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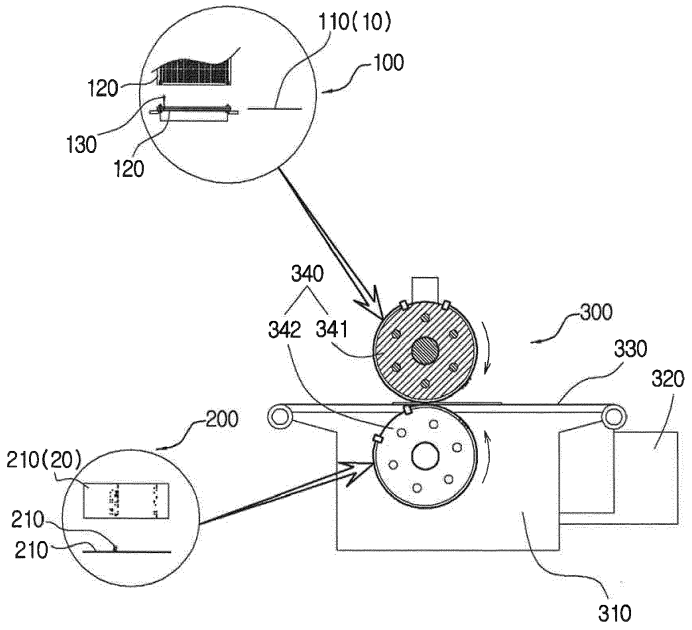
## (54) BRAILLE PRINTING SYSTEM AND BRAILLE PRINTING METHOD USING THE SAME

(57) Disclosed is a braille printing system and braille printing method using the same, the system enhancing braille printing speed by using a double print head structure and enhancing completion of braille printed on paper by heating the paper. In order to achieve the above object, there is provided a braille printing system including a braille printing plate producing unit producing a braille printing plate by forming embossed dots on a metal plate; a rubber printing plate producing unit producing a rubber printing plate by forming engraved dots on a rubber sheet; and a braille printing unit producing a braille printed material by printing braille on a paper being conveyed between the braille printing plate and the rubber printing plate. The braille printing unit prints the braille by simultaneously heating and compressing the paper.

Fig.1

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## Description

BACKGROUND OF THE INVENTION

Field of the Invention

**[0001]** The present invention relates generally to a braille printing system and a braille printing method using the same and. More particularly, it relates to a braille printing system and a braille printing method using the same, the braille printing system enhancing braille printing speed with a double print head structure and enhancing completion of braille printed on paper by heating the paper.

Description of the Related Art

**[0002]** Generally, braille is a system of embossed dots that are raised from the surface paper or a plane surface, and is used as a writing system for persons who are visually impaired.

**[0003]** Braille has a unique character system that is different from general written or printed letters expressed with dots and lines. That is, braille expresses letters and marks with braille cells that consist of big and small embossed dots, wherein the number of the embossed dots is equal to or less than six. Nowadays, countries using phonetic alphabets use braille in accordance with the letters of their alphabets.

**[0004]** Conventionally, the following methods for printing braille are used.

**[0005]** The first method is one using a slate having braille cells and using a stylus that looks like an awl to punch paper that is thicker than normal paper. The pressing method is usually applied to produce a simple braille document. In order to produce a large number of braille printed materials with the pressing method, braille paper is inserted into a press having a press board in which embossed dots expressing letters, symbols, or marks are arranged, and the braille paper is pressed under a pressure which avoids penetrating the braille paper.

**[0006]** The second method, which is widely used in recent years, is one using a computer-controlled braille printer. The braille printer uses a computer, which has a large storage capacity and fast processing speed. Therefore, it is convenient to correct errors, and the speed of producing braille printed materials is relatively fast.

**[0007]** However, in case when the computer-controlled Braille printer, paper for braille is relatively expensive such that it is difficult to produce a large number of braille printed materials. Consequently, purchase cost of braille printed materials has increased. In addition, the size and quality of paper for braille and printing methods are restricted.

**[0008]** In the meantime, the pressing method for printing braille is widely used because the pressing method has advantages, such as high quality of braille printing, no limitations on size and quality of paper, and the ability for the use of ink text with braille. The limitations are common problems of printing braille.

**[0009]** The size of a printing plate for the pressing method is not standardized, but it is generally the same size as A4 paper. A conventional printing plate is made of zinc, and recently, is made of aluminum. A braille embosser has two printing plates fixed thereto, and punches the two printing plates based on a manuscript. Paper is inserted into a space between the two printing plates, and passes through a press roller, thereby printing braille on the paper.

**[0010]** A conventional braille embosser is classified into a manual braille embosser and an automatic braille embosser according to the method of printing braille. A braille character contains six embossed dots. The automatic braille embosser automatically prints braille stored in a braille translating computer program. The manual braille embosser prints braille by a person inputting braille characters one by one with a braille input device. A braille embosser using both the manual and automatic methods is also widely used.

**[0011]** It is advantageous to use the automatic braille embosser automatically printing braille with a braille translating computer program in which the braille is stored in advance. However, when rows and columns are defined in advance, braille is printed based on the defined rows and columns. Therefore, the automatic braille embosser is inappropriate for materials having both ink text and braille.

**[0012]** A conventional automatic braille embosser is unable to control the intervals of the rows and columns. Therefore, when printing braille on paper having ink text, the braille and the ink text can be printed at the same position or ink text can be damaged. Consequently, the braille can interfere with the ink text thus making it difficult to read the ink text. In addition, the conventional automatic braille embosser limits the range of printed items, such as business cards, illustrations, pictures, etc.

**[0013]** In the meantime, the manual braille embosser prints braille by a person inputting braille characters one by one. Therefore, when printing braille on paper with ink text, the braille can be printed based on positions of the ink text having various intervals of rows and columns. In addition, the braille can be printed without interfering with the ink text.

**[0014]** However, when rows and columns are required to be adjusted during printing braille, a fixed slate of a conventional manual braille embosser should be released and again fixed to a desired position, which is a serious impediment to efficiency of the braille embosser. Consequently, purchase cost of braille printed materials increases.

**[0015]** In addition, braille printed materials having a braille height of about 0.2~0.3 mm are unstable when printed by only pressing paper without heating the paper. Therefore, the braille embossment is easily worn out and is pressed down due to frequent use. As time passes, it is difficult to read the braille, and value of the braille print-

ed materials decreases.

**[0016]** Furthermore, there is restriction of the thickness of paper and of producing a large number of the braille printed materials due to slow printing speed.

**[0017]** Therefore, a braille printing device or a braille printing system that can print braille quickly and can enhance quality of braille printed materials by ensuring durability of the braille is required.

Documents of Related Art

**[0018]** (Patent Document 1) Korean Patent No. 10-1359522 (29 January 2014).

SUMMARY OF THE INVENTION

**[0019]** Accordingly, the present invention has been made keeping in mind the above problems occurring in the related art, and the present invention is intended to propose a braille printing system and a braille printing method using the same, the system enhancing braille printing speed by heating paper on which braille is to be printed.

