

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
11 December 2008 (11.12.2008)

PCT

(10) International Publication Number
WO 2008/149093 A1

(51) International Patent Classification:

B32B 17/10 (2006.01) **G01S 17/93** (2006.01)
C03C 27/12 (2006.01) **C03C 3/095** (2006.01)
C03C 4/08 (2006.01)

(74) Agent: **CAWLEY, Aimee, Elizabeth**; Pilkington Group Limited, Group Intellectual Property Department, Pilkington European Technical Centre, Hall Lane, Lathom, Ormskirk, Lancashire L40 5UF (GB).

(21) International Application Number:

PCT/GB2008/001919

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(22) International Filing Date: 5 June 2008 (05.06.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0710808.7 6 June 2007 (06.06.2007) GB

(71) Applicants (for all designated States except US): **PILKINGTON AUTOMOTIVE LIMITED** [GB/GB]; Prescott Road, St Helens, Merseyside WA10 3TT (GB). **PILKINGTON GROUP LIMITED** [GB/GB]; Prescott Road, St Helens, Merseyside WA10 3TT (GB).

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **TORR, Ashley, Carl** [GB/GB]; 29 Sefton Gardens, Aughton, Ormskirk, Lancashire L39 6RY (GB). **BARTON, Neil** [GB/GB]; 39 Regal Drive, Windle, St Helens, Merseyside WA10 6BJ (GB).

Published:
— with international search report

(54) Title: TINTED LAMINATED VEHICLE GLAZING

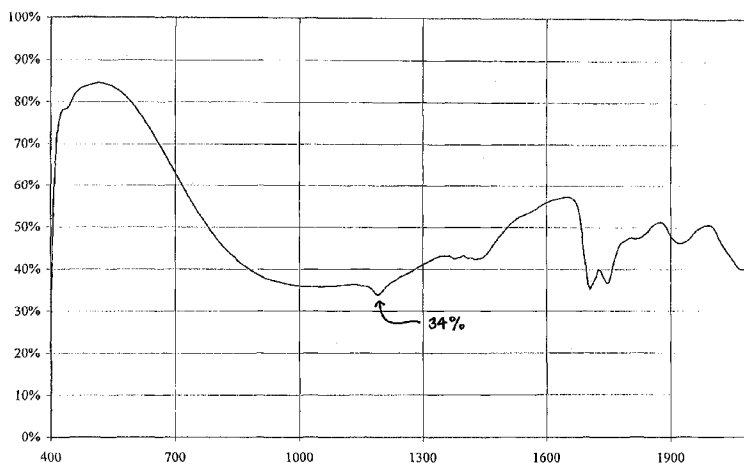


FIG 4

(57) Abstract: A laminated vehicle glazing, suitable for use with an optical sensor (for example a LIDAR type sensor), comprises first and second plies of glazing material joined together by a ply of interlayer material between them, and either: a) the first ply is a pane of body-tinted glass having a colourant portion consisting of 0.70 to 1.00 % by weight total iron (calculated as Fe₂O₃), 0 to 1.0 % titania and 0 to 2.0 % ceria, such that the glazing has a transmittance of at least 30 % in the wavelength range 400 to 2100 nm, or b) the first ply of glazing material is a pane of body-tinted glass having a colourant portion consisting of 0.30 to 0.80 by weight total iron (calculated as Fe₂O₃), 0 to 1.0 % titania (calculated as TiO₂) and 0 to 2.0 % ceria (calculated as CeO₂), and the ply of interlayer material is a solar (IR) absorbing material, such that the glazing has a transmittance of at least 30 % in the wavelength range 750 to 1300 nm.

WO 2008/149093 A1

TINTED LAMINATED VEHICLE GLAZING

The present invention relates to a tinted laminated vehicle glazing which is suitable for use with an optical sensor.

It is known to provide body-tinted automotive glazings which are suitable for use with optical sensors. An optical sensor is one which uses light to detect a condition which it then quantitatively describes; "light" being electromagnetic radiation extending from the visible and into the infrared region of the spectrum (having a wavelength in the range of approximately 400 nm to 3 μ m). A minimum transmission of approximately 30 % in this range is currently desirable. EP 1 462 244 A1 describes such blue and grey body-tinted laminated glazings. At least one of the plies comprised in a laminate is body-tinted with colourants including iron and cobalt and/or selenium. Although such glazings are aesthetically pleasing, many vehicle manufacturers still request less obviously coloured glazings, and a green-tinted glazing may often be the preferred choice.

