



(11) **EP 1 253 010 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention
of the grant of the patent:
31.01.2007 Bulletin 2007/05

(51) Int Cl.:
B41F 17/00 ^(2006.01) **B41J 3/60** ^(2006.01)
A44B 19/42 ^(2006.01)

(21) Application number: **01303708.0**

(22) Date of filing: **24.04.2001**

(54) **Thermal transfer printing apparatus for marking zip fastener**

Wärmeübertragungsdrucker zum Markieren von Reissverschlüssen

Imprimante à transfer thermique pour marquer d'une fermeture à glissière

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE TR**

(43) Date of publication of application:
30.10.2002 Bulletin 2002/44

(73) Proprietor: **YKK Portugal, Lda.**
Carregado,
2580 Alenquer (PT)

(72) Inventor: **Costa, Jose**
3 Carregado
Alenquer (PT)

(74) Representative: **Luckhurst, Anthony Henry**
William
Marks & Clerk
90 Long Acre
London WC2E 9RA (GB)

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EP-A- 0 458 220 **EP-A- 0 947 340**
DE-A- 2 925 831 **DE-A- 3 825 712**

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Description

[0001] This invention relates to an apparatus and a method for marking zip fasteners, and in particular to a thermal transfer contact system for automatically marking zip fasteners.

[0002] Zip fasteners are commonly used for joining together two edges of material. They may be used for providing a closable slit in a unit e.g. as in a dress zip, or they may be used for joining two separate pieces of material together. They are widely used in a upholstery, clothing etc., with almost any type of material. In many situations, a zip fastener will be used to join together two edges of patterned material. A particular example is the manufacture of car seat covers. In this situation, it is important that the pattern on the two edges of material matches.

[0003] Matching two such patterns is an awkward process. A conventional zip fastener has two stringers which are formed from a plurality of coupling elements located on an edge of a tape. The edges of material to be joined are attached to the respective tape and the zip fastener is closed by engaging the coupling elements with a slider. In many situations, it is not practical to attach the material when the zip fastener is closed. Therefore, the zip fastener stringers need to be marked so that the pattern on the edges of the material can be matched with the corresponding position on the stringers.

[0004] A past method of doing this has been to mark the tapes of the zip fastener stringers manually, for example with a pen. However, this method has many disadvantages, in addition to being extremely time consuming and costly. For example, during handling of the stringers, the pen mark can rub off. Also, the tape must be marked on its upper and lower surface. It is awkward to accurately align pen marks on both of these surfaces.

[0005] Another method has been to use alignment marks in the zip-fastener stringer tapes consisting of pairs of open holes. The tape of each stringer has a hole at the same positions along the length of the stringers, allowing accurate alignment from either side. The holes are punched between the line of attachment of the material and the coupling elements so that the strength of the zip fastener is not weakened. To prevent fraying, the pins used to punch the holes are heated, sealing the walls of the hole. This works well for a polyester type material, although for other materials, a more complicated and more expensive sealing technique may be required. A major disadvantage of the hole punching method is that it is time consuming and therefore expensive to punch the holes. Except for particularly long zip fasteners, only a single alignment hole is generally provided, about half-way along the length of the zip fastener.

[0006] The present invention overcomes these problems by providing an apparatus and a method to create alignment marks preferably on both sides of a zip fastener stringer by printing, particularly thermal transfer printing. Multiple alignment marks can easily be made along the

length of the stringers, so that the material can be matched at more than one point. This is particularly important for long zip fasteners which are used in car seat manufacture. The alignment marks may be regularly or irregularly spaced, which may be of use for attaching to material with a more complex pattern or shape, for example. Multiple types of markings may be used, and markings can be accurately aligned on the upper and lower surfaces. Markings can be made using a choice of colours of ink, or using more than one colour of ink. Lengths of chain which have been previously dyed in different colours may be marked.

[0007] Thermal transfer contact systems provide a simple, economical and clean method of printing on layers of fabric, and on many consumer items utilising brightly coloured designs, such as ceramic mugs. However, none of these currently known machines are suited to printing on zip fasteners. In order to automatically print markings on a zip fastener, a printing machine must be able to take account of the width of the zip fastener chain, and it must be able to automatically deal with both continuous chain and gapped chain, taking account of the spacings between different lengths of gapped chain. It must be able to print on both the front and the back surfaces of zipper chains.

[0008] Thermal transfer printing technology is suitable for printing simple codes or marks onto a flat surface such as plastic film, cases or textile tapes. It ensures good and regular print quality. It is particularly suitable when the code to be printed is short and does not change often. Due to the fact that thermal contact printers use non solvent-based solid inks, ribbons or dry inks, this technology is environmentally friendly.