**[0020]** In addition, the present invention is intended to propose the braille printing system enhancing braille printing quality by heating the paper.

**[0021]** In addition, the present invention is intended to propose a braille printed material that easy for a braille reader to read by printing the braille higher.

**[0022]** In addition, the present invention is intended to propose a braille printing system maintaining durability and the height of the printed braille regardless of thickness of the paper.

**[0023]** In addition, the present invention is intended to propose a braille printed material compensating for defects such as that braille of a conventional braille printed material is easily pressed down as time passes and is vulnerable to moisture or water, etc., by simultaneously heating and compressing a surface of the paper.

**[0024]** In addition, the present invention is intended to propose a braille printed material that has good durability and is easy to read, thereby maintaining quality of the braille printed material despite frequent use.

**[0025]** In addition, the present invention is intended to propose a braille printing method enhancing braille printing speed by using a double print head structure, and enhancing completion of braille printed on paper by heating the paper, thereby reducing work time and enhancing printing work efficiency.

**[0026]** In order to achieve the above object, according to one aspect of the present invention, there is provided a braille printing system including a braille printing plate producing unit producing a braille printing plate by forming embossed dots on a metal plate; a rubber printing plate producing unit producing a rubber printing plate by forming engraved dots on a rubber sheet; and a braille printing unit producing a braille printed material by printing braille on a paper being conveyed between the braille printing plate and the rubber printing plate placed to face each other. The braille printing unit prints the braille on the paper by simultaneously heating and compressing a surface of the paper passing between the braille printing plate and the rubber printing plate.

**[0027]** In addition, the braille printing plate producing unit may include the metal plate on which the embossed dots are formed; a braille typesetting plate guiding a position to be punched in a dot shape, on the metal plate; and a punching device punching a surface of the metal plate to form the embossed dots thereon.

**[0028]** In addition, the braille typesetting plate may include an upper perforated plate through which a first braille hole is formed; a lower perforated plate placed to face the upper perforated plate, with a second braille hole formed through the lower perforated plate; a bottom fixing plate integrally attached to a lower surface of the lower perforated plate; and a spacer provided on end portions of the upper and lower perforated plates, and maintaining a space between the upper and lower perforated plates.

**[0029]** In addition, the upper and lower perforated plates may be made of a transparent acrylic board such that, when the metal plate is inserted into the space between the upper and lower perforated plates and the surface of the metal plate is punched, the position to be punched in the dot shape and a position of ink text printed on the metal plate may be checked.

**[0030]** In order to achieve the above object, there is provided the braille printing unit that may include a base; a paper supply unit provided at an end of the base, and supplying paper in order; a conveying belt provided on the base to have a connection with the paper supply unit, and conveying the paper; and a braille forming unit provided at a middle portion of the base to print the braille on the paper being conveyed by the conveying belt. The braille forming unit may include two cylindrical drums placed to face each other to which the braille printing plate and the rubber printing plate respectively are attached.

**[0031]** In addition, the braille forming unit may have a double drum structure that is formed by an upper head and a lower head placed to face each other in a vertical direction, both having a cylindrical drum shape. The upper and lower heads may have respective heating wires therein. The upper and lower heads may rotate and print the braille on the paper by simultaneously heating and compressing the surface of the paper passing therebetween.

**[0032]** In addition, the upper head may be provided with the braille printing plate detachably attached thereto, the braille printing plate produced by forming the embossed dots on the metal plate. The lower head may be provided with the rubber printing plate detachably attached thereto, the rubber printing plate produced by punching the rubber sheet with a laser to form the engraved dots on the rubber sheet. The braille printing plate and the rubber printing plate may be respectively wound around outer circumferential surfaces of the upper head

and the lower head both having the cylindrical drum shape, and are fixed thereto by respective fixing pins.

**[0033]** In addition, the braille printing unit may produce the braille printed material having a braille height of 0.5 mm.

**[0034]** In order to achieve the above object, according to another aspect of the present invention, there is provided a braille printing method using a braille printing system including a braille printing plate producing unit producing a braille printing plate; a rubber printing plate producing unit producing a rubber printing plate; and a braille printing unit producing a braille printed material by printing braille on paper. The braille printing method includes designing, using a design program, a portion of the paper on which the braille is to be printed, printing ink text on the paper, and attaching the paper on which the ink text is printed to a metal plate; preparing, in the braille printing plate producing unit, the braille printing plate by punching the metal plate with a punching device based on a braille hole of a braille typesetting plate to form embossed dots on the metal plate, after inserting the metal plate into a space of the braille typesetting plate; preparing, in the rubber printing plate producing unit, the rubber printing plate by punching a rubber sheet with a laser to form engraved dots on the rubber sheet; preparing for printing the braille by attaching the braille printing plate and the rubber printing plate to a braille forming unit of the braille printing unit such that the braille printing plate and the rubber printing plate face each other in a vertical direction; conveying, in the braille printing unit, the paper to the braille forming unit; carving and printing, by the braille forming unit, the braille on the conveyed paper by heating and rotating an upper head and a lower head to which the braille printing plate and the rubber printing plate are respectively attached; and producing the braille printed material by completing the printing with the braille forming unit and conveying the braille printed material by a conveying belt.

**[0035]** In addition, the braille printed material may be produced to have a braille height of 0.5 mm.

**[0036]** According to the braille printing system and the braille printing method using the same, the system can enhance braille printing speed by heating paper on which braille is to be printed.

**[0037]** In addition, the braille printing system can enhance braille printing quality by heating the paper.

**[0038]** In addition, the braille printed material is easy for a braille reader to read by printing braille higher.

**[0039]** In addition, the braille printing system can maintain durability and the height of the braille regardless of thickness of the paper.

**[0040]** In addition, the braille printed material can compensate for defects such as that braille of a conventional braille printed material is easily pressed down as time passes and is vulnerable to moisture or water, etc., by simultaneously heating and compressing a surface of the paper.

**[0041]** In addition, the braille printing method can enhance braille printing speed by using the double print head structure, and can enhance completion of braille printed on paper by heating the paper, thereby reducing work time and enhancing printing work efficiency.

**[0042]** In addition, the braille printed material can have good durability and is easy to read, thereby maintaining quality of the braille printed material despite frequent use.

**[0043]** In addition, maintenance of the braille printing system is easy with the detachable printing plates and work efficiency is enhanced by easily replacing the printing plates.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0044]** The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIGS. 1 to 8 are views showing a braille printing system according to an exemplary embodiment of the present invention,

FIG. 1 is an exemplary view showing a braille printing system according to an exemplary embodiment of the present invention;

FIG. 2 is an exemplary view showing the process of producing a braille printing plate by inserting a metal plate into a space of a braille typesetting plate and of punching the metal plate according to an exemplary embodiment of the present invention;

FIG. 3 is a plan view showing a braille typesetting plate according to an exemplary embodiment of the present invention;

FIG. 4 is an exemplary view showing the process of producing a rubber printing plate by punching a rubber sheet with a laser according to an exemplary embodiment of the present invention;

FIG. 5A is a partial enlarged cross-sectional view showing a main portion of a braille printing plate according to an exemplary embodiment of the present invention;

FIG. 5B is a partial enlarged cross-sectional view showing a main portion of a rubber printing plate according to an exemplary embodiment of the present invention;

FIG. 6 is an exemplary view showing the process of producing a braille printed material by a braille forming unit printing braille on a paper according to an exemplary embodiment of the present invention;

FIG. 7 is a partial enlarged cross-sectional view showing a main portion of the braille forming unit of FIG. 6;

FIG. 8 is a front view showing a braille printed material according to an exemplary embodiment of the present invention; and

FIG. 9 is a view showing a braille printing method using the braille printing system according to an ex-

emplary embodiment of the present invention.

