Fig. 2. The offsets between the reference mark 60 and the sensor 62 in these directions are measured with the sensor 62 and stored in the control unit 66. These offsets serve for defining zero-positions for the X- and Y-coordinates.

**[0037]** The printing plate 28 is placed on the peripheral

surface of the printing cylinder 42 with adhesive tape intervening between the plate and the cylinder, but is not yet finally fixed in position, so that positional adjustments are still possible.

**[0038]** The contents of the data file shown in Fig. 5 are loaded into the control unit 66 and stored therein. The camera carriages 56 are driven to move the cameras 58 into the positions specified by the X-coordinates of the microdots 32. If the sensor 62 has detected an offset in X-direction, the camera positions are corrected by this offset, so that the reference or zero position for the X-coordinates of the microdots 62 is not formed by the sensor 62 but by the reference mark 60 on the printing cylinder.

**[0039]** Each camera 58 captures an enlarged image of a portion of the surface of the printing plate 28 that includes the respective microdot 32. Both images are shown in a display image 68, as has been illustrated in Fig. 7. A target mark 70, e.g. a hair-cross is superposed on the image of each camera. These target marks correspond exactly to the intended X-coordinates for the microdots 32. Then, the printing plate 28 is manually adjusted until the microdots 32 are exactly aligned with the centers of the target marks 70. In the example shown in Fig. 7, the printing plate has to be shifted to the left and slightly rotated clockwise. When both microdots 32 have been optimally centered onto the target marks 70, the printing plate 28 is finally fixed in position.

**[0040]** Then, the camera carriages 56 are driven to move the cameras into the target positions for the next printing plate (30) that is to be mounted on the same cylinder 42. Since the microdots 32 of both printing plates 28 and 30 have identical Y-positions, as shown in Fig. 2, it is not necessary to change the angular position of the printing cylinder 42.

**[0041]** It is observed that, since the cameras 58 move automatically to the intended coordinate positions of the microdots, even inverse dots such as the dot 32" in Fig. 4 can be found easily.

**[0042]** When the second printing plate 30 has been adjusted and mounted in the same way as has been described for the plate 28, the printing cylinder 42 is removed from the mounter 40, and the next printing cylinder is installed in the mounter and the necessary printing plates are mounted thereon by repeating, for each printing plate, the procedure that has been described above.

**[0043]** A slightly modified procedure is necessary for a printing cylinder, for which the microdots 32 of the printing plates have different Y-coordinates. In the present example, this would be the case for the printing plates 36 (Fig. 4) for the blue colour separation, and also for the printing plates 38 for the black colour separation. When, for example, the first two printing plates 36 have been mounted, which have their microdots 32 at identical Y-positions, the printing cylinder has to be rotated into the position for mounting the remaining two printing plates 36. The difference between the Y-coordinates of the microdots 32 of the first two plates and the Y-coordinates

of the microdots of the second two plates is transformed into an angular displacement of the printing cylinder, and the drive motor 50 is controlled to rotate the printing cylinder by a suitable angle, the angular displacement being controlled with high resolution by the displacement sensor 52. Thus, it can be assured that all printing plates of all cylinder have well defined angular or Y-positions relative to one another.

**[0044]** When the printing plates for all colours have been mounted on their respective cylinders, the cylinders can be mounted in the printing press. Then, the positions of the reference marks 60 are detected in the printing press, and the side registers are adjusted so that the reference marks of all printing cylinders are exactly aligned with one another. Since the reference marks 60 serve as a reference position for the microdots 32 of all the printing plates, it is assured that all printing plates have exactly the correct lateral or X-position in the printing press.

**[0045]** The angular positions of the printing cylinders in the printing press are also adjusted by reference to their reference marks 60. However, in the mounter, the sensor 62 may have detected different offsets in Y-direction for the different printing cylinders. The angular positions of the printing cylinders in the printing press are therefore corrected by the measured offsets, so that all printing plates for all colours will also have the correct longitudinal register.

**[0046]** In an alternative according to the present invention, the cameras 58 of the mounter 40 are adjustable in circumferential direction of the printing cylinder independently of one another. This will allow a configuration of the microdots as illustrated by the microdots 32' in Fig. 2, i.e. a configuration where two microdots of the same printing plate 28 have different Y-coordinates. Then, the two cameras 58 will be rotated to the angular positions that correspond to these Y-coordinates, so that both microdots 32' can be observed and displayed simultaneously in the display image 68.

**[0047]** Figs. 8 and 9 illustrate an embodiment where the printing plates (e.g. the printing plate 28) does not have any microdots at all. Instead, certain features of the image to be printed are used directly as reference structures 72, 74. In the example shown, these features are the top left corner of the triangle 16 and the lowermost corner of the square 18. The data file to be transmitted to the control unit 16 includes enlarged copies of these image features, and these copies are presented as reference images 72', 74' in the display image 68, as has been shown in Fig. 9. The data file will also include a coordinate position for each reference image, e. g. the coordinates of the image centre, and the cameras 58 are adjusted to these coordinate positions.

**[0048]** These reference images 72' and 74' will now serve as target marks. The same image features will also be visible in the images captured by the cameras 58. In Fig. 9, these features of the printing pattern on the printing plate 28 are designated as 72" and 74", respectively. In

order to adjust the printing plate on the printing cylinder, the plate will be shifted until the features 72", 74" coincide with the respective reference images 72', 74'.

