CONVENTION

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599693

APPLICATION FOR A STANDARD PATENT

I/We Heidelberger Druckmaschinen Aktiengesellschaft

of Kurfursten-Anlage 52-60,
D-6900 Heidelberg,
FEDERAL REPUBLIC OF GERMANY.

hereby apply for the grant of a standard patent for an invention entitled:

PROCESS AND DEVICE FOR REGISTER CORRECTION

which is described in the accompanying complete specification.

Details of basic application

Number of basic application: P 36 33 855.9

Convention country in which basic application was filed: FEDERAL REPUBLIC OF GERMANY

Date of basic application : 4 October 1986

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Dated: 10 August 1987

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By:

LODGED AT SUB-OFFICE
27 AUG 1987
Melbourne

APPLICATION ACCEPTED AND AMENDMENTS ALLOWED 17-5-90

Our Ref : 64326
POF Code: 1386/1386

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A-503

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DECLARATION FOR A PATENT APPLICATION

▼ INSTRUCTIONS
(a) Insert "Convention" if applicable
(b) Insert FULL name(s) of applicant(s)

In support of the (a) Convention application made by
(b) HEIDELBERGER DRUCKMASCHINEN AKTIENGESELLSCHAFT

(c) Insert "of addition" if applicable
(d) Insert TITLE of invention

(hereinafter called "applicant(s) for a patent (c) for an invention entitled (d)
"PROCESS AND DEVICE FOR REGISTER CORRECTION"

(e) Insert FULL name(s) AND address(es) of declarant(s) (See headnote*)

~~I~~/We (e) WOLFGANG PFIZENMAIER and BALDUR STOLTENBERG both
of Heidelberger Druckmaschinen Aktiengesellschaft
Kurfursten-Anlage 52-60, D-6900 Heidelberg,
Federal Republic of Germany
do solemnly and sincerely declare as follows:

~~1. I am/We are the applicant(s).~~

(or, in the case of an application by a body corporate)

~~1. I am~~/We are authorized to make this declaration on behalf of the applicant~~(s)~~.

~~2. I am/We are the actual inventor(s) of the invention.~~

(or, where the applicant(s) is/are not the actual inventor(s))

(f) Insert FULL name(s) AND address(es) of actual inventor(s)

2. (f) WILLI JESCHKE, Viertelstr. 44, 7506 Bad Herrenalb 5,
Federal Republic of Germany, and
ANTON RODI, Karlsruher Str. 12, 6906 Leimen,
Federal Republic of Germany,

~~is~~/are the actual inventor(s) of the invention and the facts upon which the applicant~~(s)~~ is~~/are~~ entitled to make the application are as follows:

(g) Recite how applicant(s) derive(s) title from actual inventor(s) (See headnote**)

(g) Applicant is the assignee of the actual inventors.

(Note: *Paragraphs 3 and 4 apply* **only** *to Convention applications)*

(h) Insert country, filing date, and basic applicant(s) for the/or EACH basic application

3. The basic application~~(s)~~ for patent or similar protection on which the application is based is~~/are~~ identified by **country, filing date, and basic applicant~~(s)~~** as follows:

(h) Federal Republic of Germany,
4th October 1986
Heidelberger Druckmaschinen Aktiengesellschaft

4. The basic application~~(s)~~ referred to in paragraph 3 hereof was~~/were~~ the first application~~(s)~~ made in a Convention country in respect of the invention the subject of the application.

(k) Insert PLACE of signing

Declared at (k) Heidelberg

(l) Insert DATE of signing

Dated (l) April 19,1990

(m) Signature(s) of declarant(s)

(m) HEIDELBERGER DRUCKMASCHINEN AKTIENGESELLSCHAFT

Pfizenmaier Stoltenberg

Note: No legalization or other witness required

To: The Commissioner of Patents

P18/7/78

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REGISTER CORRECTION DEVICE AND PROCESS

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(56) Prior Art Documents
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(57) Claim

1. Process for register correction by swivelling a flexible printing plate on a plate cylinder of a printing press, the printing plate being disposed on the plate cylinder such as to be swivellable about a point on the plate, and apparatuses being provided in the press for adjustments of the circumferential register and the side register, wherein data of a register deviation of a defined register point is determined on a specimen print with respect to circumferential deviation, ~~the~~ side deviation and angular deviation, by means of said data a rotation about a fixed point of rotation on the plate, necessary to eliminate said deviations, and a necessary displacement of the circumferential position and the side position are determined and adjustment apparatuses of the press are actuated according to the data determined for final register corrections.

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Complete Specification for the invention entitled:

PROCESS AND DEVICE FOR REGISTER CORRECTION

Our Ref : 64326
POF Code: 1386/1386

The following statement is a full description of this invention, including the best method of performing it known to applicant(s):

The invention relates to a process and to a device for register correction.

Known from DE-OS 35 41 222 is a device for correcting the skew fit of a printing plate in a printing press. This device consists of a bearing block with a clamping element for holding one end of the plate, with the clamping element comprising slots into which project pins of a mounting block. Owing to the arrangement of the slots, the turning of the clamping element on the printing-plate cylinder is possible, with the result that a skew fit of the plate can be eliminated. The skew position of a printing plate on a plate cylinder of a printing unit is established with reference to a printing plate on the plate cylinder of a further printing unit. A disadvantage of this device lies in the fact that it is possible merely to correct a skew fit of a printing plate, it not being possible with this device to turn the printed image about randomly selectable points in order to achieve register correction.

Furthermore, it is generally known, particularly in the case of web-fed offset printing presses, to correct the skew position of a printing plate in that the printing-plate cylinder is, by way of its mountings, set at a skew in accordance with the angle of the skew position of the printing plate. Although this makes it possible to counteract the skew position of the printed image, the moving of the cylinder causes a distortion of the

printed image to the extent that a rectangular image is printed, shifted in the manner of a parallelogram.