## DETAILED DESCRIPTION OF THE INVENTION

**[0045]** Hereinbelow, an exemplary embodiment of the present invention will be described in detail with reference to the accompanying drawings.

**[0046]** Hereinbelow, all embossed dots and engraved dots are denoted as "P", and a paper having a designed portion on which braille to be printed is denoted as a paper 1a, and a paper having printed braille is denoted as a braille printed material 1 in the accompanying drawings.

**[0047]** FIGS. 1 to 8 are views showing a braille printing system according to an exemplary embodiment of the present invention.

**[0048]** According to the exemplary embodiment of the present invention, a braille print system includes a braille printing plate producing unit 100 producing a braille printing plate 10; a rubber printing plate producing unit 200 producing a rubber printing plate 20; and a braille printing unit 300 producing a braille printed material 1 by printing braille on a paper 1a.

**[0049]** The braille printing plate producing unit 100 produces the braille printing plate 10 by punching a metal plate with a punching device to form embossed dots P on the metal plate. The braille printing plate producing unit 100 includes a metal plate 110 on which the embossed dots P are formed; a braille typesetting plate 120 guiding a position to be punched in a dot shape, on the metal plate 110; a punching device 130 having a needle rod 131 punching a surface of the metal plate 110 to form the embossed dots thereon.

**[0050]** In addition, it is desirable that the metal plate 110 is made of zinc or aluminum having a thickness t of about 0.2~0.4 mm. The braille printing plate 10 is produced by punching the metal plate 110 with the punching device 130 to form the embossed dots P on a front surface of the metal plate 110.

**[0051]** The braille typesetting plate 120 guides a position to be punched by the punching device 130 in a dot shape. The braille typesetting plate 120 includes an upper perforated plate 121 through which a first braille hole 121a is formed; a lower perforated plate 123 placed to face the upper perforated plate 121, with a second braille hole 123a formed through the lower perforated plate 123; a bottom fixing plate 125 integrally attached to a lower surface of the lower perforated plate 123; and a spacer 127 provided on each of end portions of the upper and lower perforated plates 121 and 123, and maintaining a space between the upper and the lower perforated plates 121 and 123.

**[0052]** Referring to FIG. 3, by the spacer 127, the upper and lower perforated plates 121 and 123 have a space therebetween, and are placed to face each other and fixed.

**[0053]** In addition, the upper and lower perforated plates 121 and 123 respectively have braille holes 121a and 123a formed through the upper and lower perforated plates 121 and 123. The braille holes 121a and 123a including several braille cells respectively having six big and small holes are arranged on front surfaces of the upper and lower perforated plates 121 and 123.

**[0054]** Here, the first braille hole 121a of the upper perforated plate 121 is a penetrating hole having a depth of about 10 mm. The second braille hole 123a of the lower perforated plate 123 is a concave hole having a depth of about 0.5 mm without penetrating the lower perforated plate 123. Therefore, when the needle rod 131 of the punching device 130 punches the metal plate 110, embossed dots P having a fixed height of 0.5 mm are formed on the metal plate 110. The needle rod has a length of 10.5 mm.

**[0055]** In addition, a bottom fixing plate 125 integrally attached to a lower surface of the lower perforated plate 123 such that the lower perforated plate 123 is steady during punching the metal plate.

**[0056]** In the meantime, after inserting the metal plate 110 into the space between the upper and lower perforated plates 121 and 123 that are fixed by the spacer 127, the metal plate 110 is properly positioned to be punched.

**[0057]** Here, it is desirable that the upper and lower perforated plates 121 and 123 are made of a transparent acrylic board. Therefore, when the metal plate is punched, the position to be punched in the dot shape and a position of ink text printed on the metal plate 110 are checked.

**[0058]** The spacer 127 maintaining the space between the upper and lower perforated plates 121 and 123 is formed of a general bolt and nut, and thus detailed description thereof will be omitted herein.

**[0059]** The punching device 130 is a punching device having a general structure for forming the embossed dots by moving forward, rearward, leftward, and rightward based on the braille holes 121a and 123a having the six big and small holes respectively formed on the upper and lower perforated plates 121 and 123. In order to form the embossed dots having a height of 0.5 mm on the metal plate 110 with the punching device 130, a length of the needle rod 131 punching the metal plate 110 is preferably 10.5 mm.

**[0060]** Namely, in a state in which the metal plate 110 is inserted into the space between the upper and lower perforated plates 121 and 123, the braille is formed by locating the needle rod 131 of the punching device 130 moving forward, rearward, leftward, and rightward. Simultaneously, a proper position to be punched to form the braille and a position of ink text reflected in the upper perforated plate 121 made from transparent acrylic material are checked.

**[0061]** The rubber printing plate producing unit 200 produces a rubber printing plate 20 by punching a surface of a rubber sheet with a laser to form engraved dots P on the rubber sheet. The engraved dots P of the rubber printing plate 20 and the embossed dots P of the braille

printing plate 10 are provided at corresponding positions.

**[0062]** Here, the rubber printing plate 20 serves as a bottom board of the braille printing plate 10 on which the embossed dots are formed. In the process of printing braille by the braille printing unit 300, a paper is pressed by the embossed dots of the braille printing plate 10. The paper is smoothly caved into the engraved dots of the rubber printing plate 20. Therefore, embossed braille is smoothly printed on the paper.

**[0063]** The braille printing unit 300 produces a braille printed material 1 by printing braille on a paper 1a after producing the braille printing plate 10 and the rubber printing plate 20.

**[0064]** The braille printing unit 300 includes a base 310; a paper supply unit 320 provided at an end of the base 310, and supplying the paper 1a in order; a conveying belt 330 provided on the base 310 to have a connection with the paper supply unit 320, and conveying the paper; and a braille forming unit 340 provided at a middle portion of the base 310 to print the braille on the paper 1a being conveyed by the conveying belt 330, the braille forming unit 340 including two cylindrical drums placed to face each other to which the braille printing plate 10 and the rubber printing plate 20 respectively are attached.

**[0065]** The paper supply unit 320 supplies paper stacked to a certain height to the conveying belt 330. The paper supply unit 320 is a general component of a printing device, and thus detailed description thereof will be omitted herein.

**[0066]** The conveying belt 330 includes a belt conveying the paper 1a to the braille forming unit 340, and includes a belt conveying the braille printed material 1 produced from the braille forming unit 340 after printing the braille.

