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(54) A METHOD AND DEVICE FOR DIRECTLY TRANSFERRING IMAGES

VERFAHREN UND VORRICHTUNG ZUR DIREKTEN UEBERTRAGUNG VON BILDERN

PROCEDE ET DISPOSITIF DE TRANSFERT DIRECT D'IMAGES

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(56) References cited:
**EP-A- 0 110 220 EP-A- 0 511 605
DE-A- 2 604 475**

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Description

Technical Field

The present invention relates to a method and a device for directly marking the surface of objects having a plane or curved form, by transfer of the ink which is present on a temperature-sensitive band, and by using a jet (current) of hot air, which pushes the temperature-sensitive band against the object.

In particular, the images transferred on the object may be a bar code, a logo (logotype), a text, etc.

Background Art

The prior art uses different methods in order to transfer images on a sheath, a packing, a plastic object, etc.

There have been already produced kinds of printers which employ a pad in order to press the inked band or strap against the object, for transferring the images.

Other methods of direct transfer of images, i.e. those which do not make use of pressure sensitive (adhesive) labels, are the following:

- marking with thermal transfer of images by means of a cliché;
- direct thermal transfer printing on objects.

"EP-A-511 605 discloses a machine for transferring images from an inked support on a cylindrical object, in particular a can. The object is preheated before the image transfer, so that this machine cannot be employed for the case of objects which are damaged by heat. Moreover, this machine uses an electrode to electrostatically charge the inked band, and the image is not instantly transferred since a slot type nozzle is used."

Disclosure of Invention

An object of the present invention is that of providing a method and a related device for carrying out such method, whereby the transfer occurs through a hot air jet (current) under controlled temperature and pressure conditions, said jet being distributed uniformly on the portion of the inked temperature sensitive band or strap which bears the positive or negative image, in order to push that portion of the band or strap against the flat or curved surface of the object.

Brief Description of Drawings

The present invention will now be described for illustrative and non-limitative purposes by means of a preferred embodiment thereof, which is shown in the only figure annexed to this document, representing a front and partially sectional view of the device.

Best Mode of Carrying out the Invention

The device shown in Fig. 1 may be incorporated in a standard electronic thermal transfer printer.

The device in Fig. 1 comprises a temperature-sensitive printing band or strap associated to a respective pay-off roller or decoiler 2 and a take-up roller or coiler 3. The reference numbers 4a and 4b indicate band tightening rollers or briefly, tighteners.

The central part 5 of the device is the innovative part, which directs the hot air jet against the Central horizontal section 1' of the inked temperature sensitive band 1.

Said horizontal section 1' is located at a predetermined distance from the object 6, which, even if it has a flat surface in the figure, may have a curved form whatever.

In fact, the hot air which leaves the diffuser 7 of compressed air, pushes the band 1 against the object 6, conforming to the shape of the latter, as will be explained later on. The central part 5 comprises a compressed air inlet duct 8 (for instance connected to a compressor), by means of which cold air is introduced inside a chamber with variable volume 9. The cold air is fed into the variable volume chamber 9 at a predetermined pressure (preferably from about 0,5 to about 8 bar) adjusted by a flow control valve 10, which is set either manually or automatically, depending on the size of the image to be transferred.

The variable volume chamber 9 comprises an upper part 11a and a lower part 11b; the latter one may be vertically displaced in order to increase or decrease the extension of the inner space of the variable volume chamber 9. This operation is done automatically. The volume of the variable volume chamber 9 is adjusted as a function of the dimensions of the image to be transferred, and internally it includes an electric resistance 12 having the shape of a coil which heats the air inside the variable volume chamber.

Reference numeral 13 denotes a control circuit which closes the flow control valve 10, when a predetermined amount of air has entered the variable volume chamber 9, and the pressure of this air has reached the pressure value adjusted by the flow control valve 10.

At this moment, while the variable volume chamber 9 is hermetically sealed, the electric resistance 12 is heated up through the control circuit 13.

The temperature of the air inside the variable volume chamber 9 is adjusted and maintained constant by means of a thermostat (not shown), at a value preferably between 40 and 700°C, depending on the kind of band or strap being employed and suited for thermal transfer of images.

The air contained in the variable volume chamber 9 will be, as a whole, maintained at a constant pressure and temperature.