According to one aspect of the present invention there is provided a process for register correction by swivelling a flexible printing plate on a plate cylinder of a printing press, the printing plate being disposed on the plate cylinder such as to be swivellable about a point on the plate, and apparatuses being provided in the press for adjustments of the circumferential register and the side register, wherein data of a register deviation of a defined register point is determined on a specimen print with respect to circumferential deviation, ~~the~~ side deviation and angular deviation, by means of said data a rotation about a fixed point of rotation on the plate, necessary to eliminate said deviations, and a necessary displacement of the circumferential position and the side position are determined and adjustment apparatuses of the press are actuated according to the data determined for final register corrections.

According to another aspect of the present invention, there is provided a device for register correction, particularly for the implementation of the above process, including the following components:

a) apparatus for acquiring the data of the register point, i.e. its location and the there existing register deviations with respect to circumferential position and side position as well as the deviation from the angular position,

b) input apparatus for inputting said data of the register point,

c) a computer for linking said data with the conditions of a fixed point of rotation on the plate and for determining the adjusting commands for corresponding adjusting apparatuses,

d) apparatuses with acutators for correcting the circumferential register and the side register and for swivelling the printing plate on the plate cylinder.

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~~- swivelling the printing plate on the plate cylinder.~~

The invention considerably simplifies the adjusting operations for obtaining good in-register printing. Conventionally, it has been necessary, with reference to a first specimen print, to determine the skew position of the printing plate and to straighten the latter and, subsequently, after a further specimen print, to determine and correct the side- and circumferential-register offset. Now, the data for circumferential and side register as well as for angular position are established and the correction performed after just one specimen print. The ensuing specimen print then shows a correct printed image.

An essential advantage of the invention is both a saving in time when setting up and also a reduction in the amount of waste produced.

Misaligned printed images in the individual printing colours may be due to various reasons. In the manufacture of a printing plate, for example, it may happen that an image that is to be transferred onto the printing plate is projected onto the printing plate out of alignment or at a skew with respect to the alignment of the printing plate. Furthermore, under certain circumstances, if the printing plate is not properly clamped into the holding device of the printing-plate cylinder, the printing plate may be clamped out of alignment. Such a misalignment with respect to the printing plate of a further printing unit in a multi-

colour printing press cannot be compensated for by adjustments to side and circumferential register, but can at best be reduced to a lesser error.

An operator will detect such an error, for example, by detecting good register in one area of a printed image and a register deviation in another area. The printing plate must then be turned about a point in the area of good register. From the area of register deviation it is possible, with reference to the register centre of rotation, to determine a swivel or rotation angle of the plate in magnitude and direction. Since the printing plate can, for design reasons, be turned only about a precisely defined centre of rotation on the printing-plate cylinder, it is necessary after the turning of the printing plate about this centre of rotation to compensate for the shift in side and circumferential register.

If there is both a side- and circumferential-register offset as well as a misalignment of a printing plate, then an area of good register cannot be detected on the printed image. In this case, the deviation of all three values to be corrected must be determined either at register marks or directly from the register error in the image.

A further advantage of the invention is to be seen in the fact that certain areas of an image can be declared as vital areas, with the alignment of the plate being performed particularly in accordance with these areas.

According to a preferred further development of the invention, it is proposed that ~~an~~ the input apparatus includes an input panel. ~~be provided for the inputting of the data, with this inputting apparatus comprising an input panel.~~ The input panel corresponds to the printed image on an identical or different scale. Such an input panel allows the particularly simple inputting of the data in that the position of the register point on the printed product can be input, identical as regards position, into the input panel. Likewise, the magnitude and direction of the turning angle can be input into the input panel in the manner of a graphic input. Of course, it is also possible to input one or more data numerically via the input panel.

A further advantageous preferred embodiment of the invention is to be seen in that the input panel comprises different scale factors for the x- and y-directions, with reference to the printed product. This is practical particularly if, for example, there is only a small and limited space available on a control console of a printing press or if an existing input panel of given dimensions is to be used for the inputting of the data.

In a further preferred development of the invention, it is proposed that the input panel be in the form of a sensor array, with the data then being input by means of corresponding sensors, possibly by pressing or touching sensor buttons or by means of contactless inductive transmission.

According to an advantageous preferred further development, situated below the sensor array is a display array for showing the positions or data that have been input so

that, as the data are being input, they are displayed at the same time, with it being possible for a correction to be made immediately to any data that have been incorrectly input. This display is useful particularly if, for example, the magnitude of the turning angle is input graphically e.g. as the chord between the two sides of the angle.

A preferred embodiment of the invention provides for the use of an inking-zone-display and -input system, of the kind used in the majority of remote-control consoles for the control of a printing press, as a control console for the process. Such a so-called inking-zone display shows the ink-layer profile over the entire printing width and consists, for example,of a multiplicity of rows of light-emitting diodes, with each row being assigned to an ink-metering element and the length of each row representing the magnitude of the inking gap. The instantaneously set inking gap of an individual ink-metering element is indicated by the lighting-up of one or more light-emitting diodes in the row. By means of buttons or other controls, the respective inking gap and the corresponding display can be altered. Such an inking-zone display can be used advantageously to input the data for turning the plate. In this case, the width of the inking-zone display represents the width of the printing plate, while the length of the printing plate is represented by the length of the rows of diodes. It is thus possible to activate a sensor element, corresponding to the position of the register point, and the light-emitting diode assigned to it and to enter and/or display the

direction and magnitude of the turning angle, for example by energizing several sensor elements, with their light-emitting diodes in a row. Of course, it is necessary prior to such inputting of the data to change the input mode and to select the printing unit in which the plate is to be turned.

It is also possible to use display and/or input panels additionally present on a control console of a printing press, for example for adjusting the registers in the individual printing units, for the graphic inputting of the data.

According to a preferred further development of the invention, it is proposed that a light pen be used for inputting the data. This light pen can be used on a sensor panel for inputting the position of the register point and the turning angle by means of suitable light-sensitive sensors. Of course, it is also possible instead of a light pen to use an input device cooperating, for example, via an inductive coupling with the input panel, as well as to use a photoelectric-barrier grid instead of an input array, which has the advantage that no auxiliary devices are required for inputting the data. In addition, a plurality of pushbuttons is conceivable as an aid for inputting.