[0009] DE-A-3825712 and EP-A-414553 show apparatus for marking the stringer tape before elements are attached to the tape to assist with manufacture of the zip fastener. EP-A-458220 describes a method of marking the tape to determine when to change the style of the top and bottom stops to be attached at the required location on a continuous chain. EP-A-947340 shows a thermal printer for printing onto both sides of thermoplastic paper.

[0010] The present invention provides a printing apparatus for marking a zip fastener stringer, as set forth in the accompanying claim 1, and a method of automatically marking a zip fastener stringer as set forth in claim 12.

[0011] Preferably, two tapes are joined to form a chain, and the printing means is adapted to print on both tapes of the chain. Preferably, the measuring means comprises a rotary shaft encoder and the feeding means comprises a feed motor. Preferably, the printing apparatus further comprises support means for supporting the chain, allowing gapped chain to be fed through the system, end detector means such as a space detector, for detecting the gap. Preferably, the printing apparatus has a second print head, and the two print heads are positioned such that in use, one print head prints onto a first surface of the chain, and the second print head prints onto the reverse surface of the chain. Preferably the design of the mark

to be printed can be manually changed, and the shape of the print heads is adapted to allow printing to the stringers of a zip fastener with a slider.

[0012] The invention will now be described by way of example with reference to the following drawings, in which:-

Figure 1 shows several lengths of zip fastener chain, each with a different arrangement of alignment markings;

Figure 2 shows a schematic diagram of a preferred embodiment of the invention;

Figure 3 shows a side view of a preferred embodiment of the invention, and

Figure 4 shows an expanded view of a print head

[0013] Figure 1 shows three separate lengths of zip fastener chain 150, 160, 170. Each zip fastener chain has two stringers 103 and 105, and each stringer 103, 105 is made up of a tape 107, 109 with a multiple of coupling elements 111, 113 on the edge of the tape 107, 109. The elements may be discrete elements or formed by a continuous moulding or helically wound filament as is well known in the art. Typically, a length of zip fastener chain is made into a zip fastener by removing end fastening elements, replacing them with stops, and adding a slider. For manufacturing purposes, two tapes are formed and then joined to form a chain which can then be processed further, for example by dyeing, and then shipping. Gaps may be formed in the elements along the chain to indicate start and finish points of individual zip fasteners, for example by cutting away the elements.

[0014] The zip fastener chains of figure 1 show three different possibilities for marking. In the first chain 150, the stringers are symmetrically marked, with level sets of markings 115 spaced at a pre-set interval. Markings are considered level when a line between the markings on each stringer is substantially perpendicular to the direction of closure of the zip fastener. In the second chain 160, an asymmetric marking pattern is shown by markings 117 on stringer 103 being at a different spacing to markings 119 on stringer 105. In the third chain 170, markings 121 on the under side of stringer 105 are aligned with markings 123 on the upper side of stringer 103.

[0015] Figure 2 shows a schematic diagram of a preferred embodiment of the invention. Zip fastener chain 200 is fed between two rollers 202, 204 of a rotary shaft encoder 206. The rotary shaft encoder 206 sends a signal to a controller 208, indicating the length of chain 200 which has passed through the rollers 202, 204. The chain 200 then passes through two sets of print heads. A bottom print head 210 prints on the underside of the chain, and a top print head 212 prints on the upper side of the chain 200. A feed motor 214 provides the driving force

via the rollers 216, 218 to pull the chain 200 through the system.

[0016] The distance between the print heads of the printers 210, 212 is known, and the distance from the rotary encoder 206, and hence the respective printer is triggered by the controller after a calculated length of chain has passed through the rotary encoder 206.

[0017] The top and bottom printers are controlled via two compact control units 220, 222. Suitable control units would be Imaje: 1 Termopack 50 V S3 and 1 Termopack 50 H S3. These are connected to the controller 208. A control panel is provided on the controller 208. Chain guides 230, 232 are used to guide the chain 200 through the system, and into the correct position between the print heads. By changing the chain guides 230, 232, different sizes or widths of chain can be accommodated. The printer preferably prints a line or other marking extending in from the outer edge of the tape 107, 109 and may be adjustable to print different lengths. An achievable print head marking speed is 150 cycles per minute. Several ribbon colours are possible, and various types of mark shape are possible. The tolerance of positioning of a mark of 1mm is possible.

[0018] The print head design may allow for the printer to be set to print on one or both sides of the elements of the chain, that is on one or both tapes 107, 109 (Figure 1). Alternatively, two printers could be provided for printing on respective tapes 107, 109.