## Claims

1. A method of mounting printing plates (26, 28, 30, 34, 36, 38) on a plurality of cylinders (42) for multi-colour printing, comprising the steps of:

- a) determining, for each colour, a number of printing plates to be mounted on a corresponding cylinder (42),
- b) specifying coordinate positions for at least two reference structures (32; 32'; 72, 74) on each printing plate,
- c) forming the reference structures at the specified coordinate positions on the printing plates,
- d) installing one of the cylinders (42) in a mounter (40) having two cameras (58),
- e) adjusting the cameras (58) in a first direction (X) to the specified coordinate positions for one of the printing plates (28) and mounting the printing plate on the cylinder (42) in a position where each reference structure (32; 32'; 72, 74) is included in an image (68) captured by one of the two cameras and is aligned with a target mark (70 ; 72', 74') that corresponds to the specified coordinate position,
- f) repeating step (e) for each printing plate to be mounted on the cylinder, and
- h) repeating steps (d) to (f) for each cylinder,

**characterized in that** it comprises the further steps of:

- providing a reference mark (60) on each cylinder (42), and
- determining a positional relationship between the reference mark and the coordinate positions of the reference structures, and **in that**
- in step e), the positions of the cameras relative to the cylinder (42) are adjusted also in a second direction (Y) orthogonal to said first direction (X) by controlling a drive motor (50) to rotate the cylinder (42) in the mounter (40) in accordance with the positional relationship between the reference mark and the coordinate positions or by rotating the cameras (58) relative to the cylinder (42) independently of one another in accordance with the positional relationship between the reference mark and the coordinate positions.

2. The method according to claim 1, wherein the number of printing plates to be mounted on the cylinder differs from cylinder to cylinder.

3. The method according to claim 1 or 2, wherein printing plates (26, 28) that cover the same part of the image but are to be mounted on different cylinders differ in size and/or shape.

4. The method according to any of the preceding claims, wherein each of at least two printing plates (36, 38) to be mounted on the same cylinder (42) has a pair of reference structures (32), the reference structures of each plate being aligned in a first direction (X), and the reference structures (32) of different printing plates (36, 38) being offset relative to one another in a second direction (Y) orthogonal to said first direction (X).

5. The method according to any of the preceding claims, wherein the reference structures are microdots (32).

6. The method according to claim 5, wherein at least one microdot is an inverse microdot (32'), i. e. a small depression formed in a printing pattern that defines a solid area.

7. The method to any of the claims 1 to 4, wherein reference structures (72, 74) are found by features of the image to be printed, and a reference image (72', 74') of each feature is shown on a display image (68), the reference image being superposed with the image captured by the camera (58) in order to form the target mark.

8. The method according any of the preceding claims , comprising the steps of:

- detecting, for each cylinder, an offset between the reference mark (60) and a fixed position (62) on the mounter (40) in at least one direction (X), and
- correcting the coordinate positions of the reference structures (32; 32'; 72, 74) by the offset that has been measured for the respective cylinder.

9. A mounter for carrying out the method according to any of the preceding claims, comprising two cameras (58) that are moveable relative to the peripheral surface of a cylinder (42) installed in the mounter into a first direction (X), the positions of the cameras in said first direction (X) being adjustable independently of one another, the mounter further comprising a control unit (66) adapted to receive coordinate positions of reference structures (32; 32'; 72, 74) on printing plates (26, 28, 30, 34, 36) to be mounted on the cylinder (42) and to adjust the positions of the cameras (58) in said first direction (X) in accordance with the coordinate positions, **characterized in that** a sensor (62) is arranged to detect a reference mark (60) on

the cylinder (42), and the control unit (66) is adapted to adjust the positions of the cameras (58) relative to the cylinder (42) also in a second direction (Y) orthogonal to said first direction (X) by controlling a drive motor (50) to rotate the cylinder (42) in the mounter (40) in accordance with the positional relationship between the reference mark and the coordinate positions or by rotating the cameras (58) relative to the cylinder (42) independently of one another in accordance with the positional relationship between the reference mark and the coordinate positions.

10. The mounter according to claim 9, wherein the sensor (62) is arranged to detect an offset between the position of a reference mark (60) on the cylinder (42) and the position of the sensor (62), the control unit (66) being adapted to correct the coordinate positions of the reference structures in at least one direction (X) in accordance with the measured offset.

#### Patentansprüche

1. Verfahren zum Montieren von Druckplatten (26, 28, 30, 34, 36, 38) an einer Mehrzahl von Zylindern (42) zum mehrfarbigen Drucken, das die Schritte umfasst:
- a) Für jede Farbe Bestimmen einer Anzahl von an einem entsprechenden Zylinder (42) zu montierenden Druckplatten,
  - b) Spezifizieren von Koordinatenpositionen für wenigstens zwei Referenzstrukturen (32; 32'; 72, 74) auf jeder Druckplatte,
  - c) Bilden der Referenzstrukturen an spezifizierten Koordinatenpositionen auf den Druckplatten,
  - d) Anbringen eines der Zylinder (42) an einem Mounter (40), der zwei Kameras (58) aufweist,
  - e) Einstellen der Kameras (58) in einer ersten Richtung (X) in die spezifizierten Koordinatenpositionen für eine der Druckplatten (28) und Montieren der Druckplatte an dem Zylinder (42) in einer Position, in der jede Referenzstruktur (32; 32'; 72, 74) in einem Bild (68) enthalten ist, das von einer der beiden Kameras erfasst wird und mit einer Zielmarkierung (70; 72'; 74') ausgerichtet wird, die der spezifizierten Koordinatenposition entspricht,
  - f) Wiederholen des Schrittes (e) für jede an dem Zylinder zu montierende Druckplatte, und
  - h) Wiederholen der Schritte (d) bis (f) für jeden Zylinder,

**dadurch gekennzeichnet, dass** es ferner die Schritte umfasst:

- Vorsehen einer Referenzmarkierung (60) an jedem Zylinder (42), und
- Bestimmen einer Positionsbeziehung zwischen der Referenzmarkierung und den Koordinatenpositionen der Referenzstrukturen, und dass
- In Schritt e) die Positionen der Kameras relativ zu dem Zylinder (42) auch in einer zweiten, zu der ersten Richtung (X) orthogonalen Richtung (Y) durch Regeln eines Antriebsmotors (50) angepasst werden, um den Zylinder (42) in dem Mounter (40) in Übereinstimmung mit der Positionsbeziehung zwischen der Referenzmarkierung und den Koordinatenpositionen zu drehen, oder durch Drehen der Kameras (58) relativ zu dem Zylinder (42) unabhängig voneinander im Übereinstimmung mit der Positionsbeziehung zwischen der Referenzmarkierung und den Koordinatenpositionen.