**[0067]** In the meantime, the braille forming unit 340 includes a double head that is an upper head 341 and a lower head 342 placed to face each other in a vertical direction both having a cylindrical drum shape. The upper and lower heads have respective heating wires 343 therein. The upper head 341 and the lower head 342 rotate and print the braille on the paper 1a by simultaneously heating and compressing the surface of the paper 1a passing therebetween, thereby producing the braille printed material 1.

**[0068]** In addition, the upper head 341 is provided with the braille printing plate 10 detachably attached thereto, the braille printing plate produced by forming the embossed dots P on the metal plate 100. The lower head 342 is provided with the rubber printing plate 20 detachably attached thereto, the rubber printing plate produced by punching the rubber sheet with a laser to form the engraved dots P on the rubber sheet.

**[0069]** It is desirable that the braille printing plate 10 and the rubber printing plate 20 are respectively wound around outer circumferential surfaces of the upper head 341 and the lower head 342 both having the cylindrical drum shape, and are fixed thereto by respective fixing pins 344.

**[0070]** In addition, when installing the heating wires 343 electrically connected to each other, the heating wires can be installed inside of the upper head 341 or lower head 342. However, it is desirable to install the heating wires inside of both upper and lower heads.

**[0071]** In addition, the heating wires are desired to have heating temperature of between 90~100□.. Due to the heating wires, printing speed of the present invention is faster than printing speed of a conventional braille printer. Furthermore, the braille printed on the paper in an embossed shape has a height of 0.5 mm. The height is maintained by heating the heating wires provided in the both upper and lower heads such that the braille is solidly maintained.

**[0072]** In the meantime, the present invention discloses a braille printing method using the braille printing system.

**[0073]** FIG. 9 is a view showing the braille printing method using the braille printing system according to an exemplary embodiment of the present invention.

**[0074]** According to the exemplary embodiment of the present invention, the braille printing method using the braille printing system includes processes of the braille printing system including a braille printing plate producing unit 100 producing a braille printing plate 10; a rubber printing plate producing unit 200 producing a rubber printing plate 20; and a braille printing unit 300 producing a braille printed material 1 by printing braille on paper 1a.

[Design metal plate preparing step]

**[0075]** A portion of paper on which braille is to be printed is designed by using a design program. Ink text is then printed on the paper and the paper, on which the ink text has been printed, is attached to a metal plate 110 at step S10.

[Braille printing plate preparing step]

**[0076]** In the braille printing plate producing unit 100, the braille printing plate 10 is prepared by punching the metal plate 110 with a punching device 130 based on a braille hole of a braille typesetting plate 120 to form embossed dots on the metal plate, after inserting the metal plate 110 into a space of the braille typesetting plate 120 at step S20.

[Rubber printing plate preparing step]

**[0077]** In the rubber printing plate producing unit 200, the rubber printing plate 20 is prepared by punching a rubber sheet with a laser to form engraved dots on the rubber sheet at step S30.

[Braille printing preparing step]

**[0078]** Printing the braille is prepared by attaching the braille printing plate 10 and the rubber printing plate 20

to a braille forming unit 340 of the braille printing unit 330 such that the braille printing plate and the rubber printing plate face each other in a vertical direction at step S40.

[Paper conveying step]

**[0079]** In the braille printing unit 300, the paper 1a is conveyed to the braille forming unit 340 at step S50.

[Braille printing step]

**[0080]** The braille forming unit 340 carves and prints the braille on the conveyed paper 1a by heating and rotating an upper head and a lower head to which the braille printing plate 10 and the rubber printing plate 30 are respectively attached at step S60.

[Braille printed material producing step]

**[0081]** In the braille forming unit 340, a braille printed material is produced by completing the printing and conveying the braille printed material by a conveying belt at step S70.

**[0082]** In addition, the braille printed material 1 is produced to have a braille height of 0.5 mm.

**[0083]** Hereinbelow, various effects realized by the braille printing system will be described with reference to the above-mentioned composition.

**[0084]** First, a braille printing plate preparing step is as follows.

**[0085]** A portion of paper on which braille is to be printed is designed by using a design program, in combination of a computer automatic braille translating program.

**[0086]** Ink text (letters or pictures) is printed on the paper based on the braille design.

**[0087]** The paper, on which the ink text is printed, is attached to a metal plate 110.

**[0088]** The metal plate is inserted into a space of the braille typesetting plate 120 between the upper and lower perforated plates 121 and 123.

**[0089]** The braille printing plate 10 is prepared by penetrating the braille typesetting plate with the needle rod of the punching device to form embossed dots on the metal plate. Simultaneously, a position of ink text reflected in the braille typesetting plate is checked.

**[0090]** Second, a rubber printing plate preparing step is as follows.

**[0091]** A rubber sheet having a thickness t of about 2 mm is prepared.

**[0092]** A rubber printing plate 20 is prepared by punching the rubber sheet with a laser to form engraved dots corresponding to the embossed dots of the metal plate formed by the braille typesetting plate 120.

**[0093]** Third, braille printing is prepared by attaching the braille printing plate 10 and the rubber printing plate 20 to the braille forming unit 340 of the braille printing unit 300.

**[0094]** Next, the paper is conveyed by the conveying belt 330 from the paper supply unit 320.

**[0095]** The braille is printed on the paper 1a conveyed by the conveying belt, simultaneously passing through the braille forming unit 340.

**[0096]** Here, the upper head 341 and the lower head 342 of the braille forming unit, which are placed to face each other in a vertical direction, rotate and print the braille on the paper 1a being conveyed, by simultaneously heating and compressing a surface of the paper 1a.

**[0097]** Last, the braille forming unit 340 prints the braille and simultaneously produces the braille printed material 1.

**[0098]** As described above, the heating wires electrically connected to each other are installed in the upper head and the lower head of the braille forming unit. The braille printing plate and the rubber printing plate respectively attached to the upper/lower heads rotate, and the embossed dots and the engraved dots meet. Simultaneously, the paper is pressed to print the braille, and a braille height of 0.5 mm is solidly maintained by the heating wires of the heads.

**[0099]** With the pressure and the heating wires of the upper/lower heads, the braille is printed quickly and the braille printed material can be produced regardless of thickness of paper. In addition, the printed braille having a fixed height of 0.5 mm is different from a conventional braille having a height of 0.2 mm. Therefore, it is possible to provide a braille printed material compensating for defects such as that braille of a conventional braille printed material is easily pressed down as time passes and is vulnerable to moisture or, etc.

## Claims

**1.** A braille printing system comprising:

a braille printing plate producing unit producing a braille printing plate by forming embossed dots on a metal plate;

a rubber printing plate producing unit producing a rubber printing plate by forming engraved dots on a rubber sheet; and

a braille printing unit producing a braille printed material by printing braille on a paper being conveyed between the braille printing plate and the rubber printing plate placed to face each other, wherein the braille printing unit prints the braille on the paper by simultaneously heating and compressing a surface of the paper passing between the braille printing plate and the rubber printing plate.