In addition to aesthetic appeal, an increasingly important concern of vehicle manufacturers is to ensure that glazings destined to be fitted in their vehicles possess some degree of solar control, i.e. the amount of incident visible light and solar heat transmitted by the glazings is regulated in some way. A maximum transmitted total energy (TE) of around 60 % (measured according to Parry Moon, Air Mass 2) appears to be a currently acceptable upper limit. Generally, the more highly tinted a glazing is (i.e. the darker the tint it has), the lower its TE will be.

Of course, any TE requirement may have to be balanced against legal visible light transmission (LT) requirements, depending on the position in a vehicle in which a particular glazing is to be fitted. For example in Europe, a windscreen must currently transmit 75 % or more of incident visible light (when measured with CIE Illuminant A).

In combining the demands for a less obviously tinted glazing preferably having TE less than 60 % which is suitable for use with an optical sensor, it has been determined that the following glazing construction is compliant:

Tinted glass ply (2.6 mm) / Clear interlayer ply (0.76 mm) / Clear glass ply (2.1 mm) wherein the tinted glass ply is tinted by use of 0.60 % by weight total iron (calculated as Fe_2O_3) and the clear glass ply includes only 0.12 % by weight total iron. The ply of interlayer material is made from polyvinyl butyral (PVB). This glazing construction leads

to an LT_A of 81.5 %, TE of 57.8 % and a minimum of 32 % transmission over the wavelength range 400 to 2100 nm. A plot of percentage transmission (y-axis) against wavelength (nm)(x-axis) for this glazing is shown in Figure 1 of the accompanying drawings. As a result, this glazing is suitable for use with an optical sensor, and because of its optical properties, may be used as a windscreen in a vehicle.

However, in addition to the solar control and optical-sensor compatibility requirements, there is a growing trend in the automotive industry for lighter weight glazings so as to reduce the overall weight of a vehicle. As climate change becomes an increasingly important global issue, so does the desire to reduce vehicle emissions. One way to achieve this is by reducing the fuel consumption of a vehicle, by reducing its weight. One of the ways of reducing the weight of a vehicle is to reduce the weight of its glazings. This may be done by reducing one or more of their thicknesses.

Unfortunately, simply reducing the thickness of the green-tinted glazing above, for example by reducing the thickness of the tinted glass ply from 2.6 mm to 2.1 mm, does not provide an adequate solution. Although the light transmission and transmission in the range 400 to 2100 nm remain acceptable, the total energy transmission (TE) increases to an unacceptably high level. Conventional wisdom suggests that increasing the amount of iron in the tinted glass ply (at 2.1 mm thickness) ought to sufficiently reduce the energy transmission to an acceptable level. However in doing so, transmission in the range 400 to 2100 nm drops below 30 %, which is an undesirably low level.

It is therefore an object of the present invention to provide a lighter weight, tinted laminated vehicle glazing that meets vehicle manufacturers' energy transmission requirements and is suitable for use with an optical sensor.

Accordingly in a first aspect, the present invention provides a laminated vehicle glazing, suitable for use with an optical sensor, comprising:

first and second plies of glazing material joined together by a ply of interlayer material between them,

the first ply of glazing material being a pane of body-tinted glass having a colourant portion consisting of 0.70 to 1.0 % by weight total iron (calculated as Fe_2O_3), 0 to 1.0 % titania (calculated as TiO_2) and 0 to 2.0 % ceria (calculated as CeO_2),

wherein the glazing has a transmittance of at least 30 % in the wavelength range 400 to 2100 nm.

This wavelength range corresponds to the visible and near to middle infrared regions of the electromagnetic spectrum – a range which may typically correspond with operation of many optical sensors. Surprisingly it was discovered that such a laminated glazing is able to meet the requirement of being lighter weight whilst exhibiting a desirable TE and having the ability to be used with an optical sensor.