2. Verfahren nach Anspruch 1, wobei sich die Anzahl der auf dem Zylinder zu montierenden Druckplatten von Zylinder zu Zylinder unterscheidet.

3. Verfahren nach Anspruch 1 oder 2, wobei sich Druckplatten (26, 28), die den gleichen Teil des Bildes abdecken, aber an verschiedenen Zylindern montiert werden sollen, hinsichtlich Größe und/oder Form unterscheiden.

4. Verfahren nach einem der vorhergehenden Ansprüche, wobei jeder der wenigstens zwei Druckplatten (36, 38), die an dem gleichen Zylinder (42) montiert werden sollen, ein Paar Referenzstrukturen (32) aufweist, wobei die Referenzstrukturen jeder Platte in einer ersten Richtung (X) ausgerichtet werden, und die Referenzstrukturen (32) von verschiedenen Druckplatten (36, 38) relativ zueinander in einer zweiten, zu der ersten Richtung (X) orthogonalen Richtung (Y) versetzt sind.

5. Verfahren nach einem der vorhergehenden Ansprüche, wobei die Referenzstrukturen Mikropunkte (32) sind.

6. Verfahren nach Anspruch 5, bei dem wenigstens ein Mikropunkt ein invertierter Mikropunkt (32') ist, d.h. eine kleine, in einer Druckvorlage gebildete Vertiefung, die ein festes Gebiet definiert.

7. Verfahren nach einem der Ansprüche 1 bis 4, wobei Referenzstrukturen (72, 74) durch Merkmale des zu druckenden Bildes gefunden werden, und ein Referenzbild (72', 74') jedes Bildes auf einem Anzeigebild (68) gezeigt wird, wobei das Referenzbild mit dem Bild überlagert wird, das von der Kamera (58) erfasst wird, um die Zielmarkierung zu bilden.

8. Verfahren nach einem der vorhergehenden Ansprüche, die Schritte umfassend:

- Für jeden Zylinder Detektieren eines Versatzes zwischen der Referenzmarkierung (60) und einer festen Position (62) auf dem Mounter (40) in wenigstens einer Richtung (X), und  
- Korrigieren der Koordinatenpositionen der Referenzstrukturen (32; 32'; 72, 74) durch den Versatz, der für den jeweiligen Zylinder gemessen worden ist.

9. Mounter zum Durchführen des Verfahrens nach einem der vorhergehenden Ansprüche, umfassend zwei Kameras (58), die relativ zu der Umfangsfläche eines an dem Mounter montierten Zylinders (42) in einer ersten Richtung (X) beweglich sind, wobei die Positionen der Kameras in der ersten Richtung (X) unabhängig voneinander einstellbar sind, wobei der Mounter weiter ein Steuergerät (66) umfasst, das eingerichtet ist, Koordinatenpositionen von Referenzstrukturen (32; 32'; 72, 74) auf an dem Zylinder (42) zu montierenden Druckplatten (26, 28, 30, 34, 36) zu empfangen und die Positionen der Kameras (58) in der ersten Richtung (X) in Übereinstimmung mit den Koordinatenpositionen anzupassen, **dadurch gekennzeichnet, dass** ein Sensor (62) angeordnet ist, um eine Referenzmarkierung (60) auf dem Zylinder (42) zu detektieren, und das Steuergerät (66) eingerichtet ist, die Positionen der Kameras (58) relativ zu dem Zylinder (42) auch in einer zweiten, zu der ersten Richtung (X) orthogonalen Richtung (Y) durch Regeln eines Antriebsmotors (50) anzupassen, um den Zylinder (42) in dem Mounter (40) in Übereinstimmung mit der Positionsbeziehung zwischen der Referenzmarkierung und den Koordinatenpositionen zu drehen oder durch Drehen der Kameras (58) relativ zu dem Zylinder (42) unabhängig voneinander in Übereinstimmung mit der Positionsbeziehung zwischen der Referenzmarkierung und den Koordinatenpositionen.
10. Mounter nach Anspruch 9, wobei der Sensor (62) angeordnet ist, einen Versatz zwischen der Position der Referenzmarkierung (60) auf dem Zylinder (42) und der Position des Sensors (62) zu detektieren, wobei das Steuergerät (66) eingerichtet ist, die Koordinatenpositionen der Referenzstrukturen in wenigstens einer Richtung (X) in Übereinstimmung mit dem gemessenen Versatz zu korrigieren.

## Revendications

1. Procédé de montage de plaques (26, 28, 30, 34, 36, 38) d'impression sur plusieurs cylindres (42) pour l'impression polychrome, comprenant les étapes consistant à :

a) déterminer, pour chaque couleur, un nombre de plaques d'impression à monter sur un cylindre correspondant (42) ;  
b) spécifier des positions de coordonnées pour au moins deux structures (32 ; 32' ; 72, 74) de référence sur chaque plaque d'impression ;  
c) former les structures de référence aux positions de coordonnées spécifiées sur les plaques d'impression ;  
d) installer un des cylindres (42) dans un dispositif (40) de montage possédant deux caméras (58) ;  
e) régler les caméras (58) dans une première direction (X) par rapport aux positions de coordonnées spécifiées pour une des plaques (28) d'impression et monter la plaque d'impression sur le cylindre (42) dans une position dans laquelle chaque structure (32 ; 32' ; 72, 74) de référence est incluse dans une image (68) capturée par une des deux caméras et est alignée avec un repère cible (70 ; 72', 74') qui correspond à la position de coordonnée spécifiée ;  
f) répéter l'étape (e) pour chaque plaque d'impression à monter sur le cylindre ; et  
h) répéter les étapes (d) à (f) pour chaque cylindre,

**caractérisé en ce qu'il** comprend les étapes supplémentaires consistant à :

- procurer un repère (60) de référence sur chaque cylindre (42) ; et  
- déterminer une relation de position entre le repère de référence et les positions de coordonnées des structures de référence ; **et en ce que** - à l'étape e), les positions des caméras par rapport au cylindre (42) sont réglées également dans une seconde direction (Y) orthogonale par rapport à ladite première direction (X) en commandant un moteur (50) d'entraînement pour la mise en rotation du cylindre (42) dans le dispositif (40) de montage conformément à la relation de position entre le repère de référence et les positions de coordonnées, et par la mise en rotation des caméras (58) par rapport au cylindre (42) de manière réciproquement indépendante conformément à la relation de position entre le repère de référence et les positions de coordonnées.

