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(54) Title: EDIBLE INK

(57) Abstract: This invention relates to an edible ink, in particular to an ink suitable for printing by an ink jet printer, which ink can be printed on chocolate, especially chocolate covered ice cream products. At present chocolate covered ice cream products are stamped with a decorative feature to render them more distinctive and attractive, and to reduce their counterfeiting. There are a number of disadvantages associated with this method of decoration. The aforementioned problems are solved by provision of a method for ink-jet printing an edible non-conductive ink on chocolate, the method comprising the steps of: a) applying the ink to chocolate using an ink-jet printer thereby to produce a printed chocolate, then; b) storing the printed chocolate at less than zero, preferably in the range zero to - 30, most preferably in the range -5 to -20 degrees centigrade; wherein the ink comprises a polymeric binder, a colourant and at least one organic solvent, wherein the polymeric binder comprises at least one substance selected from the group consisting of polysaccharides, glycoproteins, esters, polyesters, polyvinyl pyrrolidone, derivatives thereof and mixtures thereof, wherein the polymeric binder has a number average molecular weight of either no more than 100 000 or when greater than 100 000 has a ratio of polymer concentration of the ink to the polymer overlap concentration of less than or equal to 1, wherein the polymer overlap concentration is the reciprocal of the intrinsic viscosity of the polymeric binder in the ink, wherein the colourant is oil soluble, wherein the ink is in the form of an isotropic solution and has an Ohnesorge number (Oh) of greater than 0.1 but less than 1, wherein the ink comprises less than 1%, preferably less than 0.5%, more preferably less than 0.01%, even more preferably less than 0.001%, most preferably zero % by weight water-soluble colourant.

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Description

EDIBLE INK

[0001] This invention relates to an edible ink, in particular to an ink suitable for printing by an ink jet printer, which ink can be printed on chocolate, especially chocolate covered ice cream products.

[0002] At present chocolate covered ice cream products are stamped with a decorative feature to render them more distinctive and attractive, and to reduce their counterfeiting. The disadvantages associated with this method of decoration is the need for direct surface contact between the stamp and the chocolate surface, the risk of damaging the chocolate surface during the stamping process and consequent marring of the decorative feature, severe limitations on the level of detail and colour obtainable for the decorative feature, and the lack of flexibility in changing the form of the decorative feature each time requiring manufacture of new stamps and their fitting.

[0003] An alternative means for applying a decorative feature to chocolate covered ice cream products is to use ink jet printing. In ink jet printing, liquid ink droplets with volumes typically in the range of 10 to 100 pL are generated and placed on the substrate. The technology uses two mechanisms to generate and position the droplets, namely continuous inkjet (CIJ) and drop-on-demand (DOD).

[0004] In CIJ a fine liquid ink stream breaks up into a continuous train of liquid droplets through Rayleigh instability. Each droplet is charged at the point of generation and can be steered using electric or magnetic fields. If printing is not required, the droplets are captured and rejected or recycled. In DOD droplets are generated as and when required through generating a pressure pulse in a liquid reservoir. The pressure pulse can be generated by a piezoelectric actuator (piezoelectric ink-jet) or by a heater boiling a small quantity of liquid ink, the resulting vapour cavity expansion generating the pressure pulse (thermal inkjet or bubble jet). For the aforementioned application, DOD is preferable as CIJ requires the ink to have some limited electrical conductivity and the printer must have a mechanism to capture and possibly recycle unused ink. Furthermore

piezoelectric ink-jet is preferred over thermal inkjet or bubble jet because the latter needs the ink to have a high vapour pressure and low boiling temperature.

[0005] The advantages which ink jet printing brings are speed, flexibility, ability to reproduce fine detail, and that it is a contactless means for printing. The requirements for the ink to be used in such an application with an ink jet printer are that the rheology must be correct for printing, it must dry sufficiently quickly, it must be water-proof due to the formation of condensation on the surface of the cold ice cream product, and it must not bleed into the chocolate coating.