In consequence of the automatic control obtained through the control circuit 13, the solenoid valve 14 is operated, so as to let the air flow out of the chamber 9,

introducing it in the diffuser 7, or air expansion device, or air sprayer.

The diffuser 7 forms an "equipotential plane", that is, the heat flow which passes through the unit of area on the plane located at the outlet 15 of the diffuser 7, is the same at every point on this plane. Furthermore, the pressure of the air which flows out of the diffuser 7, is the same at every point of said plane. The term "equipotential" means that both conditions are satisfied.

In this manner, the pressure exerted on the portion concerned of the temperature-sensitive band or strap and the heating produced, will be the same at every point, allowing an optimum transfer of the image on the object. In order to speed up the emptying operation of the chamber 9, the flow control valve 10 may be opened simultaneously to the solenoid valve 14, introducing (cold) air into the chamber 9, which pushes downwardly the hot air contained in the chamber 9.

As shown in the figure, the section 1' of the temperature-sensitive band 1 is located at a variable distance from the diffuser 7, depending on the chosen volume of the variable volume chamber 9. The hot air is "sprayed" by the diffuser 7 on the band or strap 1', and the latter thermally transfers the image on the surface of the object 6 conforming to the shape thereof.

Claims

1. A method for directly transferring images on objects, by means of an inked temperature-sensitive band or strap and a hot air jet acting thereon and pushing the band into intimate contact with the object's surface characterized in that it comprises the following steps:

- i) Hot air is stored at a controlled temperature and pressure, inside a variable volume chamber (9), whose volume is chosen according to the dimensions of the image to be transferred;
- ii) A valve (14) is opened in order to let the stored hot air flow out through a diffuser (7) which produces an "equipotential plane" or air cushion, through which a constant pressure and a constant heat flow is obtained at every point of the whole image on the temperature sensitive band or strap (1), the latter being pushed against the surface of the object, thus conforming to its shape and allowing the thermal transfer of the image.

2. A method according to claim 1, characterized in that the air is heated up directly inside the variable volume chamber, through an electric resistance (12), to which a voltage is applied by means of a control circuit (13).

3. A method according to claim 2, characterized in that cold air is introduced into the variable volume chamber (9) by means of a flow control valve (10) at

a predetermined pressure which corresponds to the desired final pressure of the air inside the variable volume chamber (9) before its heating.

4. A method according to claim 1, characterized in that the temperature inside the variable volume chamber (9) is adjusted by a thermostat, which adapts this temperature to the kind of employed temperature-sensitive band or strap.

5. A method according to claims 1 to 4, characterized in that the valve (14) which allows the hot air stored inside the chamber (9) to flow out through the diffuser (7), is a solenoid valve controlled by the control circuit (13).

6. A method according to claims 1 to 5, characterized in that the valve (14) which allows the diffusion of hot air and which is operated through the control circuit (13), is opened simultaneously to the flow control valve (10), in order to speed up the emptying operation of the variable volume chamber (9).

7. A device for directly transferring images on objects, by means of an inked temperature-sensitive band or strap and a hot air jet acting thereon, comprising a take-up roller (3) and a pay-off roller (2), and a plurality of band tightening rollers (4a, 4b), characterized in that it comprises also a variable volume chamber (9) inside which hot air is stored at a constant pressure and temperature, said hot air being discharged through a diffuser (7) or air sprayer, when a valve (14) is opened.

8. A device according to claim 7, characterized in that the air is introduced into the variable volume chamber while it is still cold, by means of a flow control valve (10), the device comprising also an electric resistance (12) in the form of a coil which heats up the air inside the variable volume chamber (9) until a predetermined temperature is reached, suited to the quality of the employed temperature-sensitive band or strap.

9. A device according to any of the preceding claims, characterized in that the valve (14) which, when it is opened, causes the hot air to flow out of the chamber (9), is a solenoid valve (14); the device comprising also a control circuit (13) which besides heating up the electric resistance (12), automatically controls the opening and closing operations of the flow control valve (10) and of the solenoid valve (14).

10. A device according to any of the preceding claims, characterized in that the temperature of the air inside the chamber (9) is preferably adjusted so as to be included within an interval from about 40°C to about 700°C.