An advantageous preferred embodiment of the invention consists in that the printing plate is mounted at its two ends in holding rails and that said holding rails are swivellable, with the turning of the printing plate being effected by the swivelling of the holding rails.

The swivelling motion may be accomplished, for example, by an electric motor or hydraulically (see also German Patent Application P 36 04 209.9). Return information on the motion is possible by means of suitable sensors on the corresponding actuator.

The side- and circumferential-register correction may likewise be accomplished in known manner with suitable actuators, for example servo-motors. In advantageous manner, the already existing servo-motors for the side and the circumferential registers are used for this.

~~Specimen~~ Preferred embodiments of the invention are shown in the drawings and are explained in greater detail in the following description; in which

Fig. 1a shows two printed images that are misaligned and offset with respect to one another;
Fig. 1b shows two further printed images that are misaligned with reference to one another;
Fig. 2 shows an input and display unit for inputting the data necessary for correction;
Fig. 3 shows a further specimen embodiment of an input and display unit;
Fig. 4 shows an input and display unit for inking-profile adjustment and correction of the printing plates;
Fig. 5 shows a block diagram on the correction of the position of the printing plate;
Fig. 6 shows a flow chart of the process steps of a correction.

The illustration in Fig. 1a shows a specimen print with

the printed image 1 of a first ink and the printed image 2 of a second ink. Compared with printed image 2, printed image 1 exhibits both a circumferential-register offset Fu and also a side-register offset Fs and a skew position, which is defined by the turning angle Fα. The error amounts are, of course, very small and have been very greatly exaggerated in the drawing merely for better comprehension. From this specimen print, a printer establishes, for example by the evaluation of register marks, the register deviations and the misalignment of printed image 1 with respect to printed image 2. The register marks are evaluated, for example, in known manner by means of a measuring lens or with a register-mark reader. Of course, it is also possible to determine the register errors directly in the image. Once established, the three error quantities Fu, Fs, Fα are supplied to a computing apparatus via a suitable input unit, for example graphically, as will be described in the following. From these quantities, the computing apparatus produces the necessary actuating signals, i.e. it swivels the printing plate 1 about its centre of rotation B by angle Fα and simultaneously produces actuating signals for register relocation, with the register relocation being determined on the basis of the swivelling about the centre of rotation B and on the basis of the register offset established from the specimen print.

The illustration in Fig. 1b shows a special case in which two printed images are misaligned. The position of printed image 2 is the reference position, while printed image 1 is misaligned with respect to printed

image 2. In this example, the circumferential- and side-register settings are correct. This results in a register point A and in an area BA which shows good register. This is a special case, i.e. within the printed image there is an area BA which shows good register, while in an area remote from it, BC, the register deviation is caused only by the turning angle, it thus being possible for the turning angle F_{α} to be determined directly from this register deviation.
The data may, for example, be acquired as follows:
On the specimen print 30, the printer looks for the area BA showing good register. Register point A is placed in this area BA, it, of course, not always being possible exactly to define the position of the register point; nor is this necessary for implementing the process. The area in which there is the greatest register deviation or in which a register deviation can be found (area BC) is likewise established from the specimen print, and a point C 1 on printed image 1, which is offset with respect to a point C on printed image 2, is found, thus establishing the distance between these two points C/C1 and determining the angle F_{α} . The choice of position of area Bc is arbitrary, it only being important that a precise determination of the angle be possible in the area chosen.
The printing plate containing printed image 1 must be turned about register point A by angle F_{α} . This register point A may be in any position. The plate is turned after the determination of the aforementioned points in that the printing plate with the printed image 1 is turned about a fixed position B. The fixed position is determined by the design of the swivellable printing-plate mounting device.

Of course, it is possible in a printing press with several printing units to equip each printing-plate cylinder with a rotatable and/or swivellable printing-plate mount in order to be able to correct any skew position of any of the printed images. For this purpose, the position of a printing plate in a given printing unit may be chosen as the reference position. Normally, this will be the printing unit in which the ink best conforms to the printing conditions.

Fig. 2 shows an input unit 3 with which the data necessary for the correction of the angular position can be input graphically. This input unit 3 comprises a sensor area 4 which consists of an array with light-sensitive elements. The light-sensitive elements can be activated with a a light pen 5. The sensor panel 4 is intended to represent the printed image, with the result that, to input the already existing register centre of rotation A' as in Fig. 1b or the desired register point in a vital image area as in Fig. 1a, the light pen 5 is used on the sensor panel 4 to input that position which corresponds to the position of register centre of rotation A on the printed image. Input in an identical manner is position C' at which the turning angle was established on the printed image.

There are several possible ways of inputting the magnitude and the direction of the turning angle. Some of these are to be indicated here. By means of a numerical keyboard, the angle and its direction can be input directly as a chord length with corresponding sign (+ or -).

With the light pen 5, the angle, starting from point C', can be input in magnitude and direction by moving the light pen in the direction of arrow 6. Of course, it must be borne in mind that the magnitude of the angle must be input on an enlarged scale in order to make it at all possible to input very small angles.

A further possibility consists in providing an angle-input panel 7 on the sensor panel, it being possible, once again on an enlarged scale, to input the angle F_{α} by moving the light pen 5, starting from a zero point, in one of the two directions of rotation CW-CCW.

In order to show the data that have been input, the sensor panel may be provided underneath with a display panel, with the result that the input of points A' C' and of the chord length of angle F_{α} is indicated immediately, allowing a subsequent comparison of the inputted data with the printed image.

Instead of the light-sensitive sensors and a light pen it is also conceivable, for example, to use pressure-sensitive sensors which can be activated by pressing with the finger. The inputting of the data is not restricted to specific sensors and/or input elements. From the multiplicity of known sensor elements for the formation of input panels, it is possible to select the most favourable for the particular application for the implementation of the process.

A further variant of a display unit is shown in Fig. 3. The input unit 8 contains a button panel 9 with pushbuttons. Once again, the position of r -

point A' is made by pressing a button 10 situated at the corresponding position or in the vicinity of this position, and the position of location C', at which the turning angle was established, by pressing button 11 which is situated in the area of this location. The magnitude of the angle can also, for example, be input in that the button 11 is depressed several times with each actuation of the button corresponding to a given angle increment. The direction of the turning angle is in this case input by pressing a button 12 adjacent to button 11, with button 12 lying in the direction in which the printing plate and/or the printed image must be turned.