[0019] For continuous chain, the rotary encoder controls the marking by measuring the passage of the chain. For gapped chain, the start point of the elements can be detected by a space sensor 240 such as a photocell or a mechanical detector, and the controller then triggers the printers 210, 212 at pre-determined distances from the start point. The space sensor is preferably positioned downstream of the rotary encoder 206.

[0020] Figure 3 shows a sectional view of the printing machine. The chain is guided and aligned through a tensioner 250 before entering the rotary shaft encoder 206.

[0021] By controlling the tension, any stretching of the chain 200 between the encoder 206 and the motor 214 can be controlled, to ensure accurate positioning of the markings.

[0022] Figure 4 shows the construction of one of the print heads. The print head is fitted with rollers which guide an ink foil 141 below a hot press 143. The ink foil 141 enters the print head via a first roller, and leaves via a second roller. The zip fastener chain 100 is guided below the print head. An image 144 is transferred from the ink foil to the chain 200, by the hot press 143 moving towards the chain, and pressing the ink foil 144 against the chain 100.

[0023] It will be appreciated that other printer types, such as ink jet, might be used, but a thermal printer has been found to be particularly suitable.

[0024] By appropriate programming of the controller 208, markings can also be printed on the tapes 107, 109 at irregular intervals, such as 10cm, 20 cm, 45 cm from

a start point, to suit particular user requirements.

Claims

1. A printing apparatus for marking a zip fastener stringer (103, 105), said stringer (103, 105) comprising a plurality of coupling elements (111, 113) located on an edge of a tape (107, 109),
the said printing apparatus comprising:

a printer for printing onto said tape (107, 109);
feeding means (214, 216, 218) for feeding said stringer (103, 105) past a print head (210, 212) of the printer;
measuring means (206) for measuring the passage of said stringer (103, 105) past the print head (210, 212) and providing an output; and
control means (208, 220, 222) coupled to said measuring means (206) and to said printers (210, 212), **characterised in that** said control means is adapted to control the printer to print onto said tape (107, 109) at different intervals according to the output from the measuring means.

2. A printing apparatus as claimed in claim 1, **characterised in that** the measuring means comprises a rotary shaft encoder (206).

3. A printing apparatus as claimed in claim 2, **characterised in that** the feeding means comprises a feed motor (214) which pulls the tape (107, 109) through the encoder (206) and past the print head (210, 212).

4. A printing apparatus, as claimed in any one of claims 1 to 3, comprising two print heads (210, 212) positioned such that in use, one print head prints onto a first surface of the tape (107, 109), and the second print head prints onto the reverse surface of the tape (107, 109).

5. A printing apparatus as claimed in claim 4, **characterised in that** the control means (208, 220, 222) is programmable to cause the respective print heads to print at different intervals along the tape (107, 109).

6. A printing apparatus, as claimed in any one of claims 1 to 5, **characterised in that** feeding means is adapted to feed a chain (200) comprising a pair of coupled stringers (107, 109) through the apparatus.

7. A printing apparatus, as claimed in claim 6, **characterised by** further comprising end detector means (240) for detecting a gap in the coupling elements (111, 113) along the chain, (200).

8. A printing apparatus as claimed in claim 7, **characterised in that** the end detector means (240) comprises a space detector.

terised in that the end detector means (240) comprises a space detector.

9. A printing apparatus as claimed in claim 6, 7 or 8, **characterised in that** the control means is adapted to control the printer to print at different intervals on the respective tapes (107, 109) of the chain (200).

10. A printing apparatus, as claimed in any one of claims 1 to 9, **characterised in that** the design of the mark to be printed can be changed.

11. A printing apparatus, as claimed in any one of claims 1 to 10, **characterised in that** the printer (210, 212) is a thermal printer.

12. A method of automatically marking a zip fastener stringer (103, 105), said stringer (103, 105) comprising a plurality of coupling elements (111, 113) located on an edge of a tape (107, 109), the method comprising the steps of:

feeding said stringer past the print head (210, 212) of a printer for printing onto said tape (107, 109);

measuring the passage of said stringer (103, 105) past the print head (210, 212) of the printer with a measuring means (206) and providing an output from the measuring means to a control means (208, 220, 222), and

characterised by the control means (208, 220, 222) controlling the printer to print onto said tape (107, 109) at different intervals according to the output from the measuring means (206).

13. A method as claimed in claim 12, further **characterised in that** said printer comprises first and second print heads, and printing onto a first surface of said tape with the first print head and printing onto the reverse surface of said tape with the second print head.

14. A method as claimed in claim 13, **characterised in that** the control means controls the respective print heads to print at different intervals along said tape.

15. A method as claimed in any one of claims 12, 13 or 14, **characterised in that** a pair of coupled stringers (107, 109), forming a chain (200), are fed past the print head (s).