**2.** The braille printing system of claim 1, wherein the braille printing plate producing unit comprises:

the metal plate on which the embossed dots are formed;

a braille typesetting plate guiding a position to be punched in a dot shape, on the metal plate; and

a punching device punching a surface of the metal plate to form the embossed dots thereon.

**3.** The braille printing system of claim 2, wherein the braille typesetting plate comprises:

an upper perforated plate through which a first braille hole is formed;

a lower perforated plate placed to face the upper perforated plate, with a second braille hole formed through the lower perforated plate;

a bottom fixing plate integrally attached to a lower surface of the lower perforated plate; and

a spacer provided on end portions of the upper and lower perforated plates, and maintaining a space between the upper and lower perforated plates.

**4.** The braille printing system of claim 3, wherein the upper and lower perforated plates are made of a transparent acrylic board such that, when the metal plate is inserted into the space between the upper and lower perforated plates and the surface of the metal plate is punched, the position to be punched in the dot shape and a position of ink text printed on the metal plate are checked.

**5.** The braille printing system of claim 1, wherein the braille printing unit comprises:

a base;

a paper supply unit provided at an end of the base, and supplying paper in order;

a conveying belt provided on the base to have a connection with the paper supply unit, and conveying the paper; and

a braille forming unit provided at a middle portion of the base to print the braille on the paper being conveyed by the conveying belt, the braille forming unit comprising of cylindrical drums placed to face each other to which the braille printing plate and the rubber printing plate respectively are attached.

**6.** The braille printing system of claim 5, wherein the braille forming unit has a double drum structure that is formed by an upper head and a lower head placed to face each other in a vertical direction, both having a cylindrical drum shape,

wherein the upper and lower heads have respective heating wires therein,

wherein the upper and lower heads rotate and print the braille on the paper by simultaneously heating and compressing the surface of the paper passing therebetween.

**7.** The braille printing system of claim 6, wherein the upper head is provided with the braille printing plate detachably attached thereto, the braille printing plate produced by forming the embossed dots on the metal plate,

wherein the lower head is provided with the rubber printing plate detachably attached thereto, the rubber printing plate produced by punching the rubber sheet with a laser to form the engraved dots on the rubber sheet,

wherein the braille printing plate and the rubber printing plate are respectively wound around outer circumferential surfaces of the upper head and the lower head both having the cylindrical drum shape, and are fixed thereto by respective fixing pins.

**8.** The braille printing system of claim 1, wherein the braille printing unit produces the braille printed material having a braille height of 0.5 mm.

**9.** A braille printing method using a braille printing system comprising: a braille printing plate producing unit producing a braille printing plate; a rubber printing plate producing unit producing a rubber printing plate; and a braille printing unit producing a braille printed material by printing braille on a paper, the braille printing method comprising:

designing, using a design program, a portion of the paper on which the braille is to be printed, printing ink text on the paper, and attaching the paper on which the ink text is printed to a metal plate;

preparing, in the braille printing plate producing unit, the braille printing plate by punching the metal plate with a punching device based on a braille hole of a braille typesetting plate to form embossed dots on the metal plate, after inserting the metal plate into a space of the braille typesetting plate;

preparing, in the rubber printing plate producing unit, the rubber printing plate by punching a rubber sheet with a laser to form engraved dots on the rubber sheet;

preparing for printing the braille by attaching the braille printing plate and the rubber printing plate to a braille forming unit of the braille printing unit such that the braille printing plate and the rubber printing plate face each other in a vertical direction;

conveying, in the braille printing unit, the paper to the braille forming unit;

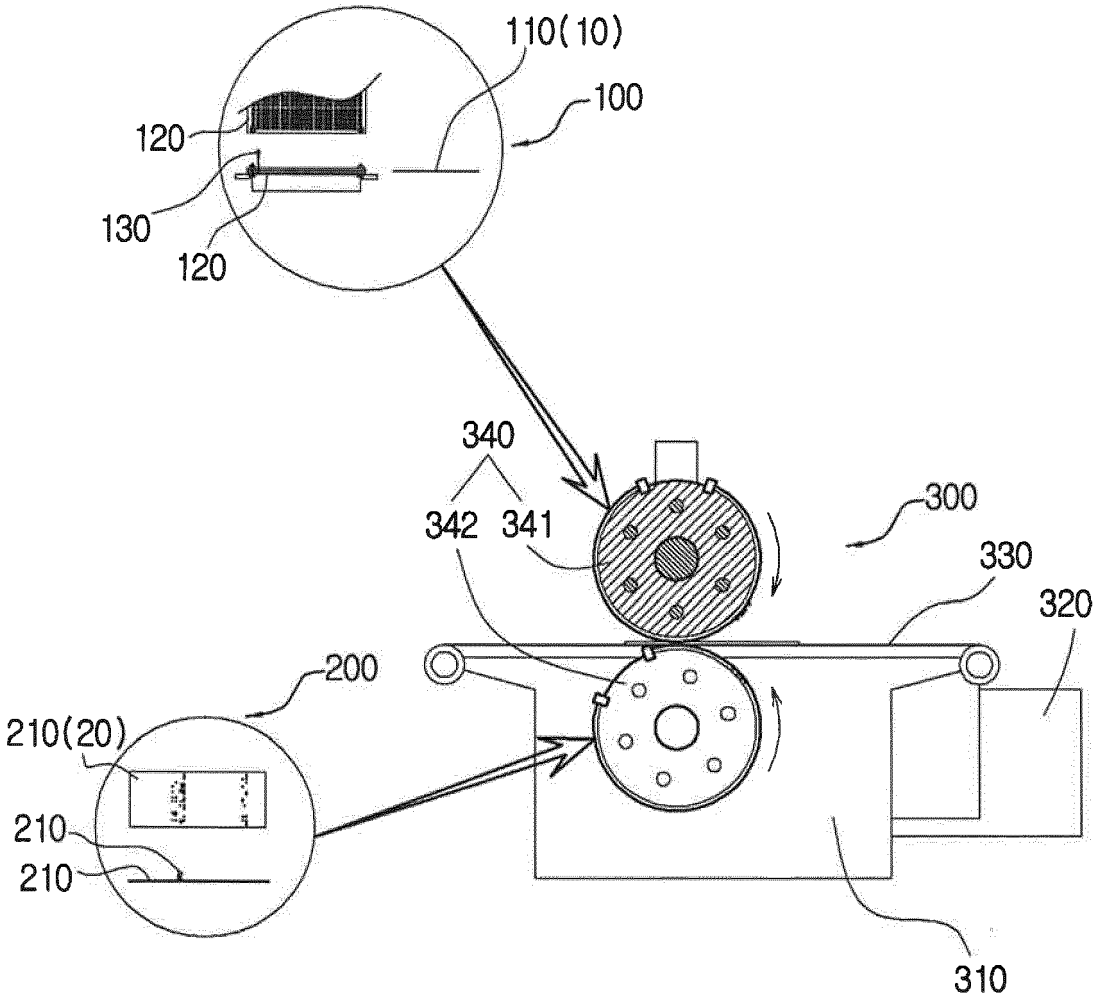
carving and printing, by the braille forming unit, the braille on the conveyed paper by heating and rotating an upper head and a lower head to which the braille printing plate and the rubber printing plate are respectively attached; and

producing the braille printed material by com-

pleting the printing with the braille forming unit and conveying the braille printed material by a conveying belt.