The inputting of the register deviations Fu, Fs is not shown in Fig. 2 and 3 and can be input in known manner by numerical inputting or directly via a register-mark reader.

Fig. 4 shows a further specimen embodiment for inputting the turning of a printing plate. Most known offset printing presses, particularly sheet-fed offset printing presses, have a control console which is provided, among other things, for setting the ink-layer thickness profile in the individual printing units. Such a control console is known, for example, under the name CPC I from HEIDELBERGER DRUCKMASCHINEN AKTIENGESELLSCHAFT (source: HEIDELBERGER Nachrichten 3/40). Fig. 4 shows a detail of a control and display panel of such a control console. An inking-zone display is situated on this control console in the lower region. The inking-zone display 14 consists of

32 rows of light-emitting diodes, with each row of light-emitting diodes indicating the position of an ink-metering cylinder through the lighting-up of one or two light-emitting diodes. The position of a row of light-emitting diodes corresponds in each case to the position of the ink-metering cylinder in the inking unit. It is thus possible, in the case of a printed product 17 which can be laid on the control console 13 above the inking-zone display 14, to influence in simple manner the inking in the individual inking zones on the basis of the correspondence between inking zone and row of light-emitting diodes. A change in the position of the metering cylinders can be input by means of a light pen 16 at the corresponding row of light-emitting diodes. For this purpose, each light-emitting diode has a light-sensitive sensor.

With this control console and the inking-zone display, it is possible, after changes in the input mode, to input graphically the data for the positional correction of a printing plate. For this purpose, the register centre of rotation A, which is situated obviously in a quite specific inking zone, is input in that, in the row of diodes corresponding to the inking zone, the light pen is used to input that point which corresponds approximately to the position of the register point in the longitudinal direction of the printed sheet. This point that is input is identified in Fig. 4 by A' and is indicated through the lighting-up of the associated light-emitting diode. The length of the row of light-emitting diodes is specified as the length of the printed sheet. In the same manner, point C, at which the deviation from the angular position was

established, is input at the row of light-emitting diodes corresponding to that inking zone in which point C is situated (row of light-emitting diodes 12). Also the vertical position of the inputted point C' on the row of light-emitting diodes must correspond approximately to the position of point C on the printed sheet. This point C' that has been input lights up likewise after it has been input. The inputting of the magnitude and direction of the turning angle can, in this example, be accomplished in a manner similar to that shown in Fig. 2 by inputting with an angle-input panel. For this purpose, the input mode is changed on the inking-zone display, such that, for example, in the row of light-emitting diodes in which point C' was input (row of light-emitting diodes 12), the centre light-emitting diode now lights up and - starting from this centre light-emitting diode - the direction of the angle is input by moving the light pen up or down, with the magnitude of the angle F being input by the length of the distance covered with the light pen on the row of light-emitting diodes. Once again, for example, the distance between two light-emitting diodes may correspond to a given chord length of angle F_{α}, so that the operator has the possibility of inputting the magnitude of the angle with very great accuracy - with corresponding resolution. Once again, it is possible for the angle that has been input to be displayed.

Fig. 5 shows a block diagram with a circuit and actuators for the implementation of a position correction to a printing plate. The block diagram contains a central processing unit 19 to which a memory 20 is assigned. An input and display unit 21 serves for the

graphic inputting of the register centre of rotation A' and of the correction point C' and of the angle F_{α} and for displaying these inputs. An additional control panel 22 is provided for the inputting of additional data such as selection of printing unit and register offset, said additional control panel, just like the input and display unit, being connected to the processing unit 19. The processing unit 19 is furthermore connected to an actuator 23 for clamping and releasing a printing plate, to a servo-motor 24 for turning the printing plate as well as to two servo-motors for adjusting the side and circumferential registers. The servo-motors 24, 25, 26 are each provided with angle-position sensors for position feedback. This Figure shows only those actuators for one printing unit or for the adjustment of one printing plate in one printing unit. Of course, the printing plates of several printing units can be adjusted by the processing unit 19; the actuators for the further printing units will be similar to the actuators shown here.

With reference to the flow chart shown in Fig. 6, the principle of the processing unit 19 and the operation of the control panel 22 are described in greater detail. The flow chart contains the process steps 101 to 120. After a start signal 101, the correction to the position of the plate is initiated 102 by pressing an initiating button 30 on the control panel 22. Subsequently, the selection of printing unit 103a is made by pressing one of the printing-unit selection buttons 5. The printing unit that has been selected is indicated by an illuminated display. In instruction

103b, any existing register errors Fu, Fs for side and circumferential register are input, for example by way of the input panel 38. In a first interrogation 104, the decision must be taken as to whether a register point is to be input. If an input is not desired, then there is an immediate correction point interrogation 108. If the register point is to be input, then the register point has to be activated by pressing the register-point button 32 (instruction 105); if there is a value for the register point in the memory 20, it is displayed on the input and display unit 21 (point A'). In the following instruction 106, there is an interrogation as to a change of register point. If the displayed register point A' is not to be changed, then instruction 107 is skipped. If a change is necessary, a new value A' should be input via the input and display unit. This newly input value is likewise displayed on the input and display unit 21, while the previous value is deleted. Furthermore, the newly input value is loaded into the memory 20, i.e. the previous value is overwritten. The following interrogation 108 concerns the inputting and changing of correction point C'. If this is not necessary, then interrogation 112 ensues immediately. If an input is desired, the correction point is to be activated by pressing the correction-point button 33 (instruction 109). If a correction point C' has already been stored, it is displayed on the input and display unit 21. In the following correction-point-change interrogation 110, a decision must be made as to whether the displayed correction point is to be retained - in this case, instruction 111 (inputting of correction point) is skipped. If a new correction