16. A method as claimed in claim 15, further comprising providing end detector means (240) and detecting a gap in the coupling elements (111, 113) along said chain by means of said end detector means.

17. A method as claimed in claim 15 or 16, further comprising printing onto the respective tapes at different

intervals along said chain.

18. A method as claimed in any one of the preceding claims, wherein the printer is a thermal printer.

Patentansprüche

1. Druckvorrichtung zum Markieren eines Reißverschlusssträgerbands (103, 105), wobei das Trägerband (103, 105) aus einer Mehrzahl von Kupplungselementen (111, 113) besteht, die sich auf einer Kante eines Bandes (107, 109) befinden, die besagte Druckvorrichtung umfasst:

einen Drucker zum Drucken auf dem Band (107, 109);
Vorschubmittel (214, 216, 218) zum Vorschieben des Trägerbandes (103, 105) vorbei an einem Druckkopf (210, 212) des Druckers;
eine Messeinrichtung (206) zum Messen des Durchlaufs des Trägerbandes (103, 105) vorbei an dem Druckkopf (210, 212) und zum Bereitstellen eines Ausgangs; und
Steuermittel (208, 220, 222), gekuppelt an die Messeinrichtung (206) und an dem Drucker (210, 212), **dadurch gekennzeichnet, dass** die Steuermittel daran angepasst sind, den Drucker zu steuern, auf das Band (107, 109) in verschiedenen Abständen gemäß dem Ausgang aus der Messeinrichtung (206) zu drucken.

2. Druckvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Messeinrichtung einen Drehgeber (206) umfasst.

3. Druckvorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** die Vorschubmittel einen Vorschubmotor (214) umfassen, der das Band (107, 109) durch den Drehgeber (206) und vorbei an dem Druckkopf (210, 212) zieht.

4. Druckvorrichtung nach einem der Ansprüche 1 bis 3, die zwei Druckköpfe (210, 212) umfasst, so positioniert, dass beim Gebrauch ein Druckkopf auf eine erste Oberfläche des Bandes (107, 109) druckt und der zweite Druckkopf auf die umgekehrte Oberfläche des Bandes (107, 109) druckt.

5. Druckvorrichtung nach Anspruch 4, **dadurch gekennzeichnet, dass** die Steuermittel (208, 220, 222) programmierbar sind, die jeweiligen Druckköpfe dazu zu bewegen, in verschiedenen Abständen entlang des Bandes (107, 109) zu drucken.

6. Druckvorrichtung nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die Vorschubmittel daran angepasst sind, eine Kette (200), die

ein Paar von gekuppelten Trägerbändern (107, 109) umfasst, durch die Vorrichtung zu verschieben.

7. Druckvorrichtung nach Anspruch 6, **dadurch gekennzeichnet, dass** sie des Weiteren eine Enddetektoreinrichtung (240) zum Erfassen einer Lücke in den Kupplungselementen (111, 113) entlang der Kette (200) umfasst.

8. Druckvorrichtung nach Anspruch 7, **dadurch gekennzeichnet, dass** die Enddetektoreinrichtung (240) einen Abstandsdetektor umfasst.

9. Druckvorrichtung nach Anspruch 6, 7 oder 8, **dadurch gekennzeichnet, dass** die Steuermittel daran angepasst sind, den Drucker zu steuern, auf die jeweiligen Bänder (107, 109) der Kette (200) in verschiedenen Abständen zu drucken.

10. Druckvorrichtung nach einem der Ansprüche 1 bis 9, **dadurch gekennzeichnet, dass** der Entwurf der zu druckenden Markierung geändert werden kann.

11. Druckvorrichtung nach einem der Ansprüche 1 bis 10, **dadurch gekennzeichnet, dass** der Drucker (210, 212) ein Thermodrucker ist.

12. Verfahren des automatischen Markierens eines Reißverschlusssträgerbands (103, 105), wobei das Trägerband (103, 105) aus einer Mehrzahl von Kupplungselementen (111, 113) besteht, die sich auf einer Kante eines Bandes (107, 109) befinden, das Verfahren die folgenden Schritte umfasst:

Vorschieben des Trägerbandes vorbei an dem Druckkopf (210, 212) eines Druckers zum Drucken auf dem Band (107, 109);
Messen des Durchlaufs des Trägerbandes (103, 105) vorbei an dem Druckkopf (210, 212) des Druckers mit einer Messeinrichtung (206) und Bereitstellen eines Ausgangs aus der Messeinrichtung (206) zu Steuermitteln (208, 22, 222) und
gekennzeichnet durch Steuern des Druckers **durch** Steuermittel (208, 220, 222), auf das Band (107, 109) in verschiedenen Abständen gemäß des Ausgangs aus der Messeinrichtung (206) zu drucken.