Patentansprüche

1. Verfahren zur direkten Übertragung von Bildern auf Gegenständen, mittels eines temperaturempfindlichen Bandes worauf Tinte angebracht worden ist, und mittels eines Heissluftstrahls der darauf wirkt und das Band unmittelbar in Berührung mit der Gegenstandsfläche bringt und darauf drückt, dadurch gekennzeichnet, dass es folgende Schritte umfasst:
 - i) Heisse Luft wird unter kontrolliertem Druck und kontrollierter Temperatur innerhalb einer Kammer (9) mit variablem Volumen gespeichert, wobei das Volumen nach der Abmessung des zu übertragenden Bildes gewählt wird;
 - ii) ein Ventil (14) wird geöffnet um die gespeicherte heisse Luft durch den Diffusor (7) herausströmen zu lassen, welcher eine Äquipotentialebene bzw. ein Luftkissen erzeugt, durch welches ein konstanter Druck und Temperaturfluss auf jedem Bildpunkt des temperaturempfindlichen Bandes (1) entsteht, derart dass letzteres gegen die Gegenstandsfläche gedrückt wird und ihre Gestalt annimmt, um dadurch die thermische Bildübertragung zu ermöglichen.
2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass die Luft direkt innerhalb der Kammer mit variablem Volumen, mittels eines elektrischen Widerstandes (12) an welchem eine Spannung durch die Steuerschaltung (13) angelegt ist, erwärmt wird.
3. Verfahren nach Anspruch 2, dadurch gekennzeichnet, dass kalte Luft innerhalb der Kammer mit variablem Volumen (9) mittels eines Stromregelventils (10) und unter vorgegebenem Druck, der dem gewünschten Enddruck der Luft vor ihrer Erwärmung in der Kammer mit variablem Volumen (9) entspricht, eingeleitet wird.
4. Verfahren nach Anspruch 1, dadurch gekennzeichnet, dass die Temperatur in der Kammer (9) mit variablem Volumen durch einen Thermostaten geregelt wird, welcher diese Temperatur zu den Eigenschaften des benutzten temperaturempfindlichen Bandes anpasst.
5. Verfahren nach Anspruch 1 bis 4, dadurch gekennzeichnet, dass das Ventil (14) welches die in der Kammer gespeicherte heisse Luft durch den Diffusor (7) strömen lässt, ein durch die Steuerschaltung (13) gesteuertes Solenoidventil bildet
6. Verfahren nach Anspruch 1 bis 5, dadurch gekennzeichnet dass das Ventil (14) welches die Diffusion

der heissen Luft erlaubt und durch die Steuerschaltung gesteuert wird, gleichzeitig mit dem Stromregelventil (10) geöffnet wird, um die Entleerung der Kammer (9) mit variablem Volumen zu beschleunigen.

7. Vorrichtung zur direkten Bildübertragung auf Gegenständen, durch ein temperaturempfindliches Band, worauf Tinte angebracht worden ist, und durch einen Heissluftstrahl der auf das Band wirkt, bestehend aus einer Wicklungsrolle (3) und einer Abwicklungsrolle (2), sowie aus einer Mehrzahl von Spannrollen (4a, 4b) für das Band, dadurch gekennzeichnet, dass die Vorrichtung auch eine Kammer mit variablem Volumen (9) aufweist, innerhalb welcher heisse Luft unter konstantem Druck und Temperatur gespeichert wird, wobei diese Luft durch einen Diffusor (7) bzw. eine Luftsprühvorrichtung ausgelassen wird, wenn ein Ventil (14) geöffnet wird.
8. Vorrichtung nach Anspruch 7, dadurch gekennzeichnet, dass die noch kalte Luft in die Kammer mit variablem Volumen durch Betätigung des Stromregelventils (10) eingeleitet wird, und dass die Vorrichtung auch einen schraubenlinienförmigen elektrischen Widerstand (12) aufweist, welcher die sich in der Kammer mit variablem Volumen (9) befindliche Luft, bis zur Erreichung der vorgegebenen, der Qualität des verwendeten temperaturempfindlichen Bandes entsprechenden Temperatur, erwärmt.
9. Vorrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass das Ventil (14) welches in der geöffneten Lage die heisse Luft von der Kammer (9) herausströmen lässt, ein Solenoidventil (14) bildet, wobei die Vorrichtung weiterhin eine Steuerschaltung (13) aufweist, welche neben der Erwärmung des elektrischen Widerstands (12), automatisch auch das Öffnen und Schliessen des Stromregelventils (10) und des Solenoidventils (14) bewirkt.
10. Vorrichtung nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, dass die Temperatur der Luft in der Kammer (9) vorzugsweise so geregelt wird, dass sie im Intervall zwischen etwa 40°C und etwa 700°C liegt.