point C' is to be input, the correction point (instruction 111) must be input by way of the input and display unit. The newly input correction point C' is likewise loaded into the memory 20; the previous correction point is deleted in the memory and in the display. The interrogation 112 concerns the displaying and inputting of angle F_{α} in magnitude and direction. A no-decision leads to a printing-unit interrogation 116, a yes-decision activating the angle display (instruction 113); an angle F_{α} that has been stored in the memory 20 is displayed via the input and display unit 21. After the angle button 34 on the control panel 22 has been pressed and after the stored angle F_{α} has been displayed, it is necessary in interrogation 114 to decide whether the previously stored angle is to be retained in magnitude and direction. In this case, the inputting of a new angle (instruction 115) is skipped. A new angle is input likewise via the input and display unit 21. The graphic inputting of the angle can be effected by the inputting methods described with reference to Fig. 2, 3 and 4. This value, too, is stored in the memory 20, and the previously stored and the previously displayed value is deleted. The following interrogation 116 concerns the selection of a further printing unit, i.e. if the turning of a printing plate in a further printing unit is likewise to be pereformed, then, after this printing unit has been selected via the printing-unit selection button 35, the entire procedure has to be repeated; if it is not necessary to turn a plate in a further printing unit, then, in a following interrogation 117, it must be decided whether the adjustment of the printing plate or plates is to be

performed in accordance with the data that have been input. If, for certain reasons, an adjustment is not necessary, then, by pressing a delete button 36, the given data are deleted (instruction 118). If an adjustment is desired on the basis of the data that are stored or that have been input, the input button 31 is pressed, whereupon the adjustment is performed. To adjust the printing plate by means of the motors 24, 25, 26, the following values are computed from the data stored in the memory 20:

The coordinates of points A and C on the printed image, the magnitude of angle F_{α} from the inputted chord length of the angle and the coordinates of points A and C.

The coordinates of points A and C can be computed in simple manner on the basis of the scale factor between the size of the input panel and the size of the printing plate; likewise, the computation of the angle from the inputted value can be performed in simple manner. The adjustment of the side and circumferential register is computed in accordance with the inputted circumferential- and side-register errors Fu, Fs and in accordance with the position of the register point with respect to the plate centre of rotation B.

Once the manipulated variables for the motors are available, the plate that is to be adjusted is released from the plate cylinder by means of the actuator 23 so that a rotation is possible and then this rotation through angle F_{α} is performed with the motor 24. After this rotation, the plate is clamped again.

Simultaneously or subsequently, a correction to the side and circumferential registers is made with motors 25 and 26. The feedback of the motions executed by the motors is accomplished by the angle-position sensors 27, 28, 29.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Process for register correction by swivelling a flexible printing plate on a plate cylinder of a printing press, the printing plate being disposed on the plate cylinder such as to be swivellable about a point on the plate, and apparatuses being provided in the press for adjustments of the circumferential register and the side register, wherein data of a register deviation of a defined register point is determined on a specimen print with respect to circumferential deviation, ~~the~~ side deviation and angular deviation, by means of said data a rotation about a fixed point of rotation on the plate, necessary to eliminate said deviations, and a necessary displacement of the circumferential position and the side position are determined and adjustment apparatuses of the press are actuated according to the data determined for final register corrections.

2. Device for register correction, particularly for the implementation of the process according to Claim 1, including the following components:

a) apparatus for acquiring the data of the register point, i.e. its location and the there existing register deviations with respect to circumferential position and side position as well as the deviation from the angular position,

b) input apparatus for inputting said data of the register point,

c) a computer for linking said data with the conditions of a fixed point of rotation on the plate and for determining the adjusting commands for corresponding adjusting apparatuses,

d) apparatuses with actuators for correcting the circumferential register and the side register and for swivelling the printing plate on the plate cylinder.

3. Device according to Claim 2, wherein the input apparatus includes an input panel representing the printed image to scale or not to scale, and wherein the position of the

register point as well as the magnitude and the direction of the swivelling angle, necessary for correcting the angular position, can be input into said input panel corresponding graphically and/or numerically to the deviations of the print product.

4. Device according to claim 3, wherein the scale of the input panel with reference to the printing plate is randomly selectable and/or is different in the x- and y-directions.

5. Device according to any one of preceding claims 3 or 4, wherein the input panel is a sensor array, with which sensor array the position of the register point and/or the swivel angle in magnitude and direction are input via input means, said input means activating the corresponding sensors.

6. Device according to any one of preceding claims 3 or 4, wherein the input panel is a pushbutton array, into which pushbutton array the data can be input by the pressing of corresponding buttons.

7. Device according to any one of preceding claims 5 or 6, wherein located below the array is a display array, with which display array the inputted positions and/or data are displayed.

8. Device according to Claim 3, wherein ~~the~~ an input and display panel for regulating the ink amount in ink zones serves as the input panel for the data of the register point, the input mode being modified such that, to scale or not to scale, the width of the ink zone display corresponds to the width of the printing plate and the length of a respective row of diodes corresponds to the length of the printing plate.

9. Device according to any one of preceding claims 3, 5 or 8,
w h e r e i n
the input data are input with a light pen.

10. Device according to any one of the preceding claims,
w h e r e i n
the printing plate is mounted at both ends in holding rails and the holding rails are swivellable and displaceable, the turning of the printing plate about the plate point of rotation being effected by at least one actuator acting on the holding rails.

~~11. Process for register correction substantially as herein particularly described with reference to any one of the embodiments as shown in the accompanying drawings.~~

12. Device for register correction substantially as herein particularly described with reference to any one of the embodiments as shown in the accompanying drawings.