13. Verfahren nach Anspruch 12, des Weiteren **dadurch gekennzeichnet, dass** der Drucker erste und zweite Druckköpfe und Drucken auf eine erste Oberfläche des Bandes mit dem ersten Druckkopf und Drucken auf die umgekehrte Oberfläche des Bandes mit dem zweiten Druckkopf umfasst.

14. Verfahren nach Anspruch 13, **dadurch gekennzeichnet, dass** die Steuermittel die jeweiligen

Druckköpfe steuern, in verschiedenen Abständen entlang des Bandes zu drucken.

15. Verfahren nach Anspruch 12, 13 oder 14, **dadurch gekennzeichnet, dass** ein Paar von gekuppelten Trägerbändern (107, 109), die eine Kette (200) bilden, vorbei an dem Druckkopf/den Druckköpfen vorgeschoben werden. 5
16. Verfahren nach Anspruch 15, das des Weiteren umfasst: Bereitstellen einer Enddetektoreinrichtung (240) und Erfassen einer Lücke in den Kupplungselementen (111, 113) entlang der Kette mittels der Enddetektoreinrichtung. 10
17. Verfahren nach Anspruch 15 oder 16, das des Weiteren Drucken auf die jeweiligen Bänder in verschiedenen Abständen entlang der Kette umfasst. 15
18. Verfahren nach einem der vorangehenden Ansprüche, worin der Drucker ein Thermodrucker ist. 20

Revendications

1. Appareil d'impression permettant de marquer une bande d'accrochage de fermeture à glissière (103, 105), ladite bande d'accrochage (103, 105) comprenant une pluralité d'éléments d'accouplement (111, 113) situés sur un bord d'un ruban (107, 109), ledit appareil d'impression comprenant : 25
 - une imprimante permettant d'imprimer sur ledit ruban (107, 109) ;
 - un moyen d'alimentation (214, 216, 218) pour faire avancer ladite bande d'accrochage (103, 105) devant une tête d'impression (210, 212) de l'imprimante ; 30
 - un moyen de mesure (206) pour mesurer le passage de ladite bande d'accrochage (103, 105) devant la tête d'impression (210, 212) et fournir une sortie ; et
 - un moyen de commande (208, 220, 222) couplé audit moyen de mesure (206) et à ladite imprimante (210, 212), **caractérisé en ce que** ledit moyen de commande est adapté pour commander l'imprimante pour imprimer sur ledit ruban (107, 109) à différents intervalles selon la sortie fournie par le moyen de mesure. 35
2. Appareil d'impression selon la revendication 1, **caractérisé en ce que** le moyen de mesure comprend un codeur à axe rotatif (206). 40
3. Appareil d'impression selon la revendication 2, **caractérisé en ce que** le moyen d'alimentation comprend un moteur d'alimentation (214) qui tire le ruban (107, 109) dans le codeur (206) et devant la tête 45

d'impression (210, 212).

4. Appareil d'impression selon l'une quelconque des revendications 1 à 3, comprenant deux têtes d'impression (210, 212) positionnées de telle manière que, en utilisation, une tête d'impression imprime sur une première face du ruban (107, 109) et la seconde tête d'impression imprime sur l'autre face du ruban (107, 109). 5
5. Appareil d'impression selon la revendication 4, **caractérisé en ce que** le moyen de commande (208, 220, 222) est programmable pour faire imprimer les têtes d'impression respectives à différents intervalles sur le ruban (107, 109). 10
6. Appareil d'impression selon l'une quelconque des revendications 1 à 5, **caractérisé en ce que** le moyen d'alimentation est adapté pour faire avancer une chaîne (200) comprenant une paire de bandes d'accrochage accouplées (107, 109) dans l'appareil. 15
7. Appareil d'impression selon la revendication 6, **caractérisé en ce qu'il** comprend en outre un moyen de détection d'extrémité (240) pour détecter un vide dans les éléments d'accouplement (111, 113) de la chaîne (200). 20
8. Appareil d'impression selon la revendication 7, **caractérisé en ce que** le moyen de détection d'extrémité (240) comprend un détecteur d'espace. 25
9. Appareil d'impression selon la revendication 6, 7 ou 8, **caractérisé en ce que** le moyen de commande est adapté pour commander l'imprimante pour imprimer à différents intervalles sur les rubans respectifs (107, 109) de la chaîne (200). 30
10. Appareil d'impression selon l'une quelconque des revendications 1 à 9, **caractérisé en ce que** le dessin de la marque à imprimer peut être changé. 35
11. Appareil d'impression selon l'une quelconque des revendications 1 à 10, **caractérisé en ce que** l'imprimante (210, 212) est une imprimante thermique. 40
12. Procédé de marquage automatique d'une bande d'accrochage de fermeture à glissière (103, 105), ladite bande d'accrochage (103, 105) comprenant une pluralité d'éléments d'accouplement (111, 113) situés sur un bord d'un ruban (107, 109), le procédé comprenant les étapes consistant à : 45
 - faire avancer ladite bande d'accrochage devant la tête d'impression (210, 212) d'une imprimante pour imprimer sur ledit ruban (107, 109);
 - mesurer le passage de ladite bande d'accrochage (103, 105) devant la tête d'impression (210,