Summary of the invention

[0006] The aforementioned problems are solved in a first aspect of the invention by provision of a method for ink-jet printing an edible non-conductive ink on chocolate, the method comprising the steps of:

a) applying the ink to chocolate using an ink-jet printer thereby to produce a printed chocolate, then;

b) storing the printed chocolate at less than zero, preferably in the range zero to -30, most preferably in the range -5 to -20 degrees centigrade;

wherein the ink comprises a polymeric binder, a colourant and at least one organic solvent,

wherein the polymeric binder comprises at least one substance selected from the group consisting of polysaccharides, glycoproteins, esters, polyesters, polyvinyl pyrrolidone, derivatives thereof and mixtures thereof,

wherein the polymeric binder has a number average molecular weight of either no more than 100 000 or when greater than 100 000 has a ratio of polymer concentration of the ink to the polymer overlap concentration of less than or equal to 1, wherein the polymer overlap concentration is the reciprocal of the intrinsic viscosity of the polymeric binder in the ink,

wherein the colourant is oil soluble,

wherein the ink is in the form of an isotropic solution and has an Ohnesorge number (Oh) of greater than 0.1 but less than 1,

wherein the ink comprises less than 1%, preferably less than 0.5%, more

preferably less than 0.01%, even more preferably less than 0.001%, most preferably zero % by weight water-soluble colourant.

[0007] By the term " chocolate" is meant dark chocolate, milk chocolate, white chocolate, flavoured chocolate, couverture chocolate, compound chocolate (which is made from a combination of cocoa solids, non-cocoa butter vegetable fat and sweeteners), other chocolate-like fat-based confectionary compositions made with fats other than cocoa butter (eg coconut oil), and mixtures thereof. The chocolate may also comprise inclusions such as nuts or pieces thereof, dried fruit, such as raisins, or pieces thereof, biscuit and mixtures thereof.

[0008] The intrinsic viscosity of the polymeric binder is typically measured by using an Ubbelohde capillary viscometer.

[0009] Surface tension and viscosity are defined by the Ohnesorge number, (*Oh*), which is the ratio of viscous forces and surface tension.

[0010] $$Oh = We^{1/2}/ Re = \eta / (d\gamma \rho)^{1/2}$$

[0011] where *We* (Weber number) $= \rho v^2 d/\gamma$

Re (Reynolds number) $= \rho vd/\eta$

ρ = *density of fluid;*

v = *fluid velocity;*

γ =*surface tension*

d = *nozzle diameter;* and

η = *viscosity*.

[0012] The Ohnesorge number is measured at 25 degrees centigrade. For DOD ink jet printing, $0.1 < Oh < 1$. When $Oh > 1$ viscous dissipation within the liquid prevents droplet formation. When $Oh < 0.1$ the balance between the surface tension and viscosity results in the liquid breaking into a series of satellite droplets rather than a single droplet as desired.

[0013] It has been observed that careful selection of the polymeric binder provides the desired non-Newtonian rheology and reduces bleeding of the colourant through the fat based chocolate. Furthermore it also reduces the formation of crystallised fat of oil-based binders such as cocoa butter which manifests itself as a white surface patina on the chocolate surface.

[0014] Use of an oil soluble colourant has been observed to reduce the smearing observed with water soluble colourants under the conditions in which ice cream products are stored and consumed with concomitant formation of condensation on the surface of the products. Preferably the oil soluble colourant is present in an amount of at least 0.01 wt%, more preferably at least 0.05 wt %, more preferably still at least 0.1 wt%, yet more preferably still at least 0.2 wt% and preferably at most 20 wt%, more preferably at most 10 wt%, more preferably still at most 5 wt%.

[0015] Storing the printed chocolate at less than zero degrees centigrade is not only necessary for a chocolate covered ice cream product but has been observed to assist in reducing bleeding on storage.

[0016] The measured high ink jet throw distance is particularly advantageous when printing on an uneven substrate as can be the case on high speed chocolate coated ice cream product lines.

[0017] The polymeric binder may be selected from the group consisting of shellac, rosin, gum Arabic, shea nut butter, ethyl cellulose, glycerol ester of rosin and rice bran wax. Preferably the polymeric binder is present in an amount of at least 0.1 wt%, more preferably at least 1 wt %, more preferably still at least 2 wt% and preferably at most 40 wt%, more preferably at most 20 wt%, more preferably still at most 10 wt%.

[0018] The colourant may comprise at least one substance selected from the group consisting of heme-containing substances, chlorophyll-containing substances, carotenoids, flavonoids, betalains, azo compounds, triphenylmethane dyes, xanthines, indigo, derivatives thereof and mixtures thereof.