2. Procédé selon la revendication 1, dans lequel le nombre de plaques d'impression à monter sur le cylindre diffère d'un cylindre à l'autre.

3. Procédé selon la revendication 1 ou 2, dans lequel des plaques (26, 28) d'impression qui recouvrent la même partie de l'image, mais qui doivent être montées sur des cylindres différents, diffèrent en ce qui

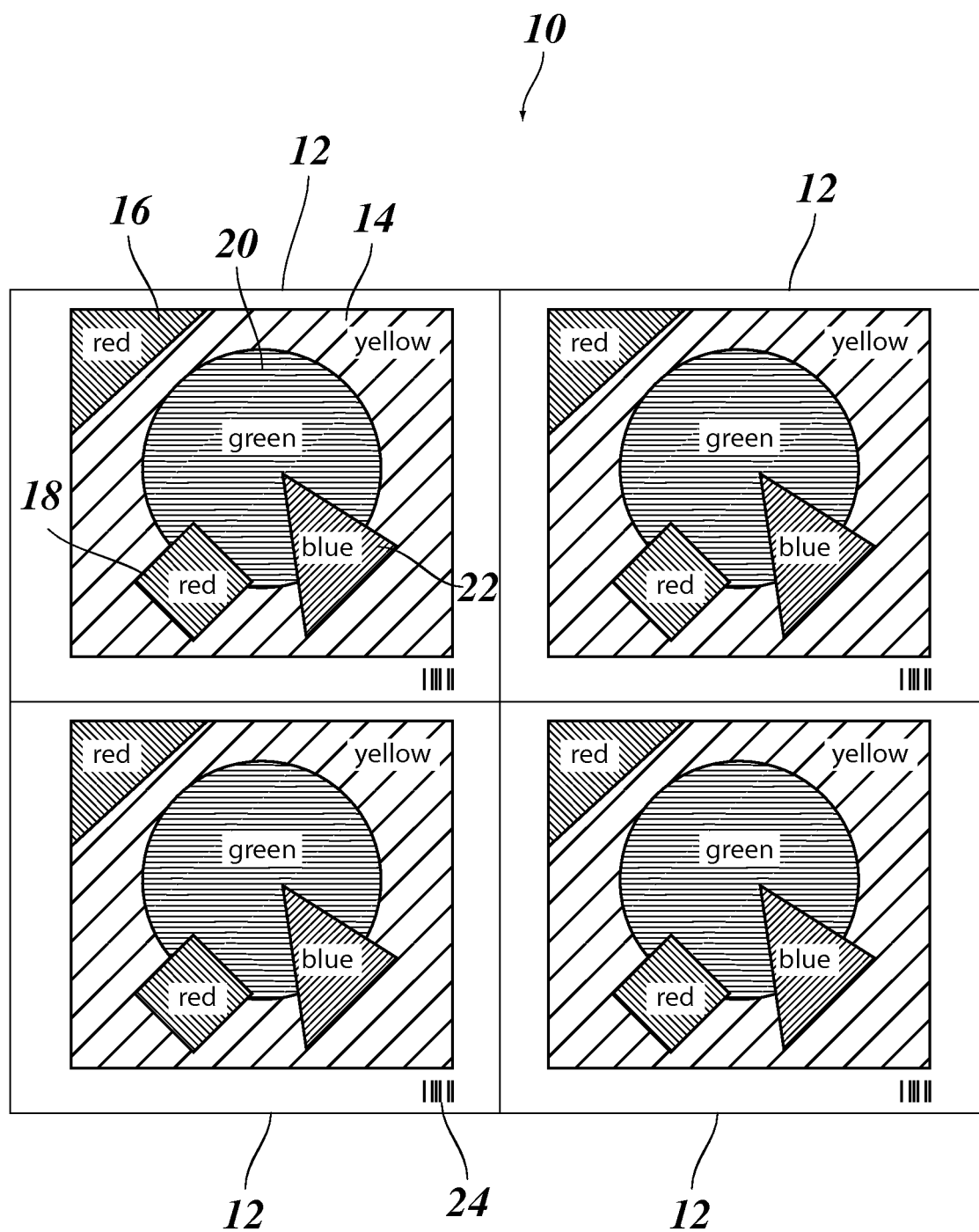
concerne leur dimension et/ou leur configuration.

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel chacune desdites au moins deux plaques (36, 38) d'impression à monter sur le même cylindre (42) possède une paire de structures (32) de référence, les structures de référence de chaque plaque étant alignées dans une première direction (X), et les structures (32) de référence de différentes plaques (36, 38) d'impression étant décalées les unes par rapport aux autres dans une seconde direction (Y) orthogonale à ladite première direction (X). 5
5. Procédé selon l'une quelconque des revendications précédentes, dans lequel les structures de référence sont des micropoints (32). 10
6. Procédé selon la revendication 5, dans lequel au moins un micropoint représente un micropoint inverse (32'), c'est-à-dire une petite dépression formée dans un motif d'impression qui définit une zone pleine. 15
7. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel des structures (72, 74) de référence sont trouvées par des caractéristiques de l'image à imprimer, et une image (72', 74') de référence de chaque caractéristique est représentée sur une image (68) d'affichage, l'image de référence étant superposée à l'image capturée par la caméra (58) dans le but d'obtenir le repère cible. 20
8. Procédé selon l'une quelconque des revendications précédentes, comprenant les étapes consistant à : 25
  - détecter, pour chaque cylindre, un décalage entre le repère de référence (60) et une position fixe (62) sur le dispositif (40) de montage dans au moins une direction (X) ; et 30
  - corriger les positions de coordonnées des structures (32 ; 32' ; 72, 74) de référence par le décalage qui a été mesuré pour le cylindre respectif. 35
9. Dispositif de montage pour la mise en oeuvre du procédé selon l'une quelconque des revendications précédentes, comprenant deux caméras (58) qui sont mobiles par rapport à la surface périphérique d'un cylindre (42) monté dans le dispositif de montage, dans une première direction (X), les positions des caméras dans ladite première direction (X) étant réglables de manière respectivement indépendante, le dispositif de montage comprenant en outre une unité (66) de commande conçue pour recevoir des positions de coordonnées de structures (32 ; 32' ; 72, 74) de référence sur des plaques (26, 28, 30, 34, 36) d'impression à monter sur le cylindre (42) et pour 40