DATED: 27 August, 1987
PHILLIPS ORMONDE & FITZPATRICK
Attorneys for:
HEIDELBERG DRUCKMASCHINEN AKTIENGESELLSCHAFT

Fig. 1a

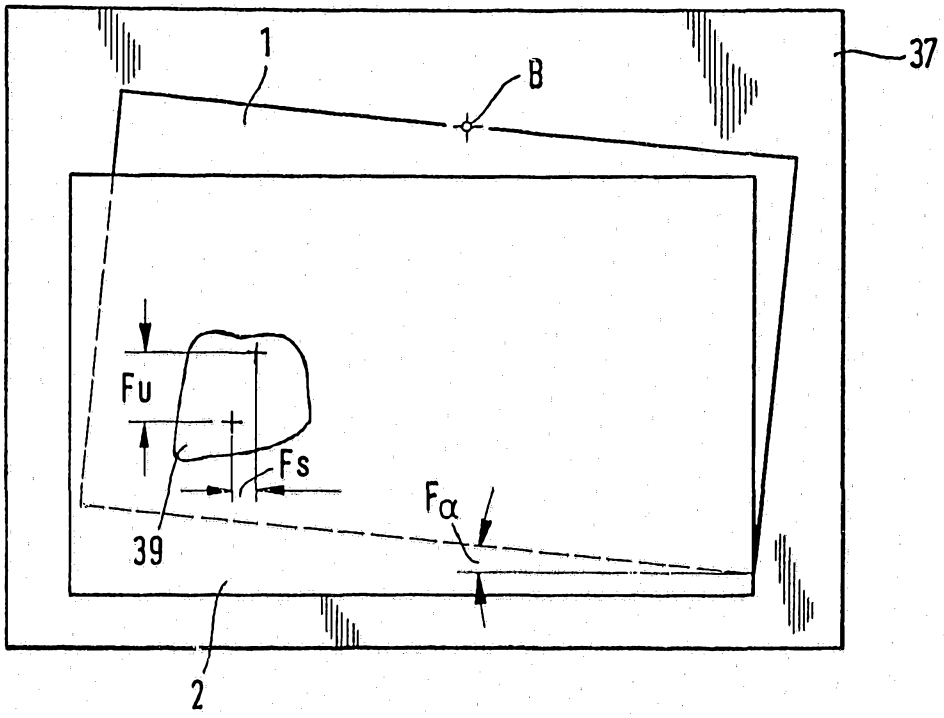


Fig. 1b

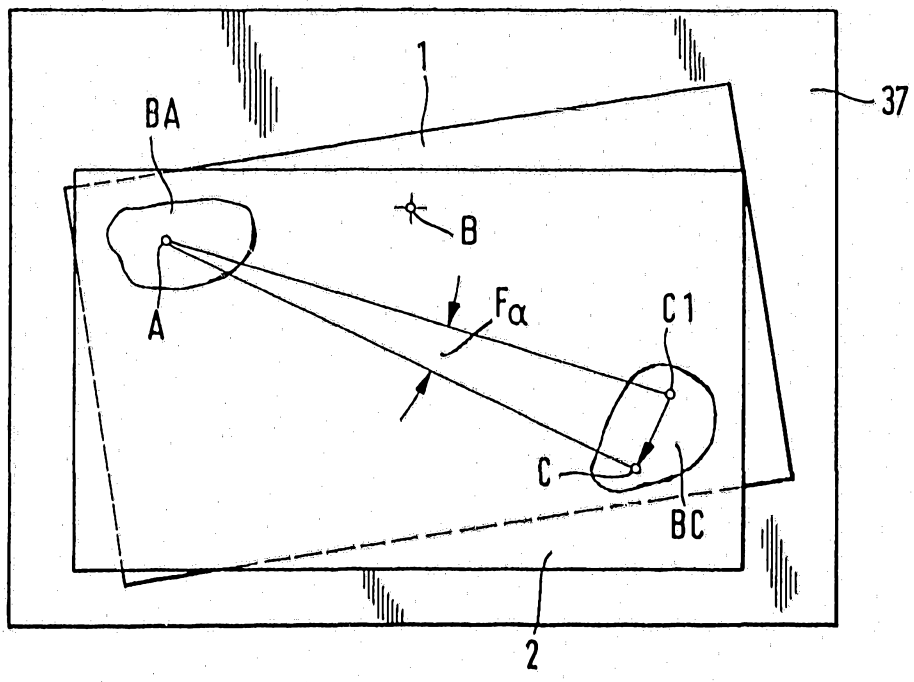


Fig. 2

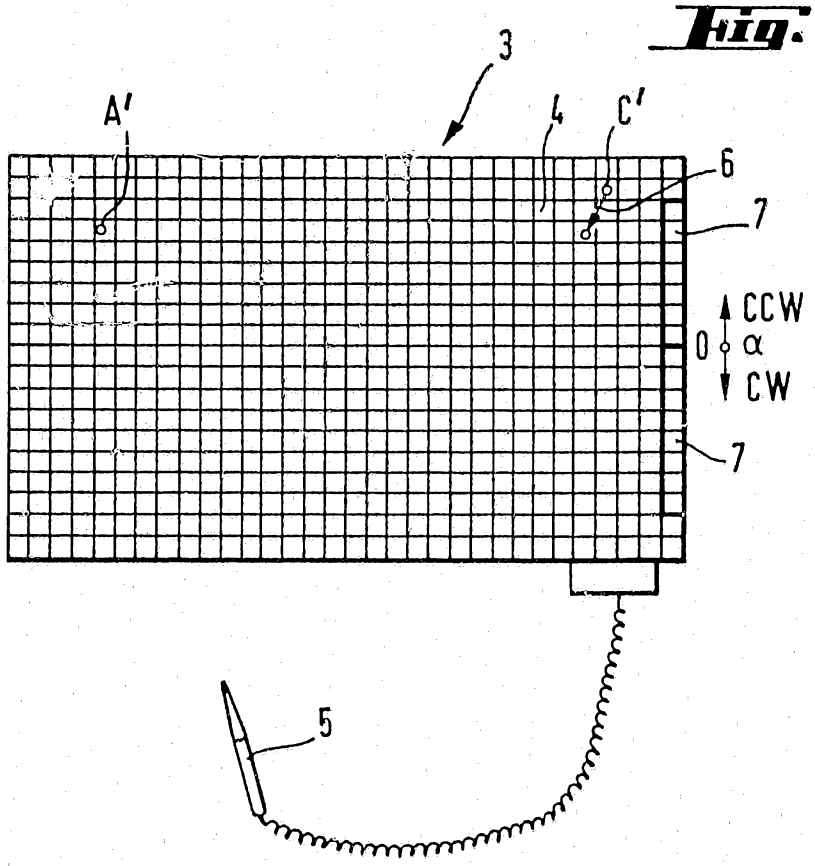
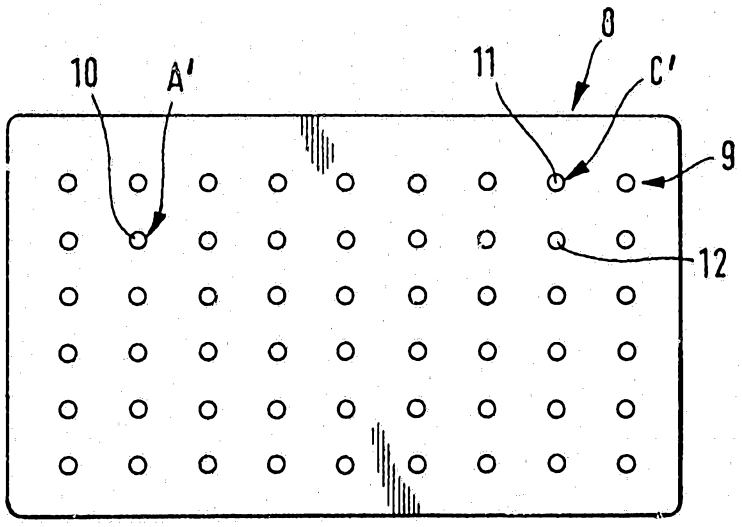