[0019] The organic solvent may comprise at least one substance selected from the group consisting of alcohols, esters, glycols, polyols, ethyl lactate and mixtures thereof.

[0020] Preferably the ink does not include a fat selected from the group consisting of cocoa butter, cocoanut oil, palm kernel stearin, hardened coconut oil, shea stearin, palm mid fraction, illipe oil and mixtures thereof. This reduces the incidence of formation of white crystallised fat on the surface

of the printed chocolate which not only obscures the decorative features but is also unsightly.

[0021] In a second aspect of the invention a printed chocolate is provided obtained by or obtainable by the method of the first aspect.

Brief description of the figures

[0022] The invention will now be exemplified with reference to the figures in which:

[0023] Figure 1 shows in (A) an image printed onto chocolate (Nestle Milkybar) using an oil-based ink (ink 4.1) and in (B) the same after storage at room temperature showing the whitening effect attributed to the formation of crystallised cocoa fat;

[0024] Figure 2 shows in (A) the bleeding typically seen when printing a solvent-based ink (ink 5.5) onto chocolate (Nestle Milkybar) when stored at room temperature for 30 days and in (B) the bleeding stability obtained when printing a solvent-based ink (ink 5.6) onto chocolate (Nestle Milkybar) when stored at minus five degrees centigrade; and

[0025] Figure 3 shows the results in which the distance between the nozzles and the paper substrate was varied from 5-10 mm (A) to 15-20 mm (B) to 25-30 mm (C) for oil-based ink 6.1 printed at 50 degrees centigrade on paper; and

[0026] Figure 4 shows solvent-based ink 5.6 printed on chocolate (Nestle Milkybar) and the printed decorative feature maintains its accuracy and clarity across the undulating surface of the chocolate.

Detailed description of the invention

[0027] A DMP-2800 printer (Fujifilm Dimatix Inc., Santa Clara, USA) was used to print images on chocolate using a disposable piezo ink jet cartridge. This printer can create and define patterns over an area of about 200 x 300 mm and handle substrates up to 25 mm thick being adjustable in the vertical direction. The temperature of the vacuum platen, which secures the substrate in place, is adjustable up to 60 degrees centigrade. Additionally a waveform editor and a drop-watch camera system allows manipulation of the electronic pulses to a piezo jetting device for optimization of the droplet characteristics as they are ejected from the device nozzles. The

device comprises a nozzle plate with a single row of sixteen 23 microns diameter nozzles spaced 254 microns apart. Each nozzle is able to generate droplets of 10 pL with a diameter 27 microns. The cartridge temperature was varied in order to optimize the jetting conditions. The platen was kept at room temperature. The ink specification for the printer is a viscosity of 2-30, preferably 8-10 cP, and a surface tension of 25-40, preferably 25-35 mN/m.

[0028] The ink viscosity was measured on a TA AR 2000 (TA Instruments) at 25 degrees centigrade using a 4 centimetre diameter spindle (parallel plate arrangement) with a gap size of 200 microns. The shear stress was swept from 0.7958 to 100 Pa and the viscosity calculated at 63 Pa.

[0029] The ink surface tension was measured at 25 °C on a Kruss 100 Tensiometer (Kruss) using the pendant drop method with a drop volume of 12-14 microlitres.

Example 1: Chocolate ink

[0030] A chocolate ink was prepared by melting the following ingredients at 50 degrees centigrade for ten minutes:

Ingredient	Weight (%)
Hazelnut paste	25
Sucrose	30
Cocoa powder	8
Cocoa butter	20
Whole milk powder	16.5
Lecithin	0.4
Vanillin	0.1

[0031] However the viscosity of the ink at 50 degrees centigrade was in excess of 5000 cP and hence far too viscous to be dispensed from an ink jet printer. In addition, the ink dried too quickly and blocked the nozzles of the printer.

Example 2: Cocoa powder ink

[0032] 0.5 g cocoa powder was dissolved in 15 g deionised water at 80 degrees centigrade and sonicated for two minutes. The resulting suspension was centrifuged for five minutes at 3 000 rpm and the supernatant collected and used as a cocoa powder ink. However it was observed that the cocoa

powder tended to precipitate which could lead to blocking of the printer nozzles. Although the precipitate could be re-suspended by sonication and centrifugation, the colour strength of the ink was poor.