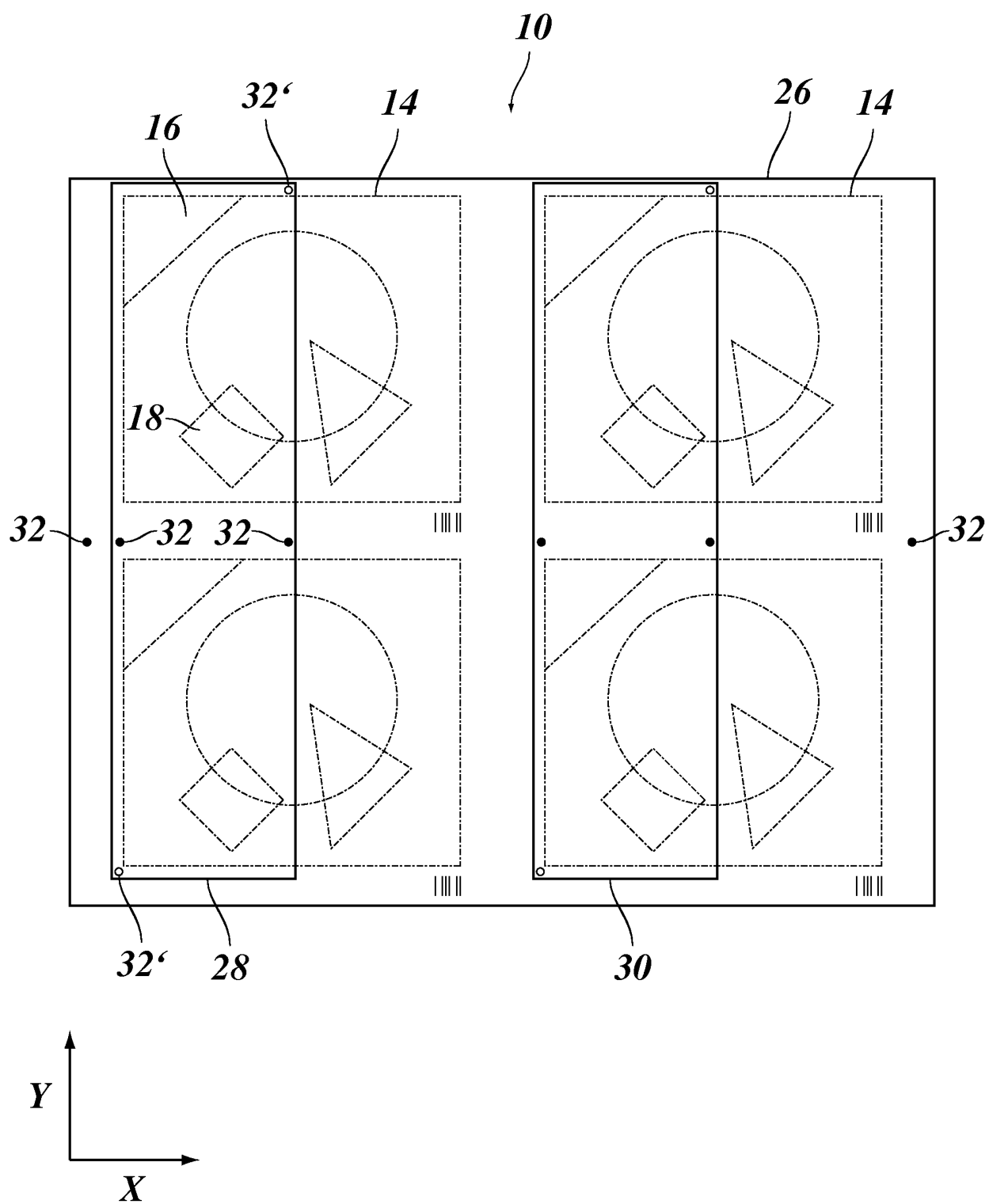
régler les positions des caméras (58) dans ladite direction (X) conformément aux positions de coordonnées, **caractérisé en ce qu'un** capteur (62) est monté pour détecter un repère (60) de référence sur le cylindre (42) et l'unité (66) de commande est conçue pour régler les positions des caméras (58) par rapport au cylindre (42) également dans une seconde direction (Y) orthogonale à ladite première direction (X) en commandant un moteur (50) d'entraînement pour la mise en rotation du cylindre (42) dans le dispositif (40) de montage conformément à la relation de position entre le repère de référence et les positions de coordonnées, ou par la mise en rotation des caméras (58) par rapport au cylindre (42) de manière réciproquement indépendante conformément à la relation de position entre le repère de référence et les positions de coordonnées.