212) de l'imprimante à l'aide d'un moyen de mesure (206) et fournir une sortie du moyen de mesure à un moyen de commande (208, 220, 222), et

caractérisé en ce que le moyen de commande (208, 220, 222) commande l'imprimante pour imprimer sur ledit ruban (107, 109) à différents intervalles selon la sortie fournie par le moyen de mesure (206).

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13. Procédé selon la revendication 12, **caractérisé en outre en ce que** ladite imprimante comprend des première et seconde têtes d'impression, et par le fait d'imprimer sur une première face dudit ruban avec la première tête d'impression et d'imprimer sur l'autre face dudit ruban avec la seconde tête d'impression.

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14. Procédé selon la revendication 13, **caractérisé en ce que** le moyen de commande commande les têtes d'impression respectives pour les faire imprimer à différents intervalles sur ledit ruban.

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15. Procédé selon l'une quelconque des revendications 12, 13 et 14, **caractérisé en ce que** l'on fait avancer une paire de bandes d'accrochage accouplées (107, 109), formant une chaîne (200), devant la ou les tête(s) d'impression.

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16. Procédé selon la revendication 15, comprenant en outre le fait de prévoir un moyen de détection d'extrémité (240) et de détecter un vide dans les éléments d'accouplement (111, 113) de ladite chaîne à l'aide dudit moyen de détection d'extrémité.

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17. Procédé selon la revendication 15 ou 16, comprenant en outre le fait d'imprimer sur les rubans respectifs à différents intervalles le long de ladite chaîne.

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18. Procédé selon l'une quelconque des revendications précédentes, dans lequel l'imprimante est une imprimante thermique.

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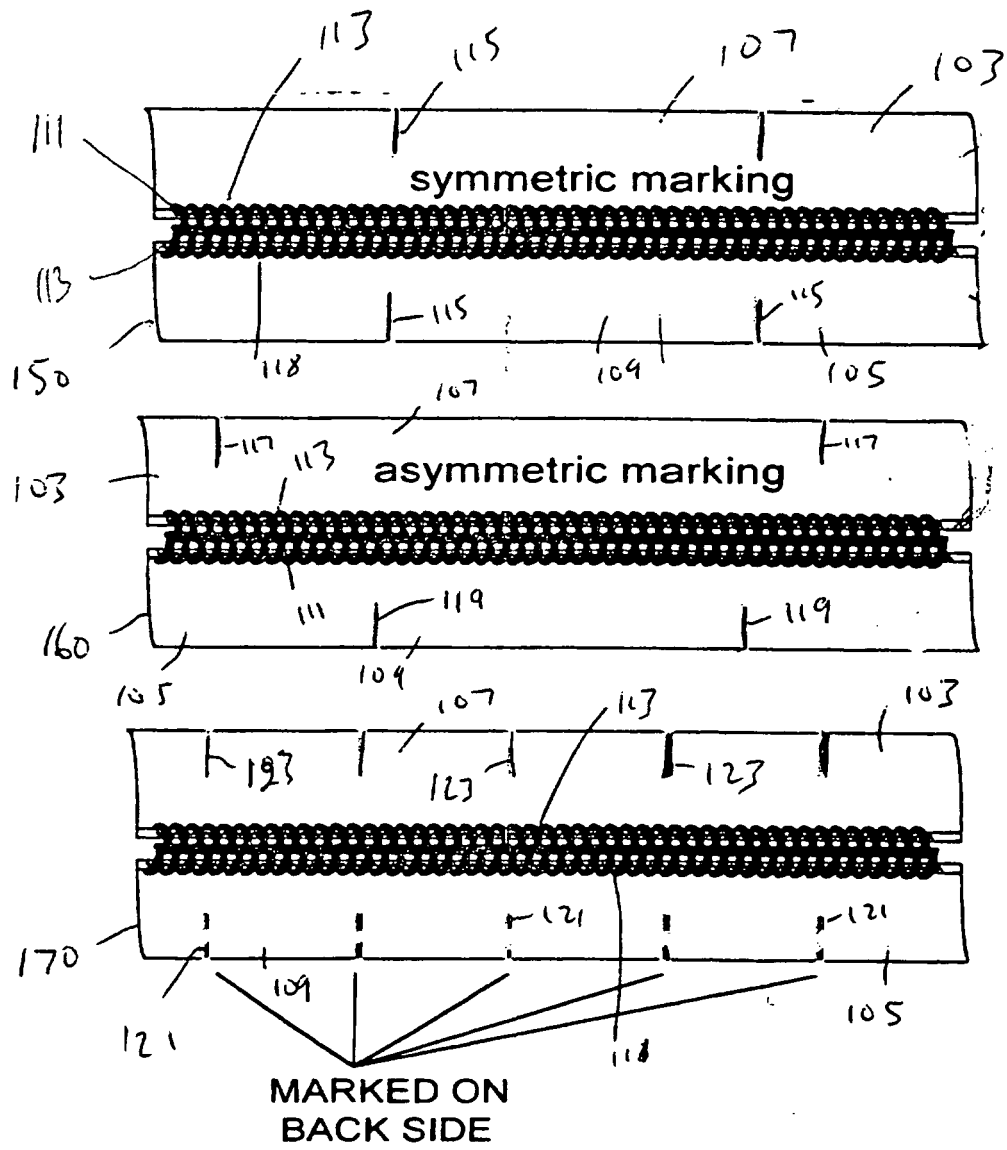