Example 3: Water-based ink

[0033] Brilliant Black BN (Sensient Food Colours Europe), a food grade water soluble colourant was dissolved in a vehicle system including any one of deionised water, ethyl alcohol, propylene glycol, butyl alcohol and ethyl lactate. Either gum arabic and/or polyvinylpyrrolidone (PVP) were dissolved in the vehicle system to provide an adhesive property to the ink. The viscosities of the inks were in the range of 3 to 18 cP and the surface tension around 30 mM/m. Details of the inks are provided in table 1.

[0034] Table 1: Water-based inks (ST = surface tension)

Table 1

Component	Role in ink	Ink 3.1	Ink 3.2	Ink 3.3	Ink 3.4	Ink 3.5	Ink 3.6
		wt-%	wt-%	wt-%	wt-%	wt-%	wt-%
DI water	vehicle system	64.0	4.3	4.1	4.0	4.1	4.1
Ethyl alcohol	vehicle system	7.8	-	10.2	7.8	18.2	18..2
Propylene glycol	vehicle system	12.5	-	-	12.5	12.5	12.5
Butyl alcohol	vehicle system	4.7	-	-	4.7	14.7	14.7
Ethyl lactate	vehicle system	-	80.4	70.2	65.0	45.0	45.0
PVP(10K)	binder	5.0	14.9	15.1	5	5.0	5.0
Gum arabic	binder	5.0	-	-	-	-	-
Polysorbate 80	preservative	0.5	-	-	0.5	-	-
Brilliant Black BN	Colourant	0.5	0.4	0.4	0.5	-	0.5
Burnt sugar	Colourant	-	-	-	-	-	-
Erythrosine	Colourant	-	-	-	-	0.5	-
Vitamin C	Nutrition	-	-	-	-	-	-
η @25°C(cP)	-	10.4	17.6	15.1	7.0	7.2	7.2
ST @25 °C	-	30.8	29.7	29.8	30.2	30.2	30.2

(mN/m)							

[0035] Despite ink 3.2 being on the limit of acceptable jettability (ie producing discrete monodisperse droplets), all the inks produced good quality images on chocolate (either Nestle Milkybar or Sainbury' s Belgian milk chocolate). However these inks are not water-proof because the colourant is water-soluble and hence smear under the conditions in which chocolate coated ice cream products are stored and consumed.

Example 4: Oil-based inks

[0036] Oil Red O, a food grade oil soluble colourant, was dissolved in a vehicle system consisting of sunflower oil, butyl alcohol and ethyl lactate. Cocoa fat and/or cocoa butter were dissolved in the vehicle system to provide the inks with an adhesive property. The viscosity of the inks was in the range of 5 to 8 cP and the surface tension around 30 mM/m. Details of the inks are provided in table 2.

[0037] Table 2: Oil-based inks (ST = surface tension)

Table 2

Component	Role in ink	Ink 4.1	Ink 4.2	Ink 4.3	Ink 4.4
		wt-%	wt-%	wt-%	wt-%
Butyl alcohol	vehicle system	42.9	42.9	32.9	32.9
Ethyl lactate	vehicle system	21.4	21.4	29.7	29.7
Sunflower oil	vehicle system	11.3	11.3	8.7	8.7
Cocoa fat	binder	22.9	-	27.5	-
Cocoa butter	binder	-	22.9	-	27.5
Oil red O	Colourant	1.5	1.5	1.2	1.2
η @25°C(cP)	-	6.5	6.9	8.2	8.5
ST @25 °C (mN/m)	-	30.6	30.9	34.1	34.7

[0038] All the inks produced good quality images on chocolate (either Nestle Milkybar or Sainbury' s Belgian milk chocolate). Furthermore as the colourant is oil soluble, the inks are water-proof. However it was observed that the surface of the printed chocolate whitened obscuring the

printed decorative features. This is thought to be due to the formation of crystallised fat of cocoa butter. This is illustrated in Figure 1. Furthermore the drying time of these inks is a few minutes which is too long and much longer than that for the water-based inks (a few seconds).