10. Dispositif de montage selon la revendication 9, dans lequel le capteur (62) est disposé pour détecter un décalage entre la position d'un repère (60) de référence sur le cylindre (42) et la position du capteur (62), l'unité (66) de commande étant conçue pour corriger les positions de coordonnées des structures de référence dans au moins une direction (X) conformément au décalage mesuré. 45

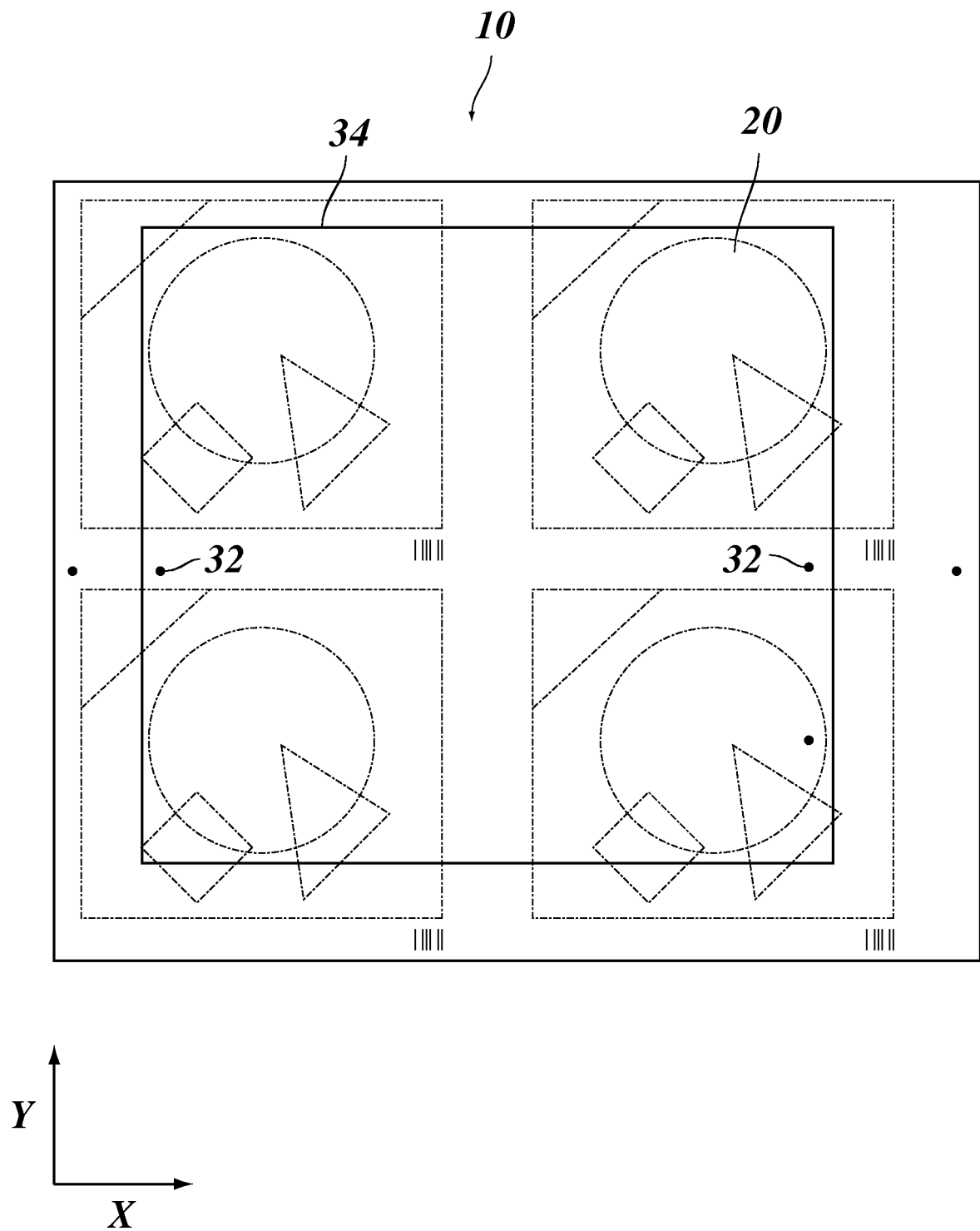
*Fig. 1*



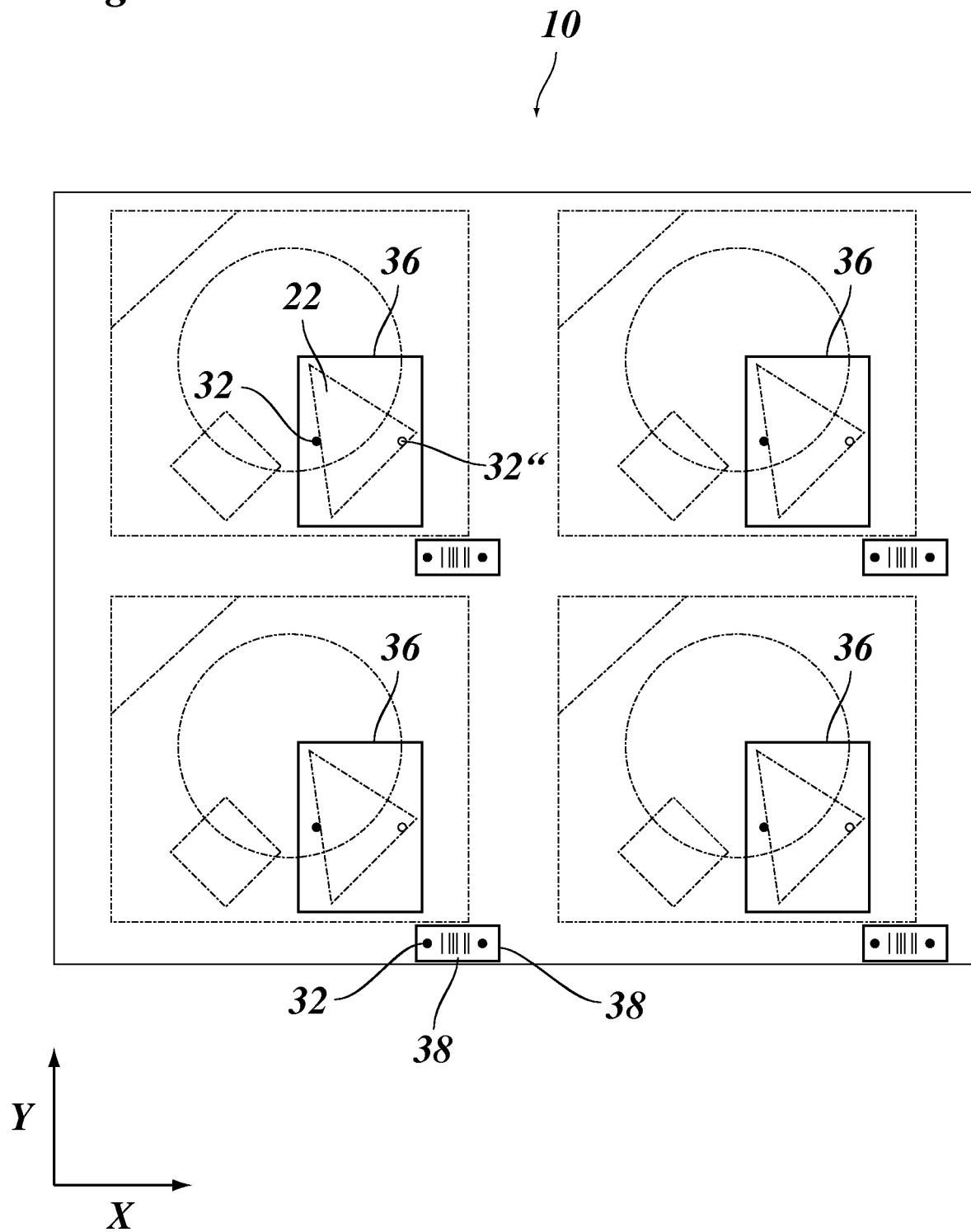
**Fig. 2**



**Fig. 3**



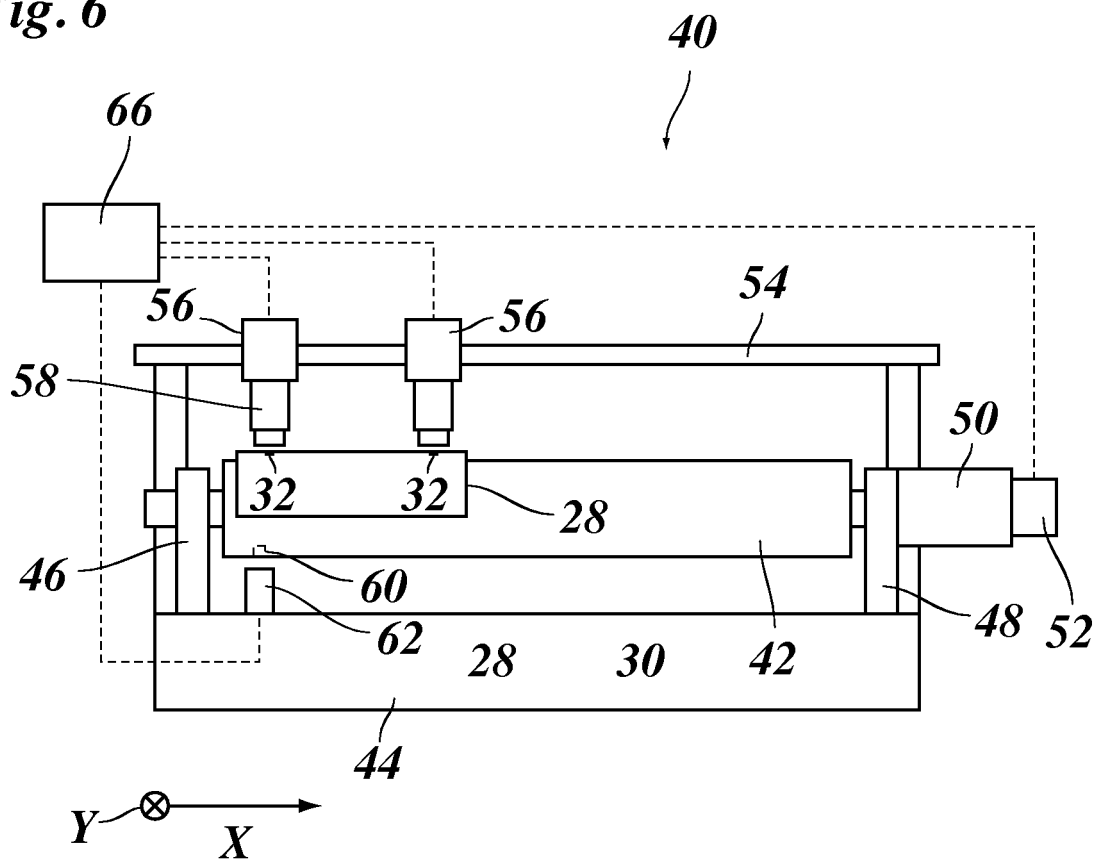
*Fig. 4*



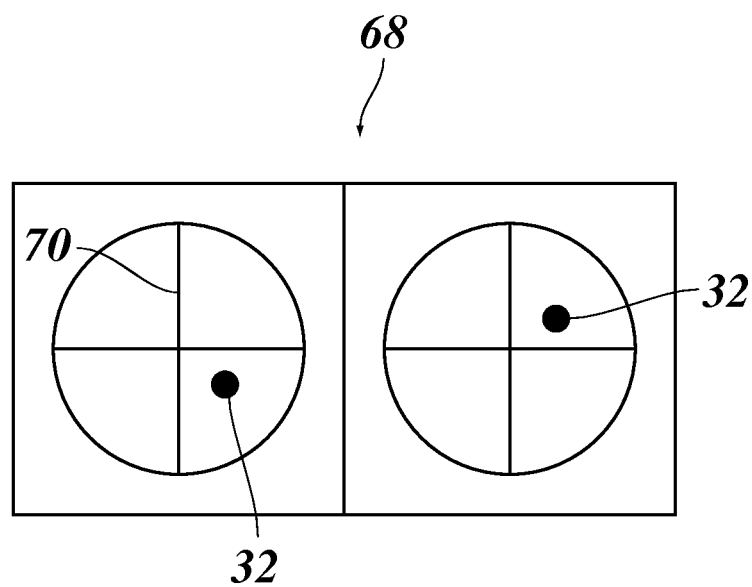
***Fig. 5***

| Colour | Plates | Plate-No. | Coordinates |   |       |   |
|--------|--------|-----------|-------------|---|-------|---|
|        |        |           | Dot 1       |   | Dot 2 |   |
|        |        |           | X           | Y | X     | Y |
| yellow | 1      | 1         |             |   |       |   |
| red    | 2      | 1         |             |   |       |   |
|        |        | 2         |             |   |       |   |
| green  | 1      | 1         |             |   |       |   |
| blue   | 4      | 1         |             |   |       |   |
|        |        | 2         |             |   |       |   |
|        |        | 3         |             |   |       |   |
|        |        | 4         |             |   |       |   |
| black  | 4      | 1         |             |   |       |   |
|        |        | 2         |             |   |       |   |
|        |        | 3         |             |   |       |   |
|        |        | 4         |             |   |       |   |