FIG 1

FLG2

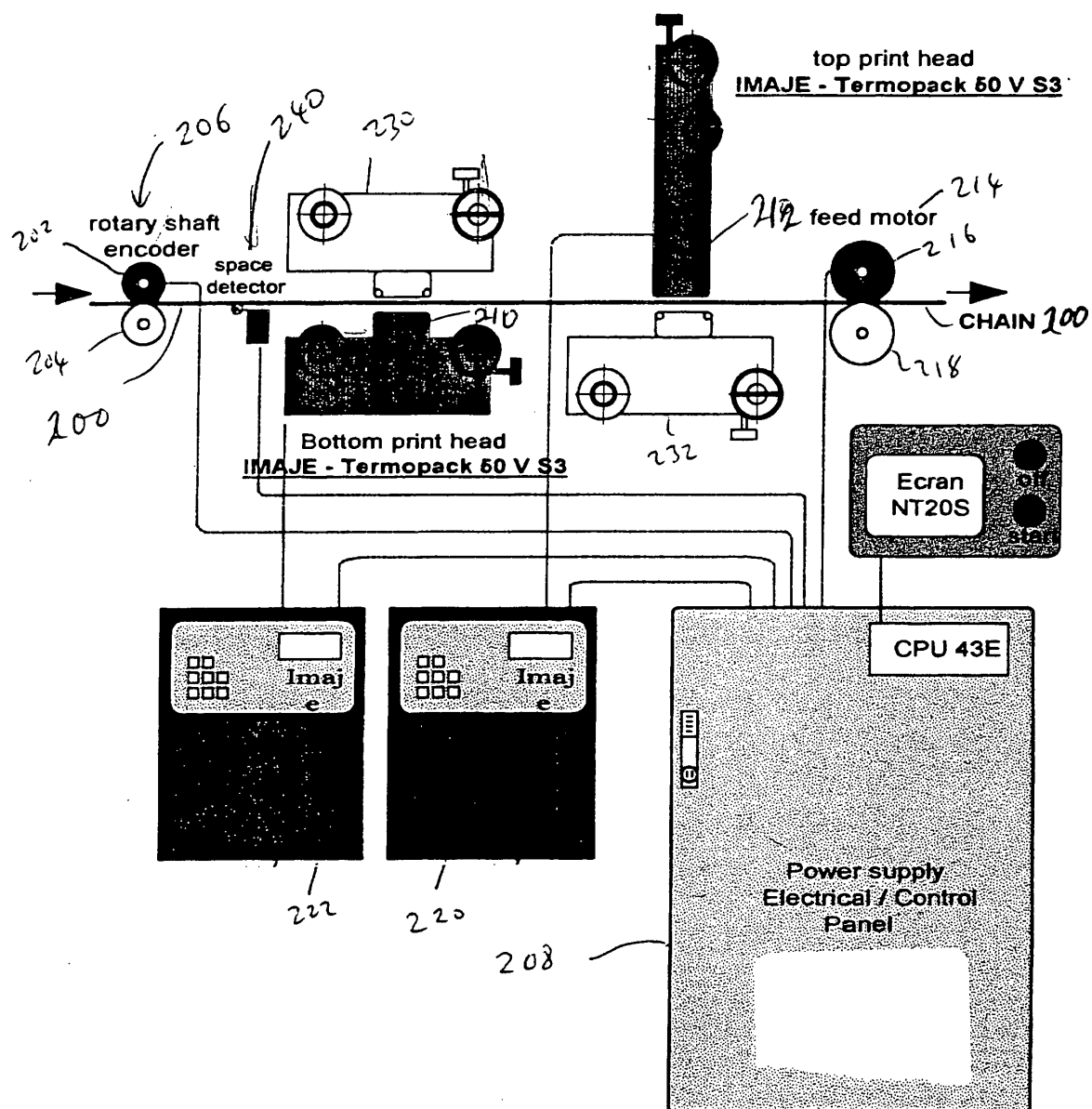