Example 5: Solvent-based inks

[0039] Red Oil O, annatto or paprika, all food grade colourants, were dissolved in a vehicle system which consisted of ethyl alcohol, propylene glycol, butyl alcohol and ethyl lactate. One of PVP polymer, gum rosin or shellac was dissolved in the vehicle system to provide the ink with an adhesive property. The viscosity of the inks was in the range of 4 to 20 cP and the surface tension around 30 mM/m. Details of the inks are provided in table 3.

[0040] Table 3: Solvent-based inks (ST = surface tension)

Table 3

Component	Role in ink	Ink 5.1	Ink 5.2	Ink 5.3	Ink 5.4	Ink 5.5	Ink 5.6
		wt-%	wt-%	wt-%	wt-%	wt-%	wt-%
Ethyl alcohol	vehicle system	58.3	60.1	57.6	52.6	40.3	46.1
Propylene glycol	vehicle system	5.6	5.8	5.5	5.1	27.0	16.3
Butyl alcohol	vehicle system	20.2	20.7	19.8	18.1	14.0	15.8
Ethyl lactate	vehicle system	11.3	11.6	11.1	10.2	7.8	9.0
PVP-1300K	binder	2.3	-	-	-	-	-
Gum rosin	binder	-	1.2	4.9	13.5	10.4	11.9
Annatto	Colourant	-	-	-	-	-	-
Paprika	Colourant	2.3	-	1.1	-	-	0.9
Oil red O	Colourant	-	0.6	-	0.5	0.5	-
η @25°C(cP)	-	20.0	2.8	3.1	3.6	7.0	5.5
ST @25 °C (mN/m)	-	30.2	30.0	29.2	30	29.7	31.1

[0041]

Table 0004

Component	Role in ink	Ink 5.7	Ink 5.8	Ink 5.9	Ink 5.10	Ink 5.11
		wt-%	wt-%	wt-%	wt-%	wt-%
Ethyl alcohol	vehicle system	64.3	64.6	61.5	44.7	28.9
Propylene glycol	vehicle system	3.2	2.8	2.4	2.8	2.7
Butyl alcohol	vehicle system	22.3	22.3	24.6	37.2	59.7
Ethyl lactate	vehicle system	6.4	5.6	6.2	5.5	5.5
PVP-1300K	binder	1.3	1.1	0.4	1.1	1.1
Gum rosin	binder	-	-	-	-	-
Annatto	Colourant	2.5	3.6	-	-	-
Paprika	Colourant	-	-	4.9	8.7	2.1
Oil red O	Colourant	-	-	-	-	-
η @25°C(cP)	-	9.8	8.9	4.5	12.0	9.6
ST @25 °C (mN/m)	-	29.8	30.4	31.3	30.6	31.5

[0042] Despite all the inks except inks 5.5 and 5.6 being on the limit of acceptable jettability (ie producing discrete monodisperse droplets), all produced acceptable quality images on chocolate (Nestle Milkybar). The drying time was about 30 seconds at room temperature. The aforementioned whitening issue was addressed by replacing the cocoa fat and cocoa butter with one of PVP polymer, gum rosin or shellac. Furthermore as the colourants were solvent soluble, the ink did not clog the printer nozzles and the ink was waterproof. One drawback was the tendency of the colourant to bleed at room temperature. However when the printed chocolate was stored at minus five degrees centigrade, bleeding decreased and this is illustrated in figure 2.

Example 6: Ink jet throw distance

[0043] The throw distance was determined by printing at 50 degrees centigrade an oil-based ink (ink 6.1) as set forth in table 4 on paper. The ink surface tension could not be determined at room temperature as the ink was too viscous. Figure 3 shows the results in which the distance between the nozzles and the paper substrate was varied from 5-10 mm (A) to 15-20 mm (B) to 25-30 mm (C) giving high image quality for (A), adequate image quality for (B) and low image quality for (C). Thus ink jet printing is suitable for use where the distance between the nozzles and substrate varies over several millimetres. This is illustrated in figure 4 where solvent-based ink 5.6 has been printed on chocolate (Nestle Milkybar) and the printed decorative feature maintains its accuracy and clarity across the undulating surface of the chocolate.