Revendications

1. Un procédé pour le transfert direct d'images sur des objets au moyen d'une bande ou courroie encrée thermosensible et d'un jet d'air chaud agissant sur ladite bande et poussant la bande en contact étroit avec la surface de l'objet, caractérisé de ce qu'il comprend les phases suivantes:

- i) l'air chaud est maintenu à température et pression contrôlées dans une chambre (9) dont le volume peut varier selon les dimensions de l'image qui doit être transférée;
- ii) une soupape (14) est ouverte pour faire sortir l'air chaud à travers un diffuseur (7) qui produit un "plan équipotentiel" ou coussin d'air assurant une pression et un débit de chaleur constants sur chaque point de l'image qui se trouve sur la bande ou courroie (1) thermosensible, ladite bande étant poussée contre la surface de l'objet, se conformant ainsi à sa forme et donnant lieu au transfert thermique de l'image.
2. Un procédé selon la Revendication 1, caractérisé de ce que l'air est réchauffé directement à l'intérieur de la chambre à volume variable par une résistance électrique (12) dont le voltage est alimenté par un circuit de contrôle (13).
 3. Un procédé selon la Revendication 2, caractérisé de ce que l'air froid est introduit dans la chambre à volume variable (9) par une soupape de contrôle du flux (10) à une pression prédéterminée qui correspond à la pression finale désirée de l'air à l'intérieur de la chambre à volume variable (9) avant le réchauffement.
 4. Un procédé selon la Revendication 1, caractérisé de ce que la température à l'intérieur de la chambre à volume variable (9) est réglée par un thermostat qui adapte cette température au type de bande ou courroie thermosensible utilisée.
 5. Un procédé selon les Revendications de 1 à 4, caractérisé de ce que la soupape (14) qui permet la sortie de l'air chaud contenu dans la chambre (9) par un diffuseur (7) est une soupape solénoïdale contrôlée par le circuit de contrôle (13).
 6. Un procédé selon les Revendications de 1 à 5, caractérisé de ce que la soupape (14) qui permet la diffusion de l'air chaud et qui est actionnée par le circuit de contrôle (13) est ouverte au même temps que la soupape de contrôle du flux (10) de façon à accélérer l'opération de vidage de la chambre à volume variable (9).
 7. Un dispositif de transfert direct d'images sur des objets au moyen d'une bande ou courroie encrée thermosensible et d'un jet d'air chaud agissant sur ladite bande, comprenant un rouleau enrouleur (3), un rouleau dérouleur (2) et une pluralité de rouleaux (4a, 4b) de coulissement de la bande, caractérisé de ce que ce dispositif comprend aussi une chambre à volume variable (9) contenant de l'air chaud à température et pression constantes, l'air chaud étant déchargé à travers un diffuseur (7) ou vaporisateur d'air suivant l'ouverture d'une soupape (14).
 8. Un dispositif selon la Revendication 7, caractérisé de ce que l'air est introduit encore froid dans la chambre à volume variable grâce à une soupape de contrôle du flux (10), le dispositif comprenant aussi une résistance électrique (12) de forme spiraloïdale qui réchauffe l'air dans la chambre à volume variable (9) jusqu'à une température prédéterminée en fonction de la qualité de la bande ou courroie thermosensible utilisée.
 9. Un dispositif selon les revendications précédentes, caractérisé de ce que la soupape (14) qui, une fois ouverte, fait sortir l'air chaud de la chambre (9), est une soupape solénoïdale (14), le dispositif comprenant aussi un circuit de contrôle (13) qui réchauffe la résistance électrique (12) et en même temps contrôle automatiquement les opérations d'ouverture et fermeture de la soupape de contrôle du flux (10) et de la soupape solénoïdale (14).
 10. Un dispositif selon les revendications précédentes, caractérisé de ce que la température de l'air dans la chambre (9) est réglée de préférence de façon à être comprise entre 40°C et 700°C.