Fig 3.

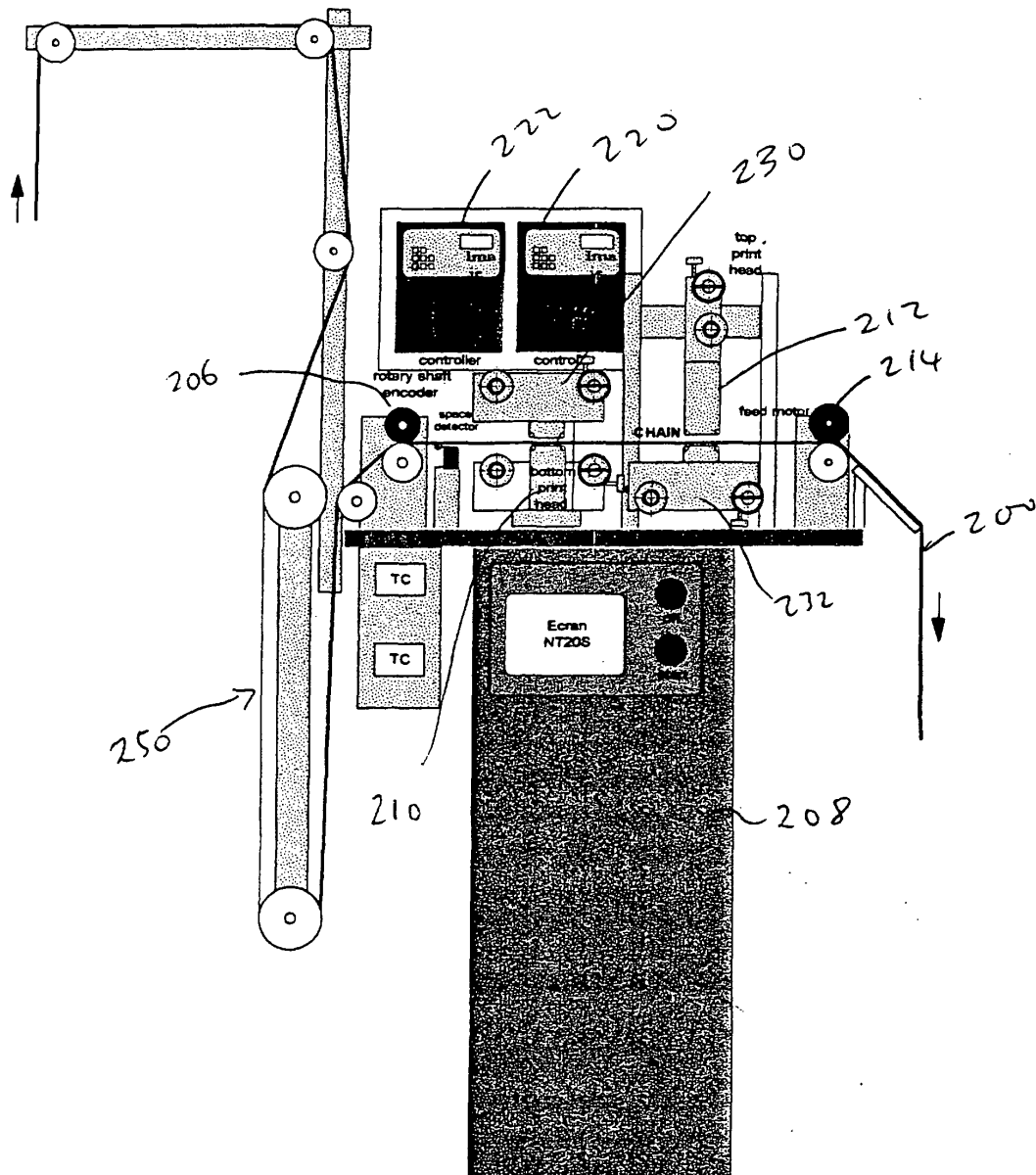


FIG-4