[0044] Table 4: Oil-based ink used for determining ink jet throw distance (ST = surface tension)

Table 4

Component	Role in ink	Ink 6.1
		wt-%
Butyl alcohol	vehicle system	30.0
Ethyl lactate	vehicle system	10.0
Cocoa fat	binder	45.0
Chlorophyll	Colourant	15.0
η @50°C(cP)	-	7.0
ST @25 °C (mN/m)	-	NA

Claims

1. A method for ink-jet printing an edible non-conductive ink on chocolate, the method comprising the steps of:

   a) applying the ink to chocolate using an ink-jet printer thereby to produce a printed chocolate, then;

   b) storing the printed chocolate at less than zero, preferably in the range zero to -30, most preferably in the range -5 to -20 degrees centigrade;

   wherein the ink comprises a polymeric binder, a colourant and at least one organic solvent,

   wherein the polymeric binder comprises at least one substance selected from the group consisting of polysaccharides, glycoproteins, esters, polyesters, polyvinyl pyrrolidone, derivatives thereof and mixtures thereof,

   wherein the polymeric binder has a number average molecular weight of either no more than 100 000 or when greater than 100 000 has a ratio of polymer concentration of the ink to the polymer overlap concentration of less than or equal to 1, wherein the polymer overlap concentration is the reciprocal of the intrinsic viscosity of the polymeric binder in the ink,

   wherein the colourant is oil soluble,

   wherein the ink is in the form of an isotropic solution and has an Ohnesorge number (Oh) of greater than 0.1 but less than 1,

   wherein the ink comprises less than 1%, preferably less than 0.5%, more preferably less than 0.01%, even more preferably less than 0.001%, most preferably zero % by weight water-soluble colourant.

2. A method according to claim 1 wherein the polymeric binder is selected from the group consisting of shellac, rosin, gum Arabic, shea nut butter, ethyl cellulose, glycerol ester of rosin and rice bran wax.

3. A method according to claim 1 or claim 2 wherein the colourant comprises at least one substance selected from the group consisting of heme-containing substances, chlorophyll-containing substances, carotenoids, flavonoids, betalains, azo compounds, triphenylmethane dyes, xanthines, indigo, derivatives thereof and mixtures thereof.

4. A method according to any one of the preceding claims wherein the organic solvent comprises at least one substance selected from the group consisting of alcohols, esters, glycols, polyols, ethyl lactate and mixtures thereof.
5. A method according to any one of the preceding claims excluding a fat selected from the group consisting of cocoa butter, cocoanut oil, palm kernel stearin, hardened coconut oil, shea stearin, palm mid fraction, illipe oil and mixtures thereof.
6. A printed chocolate obtained by or obtainable by the method according to any one of the preceding claims.

Fig.1.

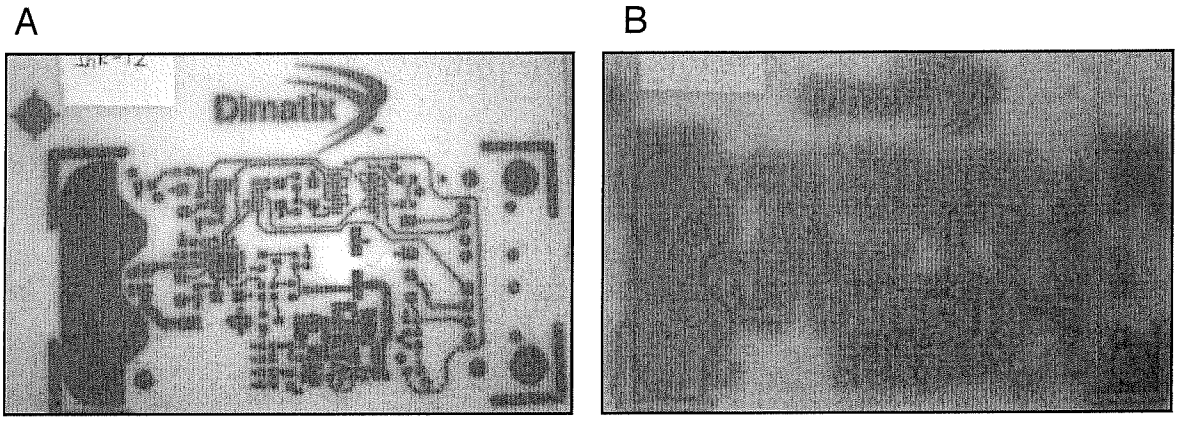


Fig.2.