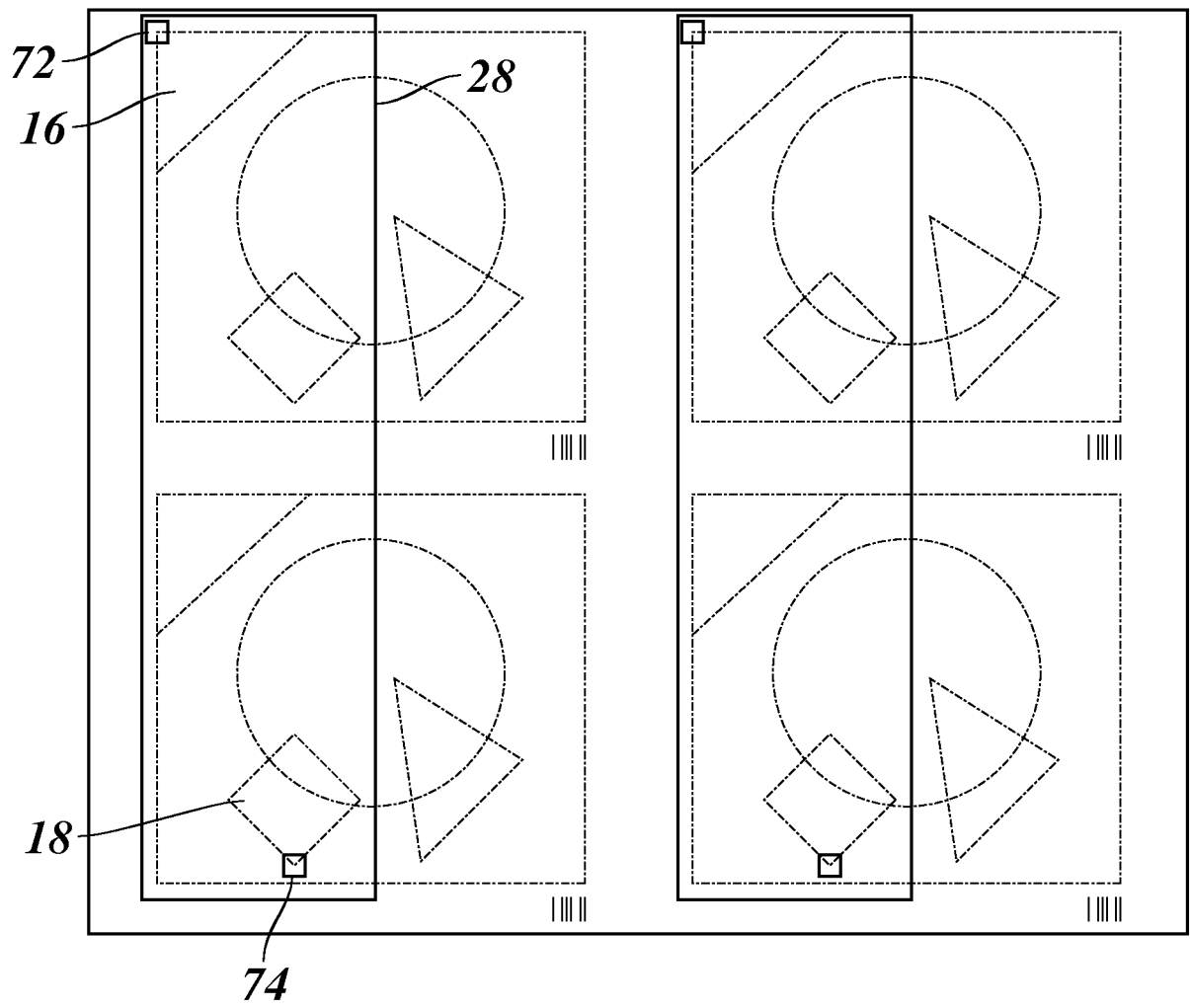
**Fig. 6**



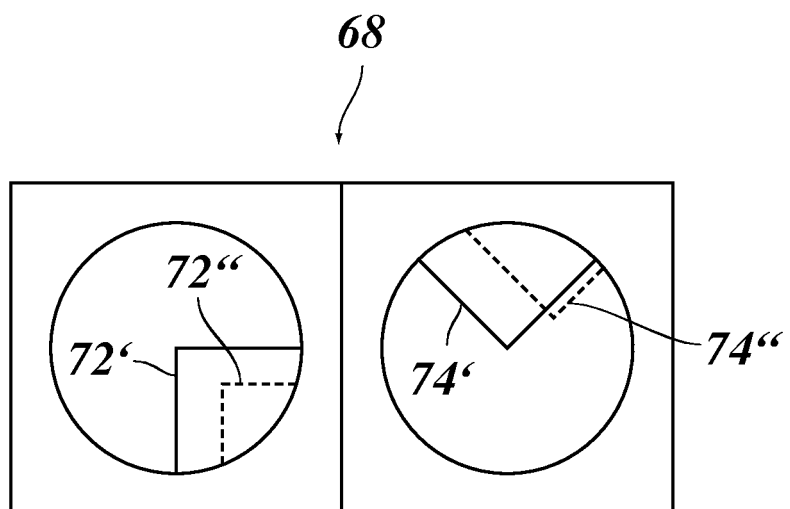
**Fig. 7**



**Fig. 8**



**Fig. 9**



**REFERENCES CITED IN THE DESCRIPTION**

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