Fig. 3



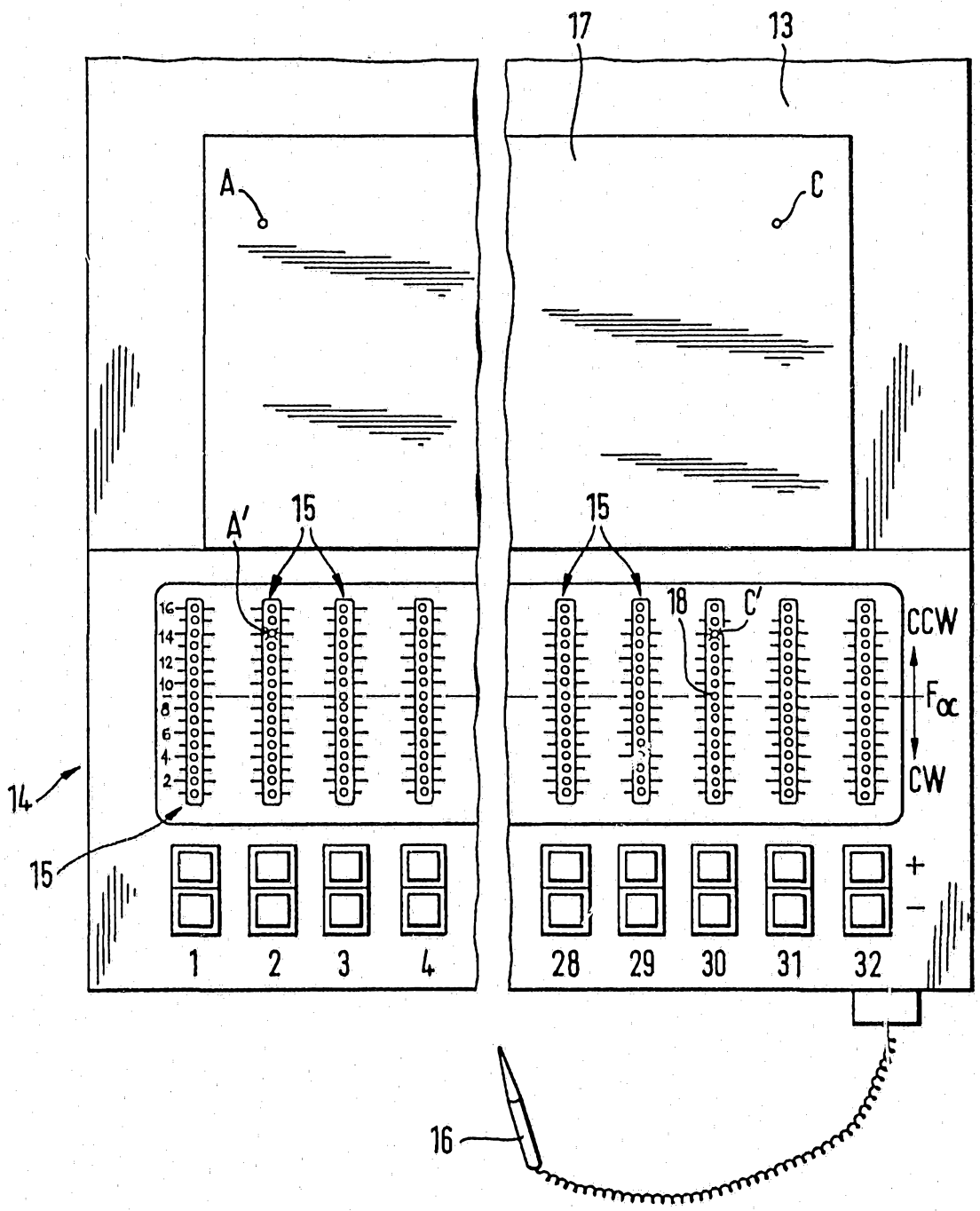


Fig. 4

27 8 07 7760

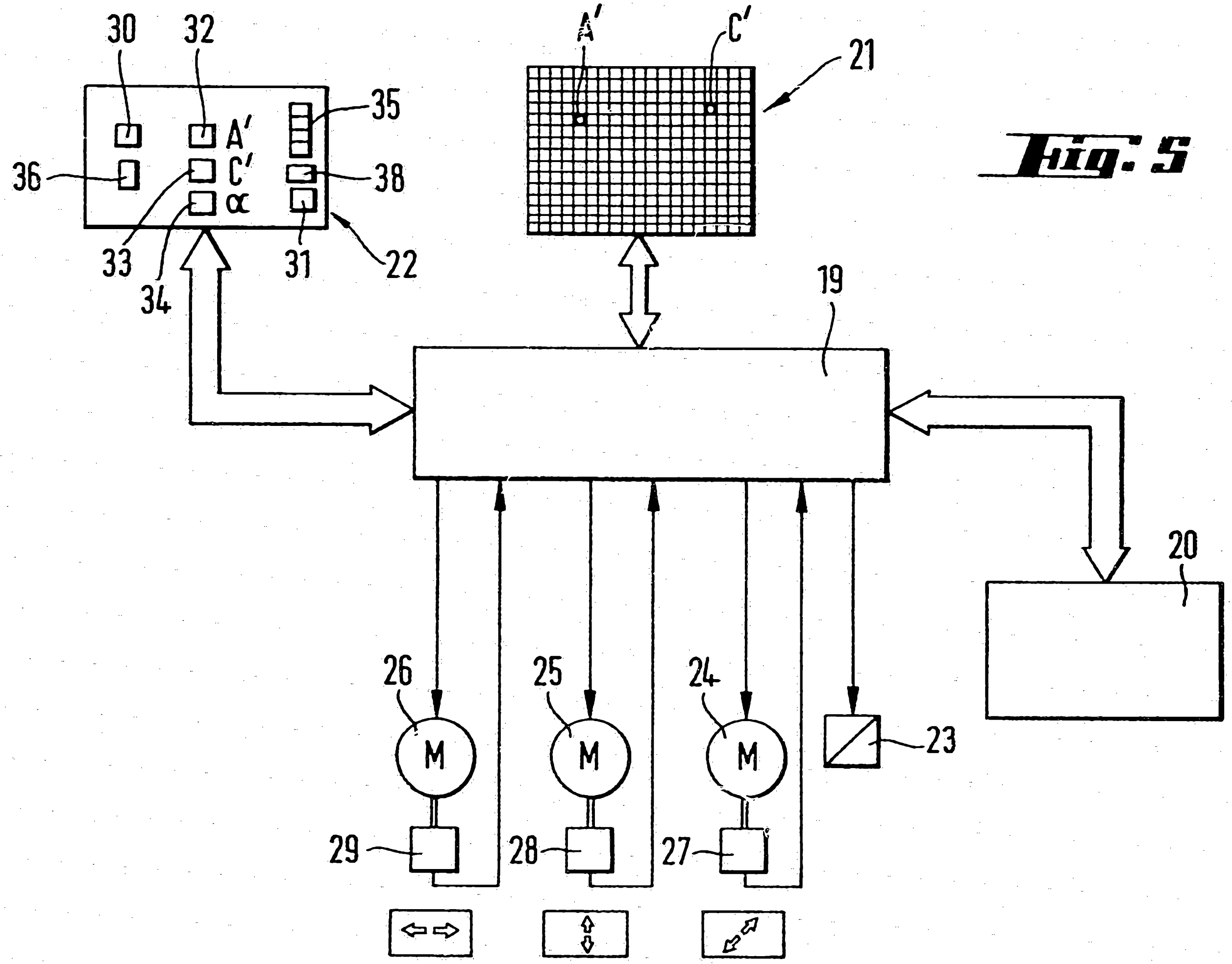
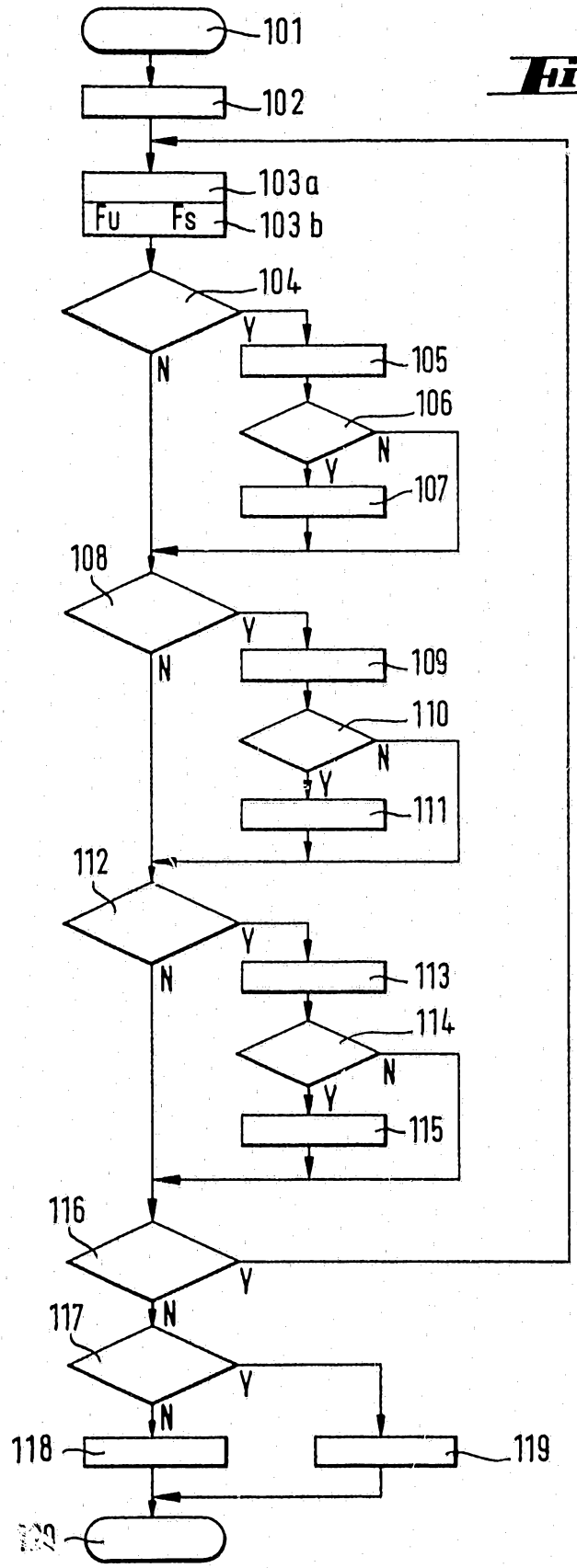


Fig. 5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103b
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Fig. 6