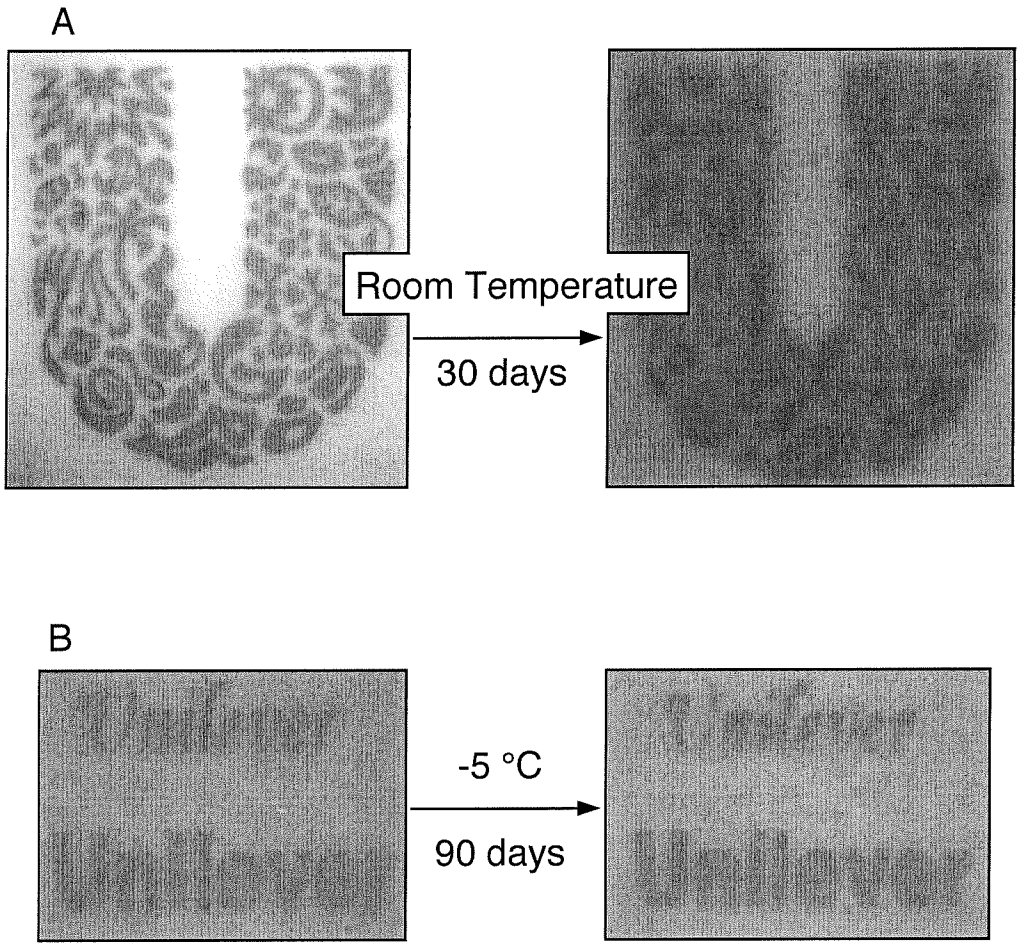


Fig.3.