**10.** The braille printing method of claim 9, wherein the braille printed material is produced to have a braille height of 0.5 mm.

Fig.1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120
340
342
341
300
330
320
200
210(20)
210
210
310

Fig.2

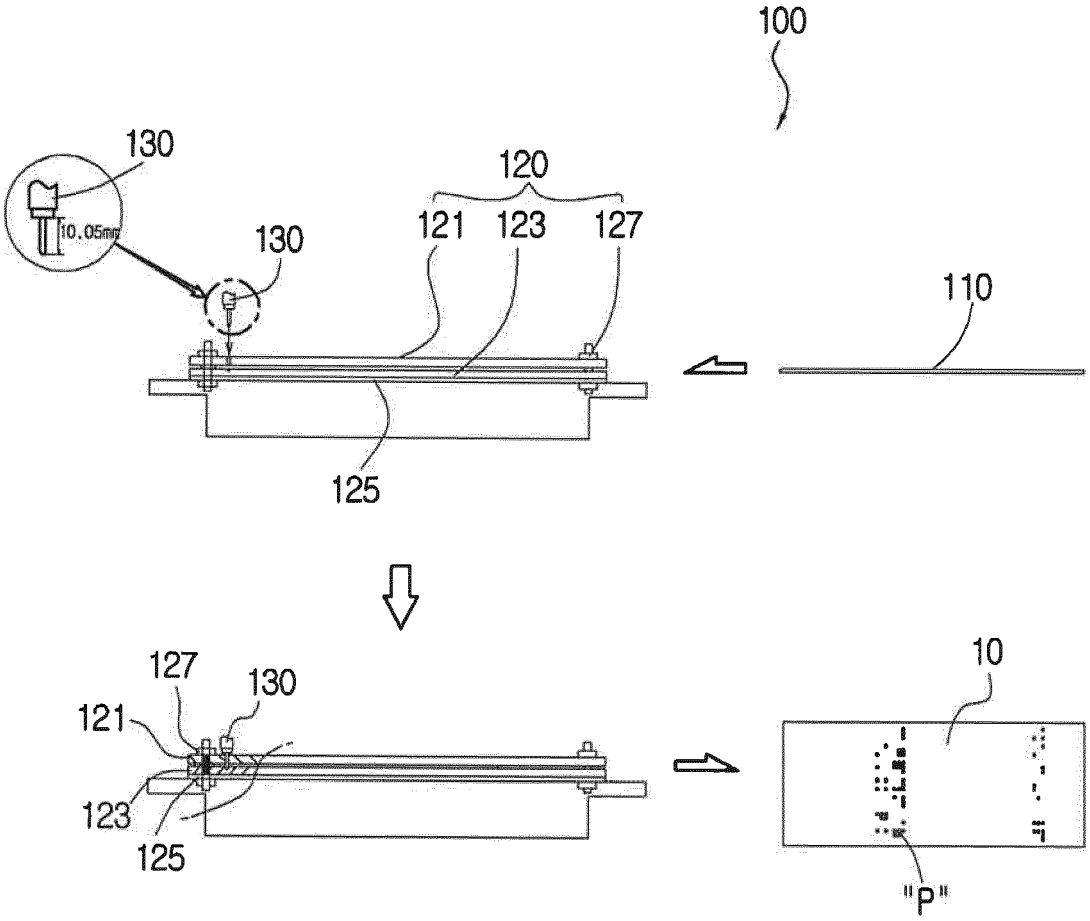

100
130
10.05mm
130
120
121
123
127
110
125
127
130
121
123
125
10
"P"