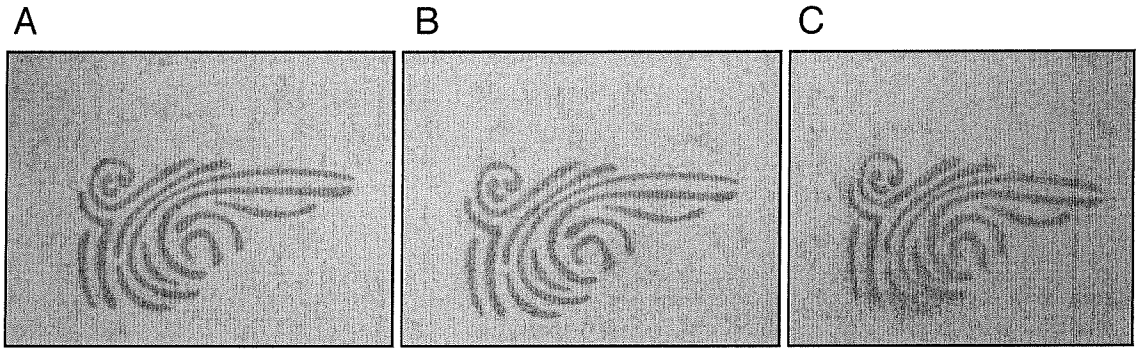
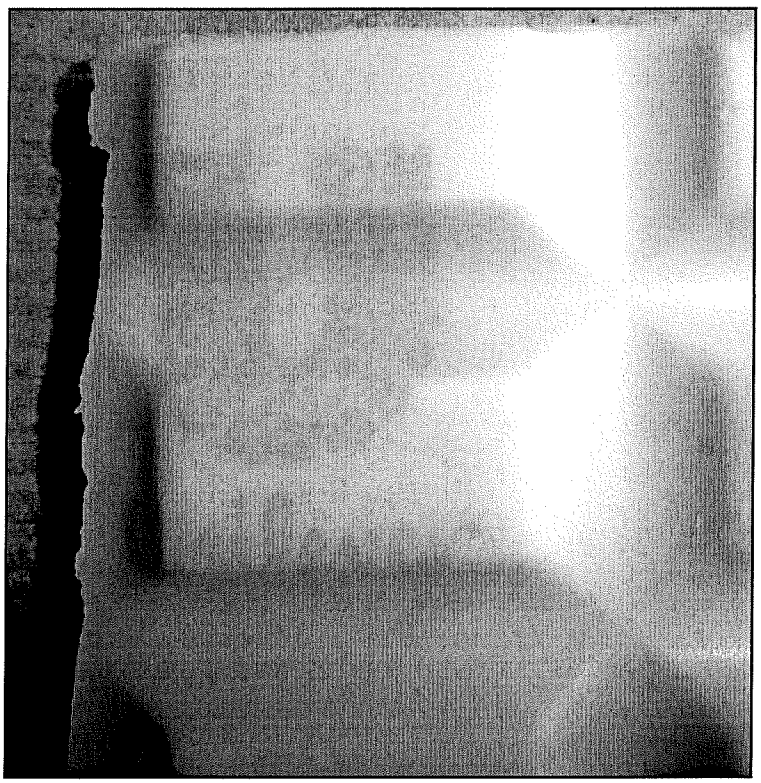


Fig.4.



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/053640

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23G3/00 A23G3/28 A23G9/24 A23G3/54 A23G9/48
A23G1/54 A23G1/30 C09D11/00 A21D13/00
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A23G C09D A21D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2004/003089 A1 (MARS INC [US]) 8 January 2004 (2004-01-08)	6
Y	page 14; table 2 page 16, paragraph 49 page 16, paragraph 57 page 6, paragraph 16 - paragraph 19 claims 1-30	1-5

X	WO 01/94116 A2 (MARS INC [US]) 13 December 2001 (2001-12-13)	6
Y	page 22, paragraph 2 - paragraph 4 claims 1-82 page 20, paragraph 2	1-5

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
5 July 2011	11/07/2011

Name and mailing address of the ISA/	Authorized officer
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International application No
PCT/EP2011/053640

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	page 8, paragraph 23; claims 1-45	1-5

X	WO 02/47488 A2 (MARS INC [US]) 20 June 2002 (2002-06-20)	6
A	claims 1-31	1-5

A	WO 2007/136802 A2 (COMPLETE SALES SOLUTIONS [US]; SANTANGELO FRANK [US]) 29 November 2007 (2007-11-29) claims 1-21 page 5, paragraph 22; claim 5 page 6, paragraph 27	1-6

A	US 2007/231434 A1 (REAM RONALD L [US] ET AL) 4 October 2007 (2007-10-04) page 4, paragraph 67 - page 6, paragraph 77	1-6

A	WO 92/14795 A1 (WILLETT INT LTD [GB]) 3 September 1992 (1992-09-03) claims 1-12 page 8 - page 9; examples 1-3	1-6

A	US 2005/157148 A1 (BAKER RICHARD [US] ET AL) 21 July 2005 (2005-07-21) page 2, paragraph 17 claims 1-35	1-6

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Information on patent family members

International application No
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