Fig.3

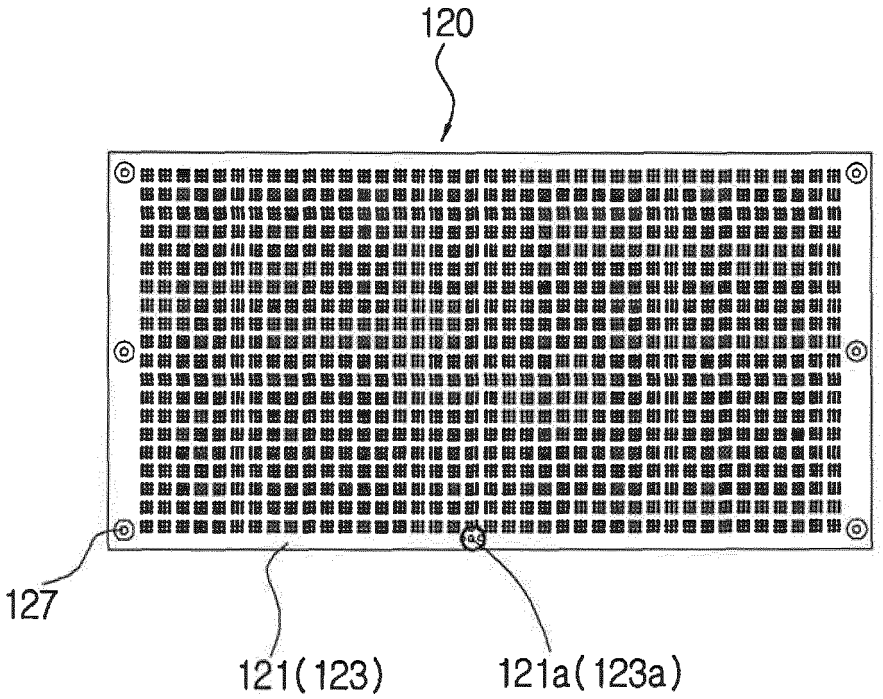



Fig.4

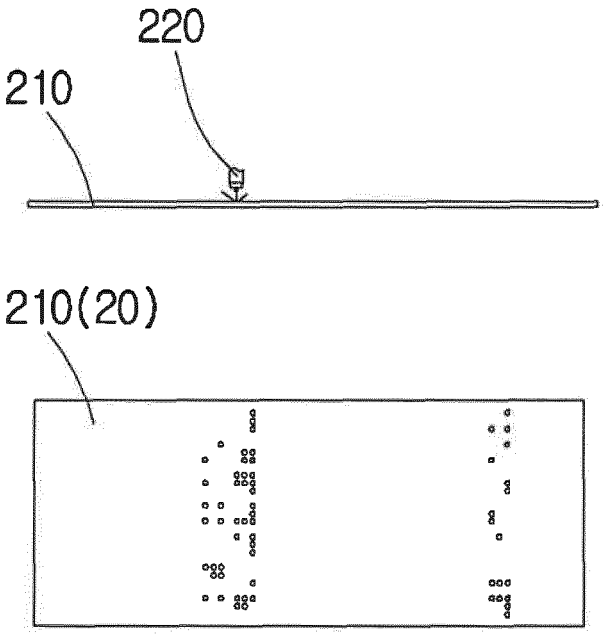


Fig.5a

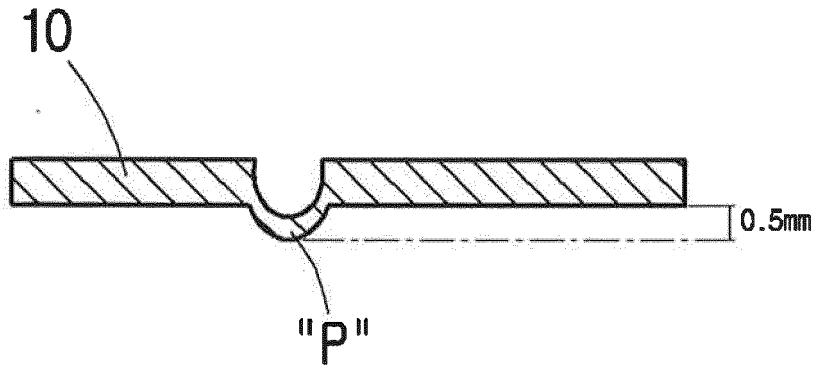



Fig.5b

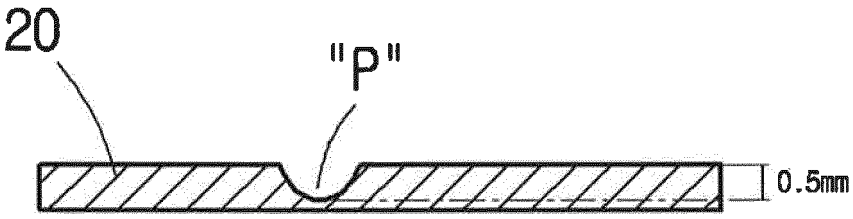


Fig.6

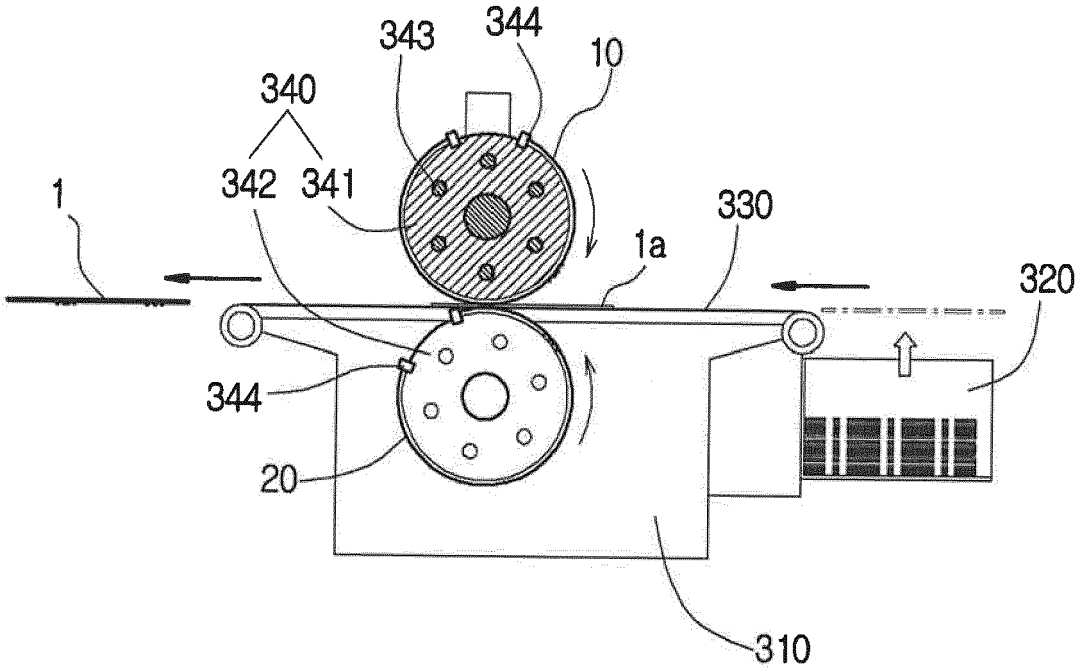


Fig.7

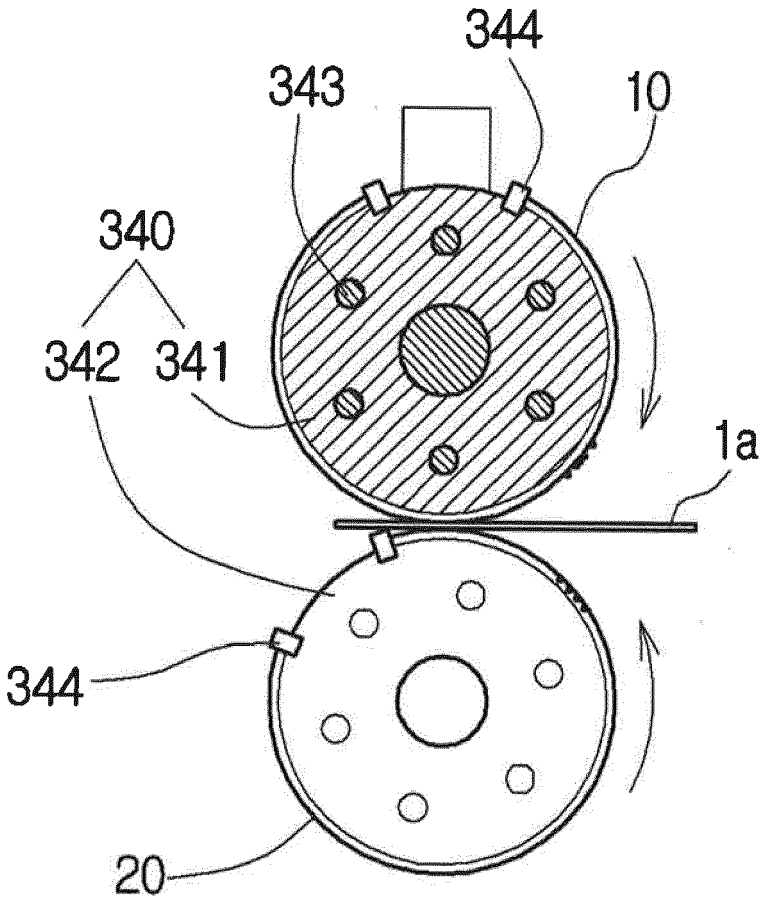


Fig.8

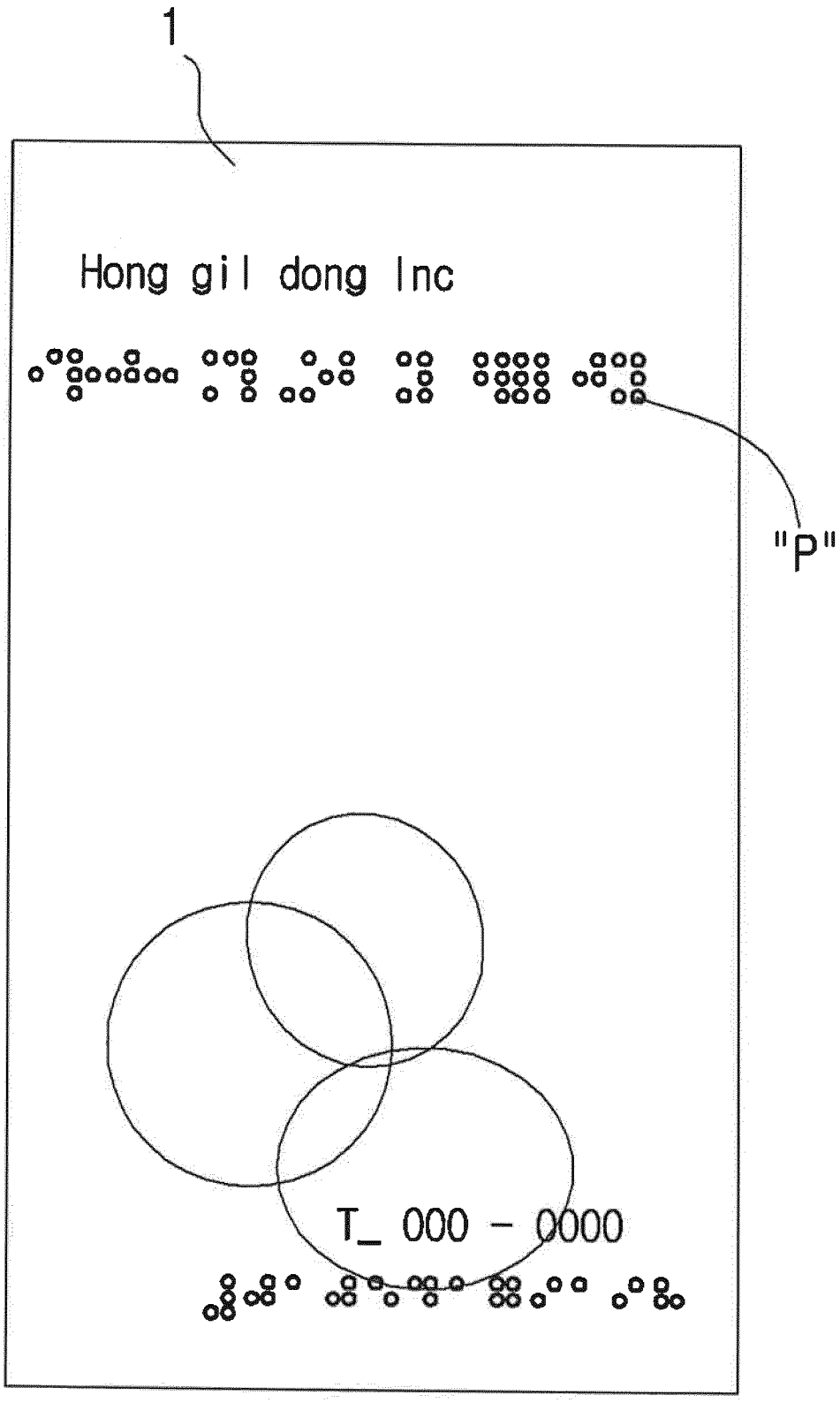
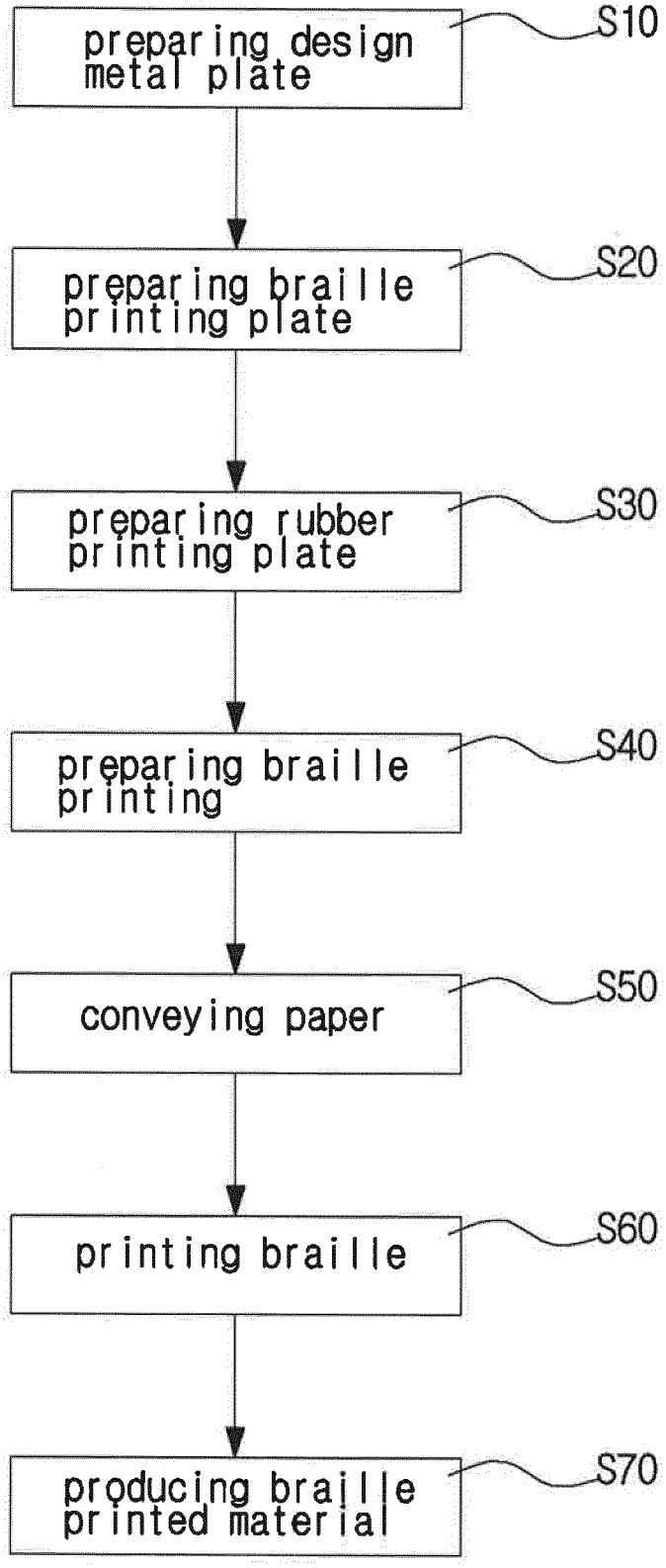


Fig.9


preparing design metal plate
S10
preparing braille printing plate
S20
preparing rubber printing plate
S30
preparing braille printing
S40
conveying paper
S50
printing braille
S60
producing braille printed material
S70

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Application Number
EP 16 19 1013

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| The Hague | 22 May 2017 | Curt, Denis |

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