Preferably the glazing has a transmittance of at least 32 %, further preferably at least 35 %, in the wavelength range 750 to 1300 nm. This narrower wavelength range covering the near-infrared region may correspond more closely to one or more optical sensors currently under consideration for use with a vehicle glazing, especially a windscreen. Advantageously the glazing may have a transmittance of at least 38 % at 905 nm, at which wavelength a number of optical sensors (to be described in more detail below) optimally operate.

According to a second aspect of the present invention, there is provided a laminated vehicle glazing, suitable for use with an optical sensor, comprising:

first and second plies of glazing material joined together by a ply of interlayer material between them,

the first ply of glazing material being a pane of body-tinted glass having a colourant portion consisting of 0.30 to 0.80 by weight total iron (calculated as Fe_2O_3), 0 to 1.0 % titania (calculated as TiO_2) and 0 to 2.0 % ceria (calculated as CeO_2), and

the ply of interlayer material being a solar absorbing material,

wherein the glazing has a transmittance of at least 30 % in the wavelength range 750 to 1300 nm.

Preferably the glazing has a transmittance of at least 35 % in the wavelength range 750 to 1300 nm. Further preferably the glazing has a transmittance of at least 38 % in the wavelength range 750 to 1100 nm. Beneficially the glazing may have a transmittance of at least 45 % at 905 nm.

Advantageously, the optical sensor may be a light detection and ranging (LIDAR) type of sensor. Such LIDAR sensors include pedestrian detection sensors, pre-crash sensors, for example closing velocity (CV) sensors and adaptive cruise control (ACC) sensors, which all work to improve the safety of vehicles. For example, a pre-crash sensor is a sensor that may be able to reduce the severity, or even completely avoid, road traffic accidents at lower speeds. In particular a CV sensor usually forms part of a pre-

crash system which may assist the driver of a vehicle in braking if there is a risk of a rear-end collision, as well as optimally tightening seatbelts and activating both driver and passenger airbags at the right moment.

In the first aspect of the invention, the pane of tinted glass preferably has a total iron content of 0.70 to 0.80 %, further preferably around 0.75 %. In the second aspect of the invention, the pane of tinted glass preferably has a total iron content of 0.40 to 0.60 %, further preferably around 0.55 %. When titania is also present in the pane of tinted glass, it is preferably in an amount greater than 0.05 %, further preferably around 0.2 %. When ceria is also present in the glass, it is preferably in an amount greater than 0.5 %, further preferably around 1.0 %. The base glass of the tinted glass may typically have the following composition (by weight):

SiO ₂	70 – 75 %
Al ₂ O ₃	0 – 5 %
Na ₂ O	10 – 15 %
K ₂ O	0 – 5 %
MgO	0 – 10 %
CaO	5 – 15 %
SO ₃	0 – 2 %

The tinted glass may further comprise impurities including oxides of chromium, manganese, cerium, zirconium, barium, strontium and boron.

In the first aspect of the invention, the ply of interlayer material may be a flexible plastics material, which may be clear or body-tinted. Suitable interlayer materials include polyvinyl chloride (PVC), polyurethane (PU), ethyl vinyl acetate (EVA), polyethylene terephthalate (PET) or polyvinyl butyral (PVB), the most common choice for lamination being PVB. The ply of interlayer material is typically provided in a thickness of between 0.38 and 1.1 mm, but most commonly 0.76 mm.

In the second aspect of the invention, the ply of solar absorbing interlayer material preferably absorbs infrared radiation (IRR), for example when it comprises tin-doped indium oxide, lanthanum hexaboride or other such suitable IRR absorbing material. By describing a sheet of interlayer material as being “IR absorbing” it is meant that when such a sheet (in 0.76 mm thickness) is interleaved between two pieces of clear glass (each of 2.1 mm thickness), the resulting laminate has a selectivity greater than 0.5 and

preferably greater than 1, where the “selectivity” is calculated by dividing the percentage visible light transmission by the percentage total energy, i.e. LT_A / TE , each measured for the laminate.

Although the IRR absorbing material may extend over substantially the whole surface area of the glazing, it may alternatively extend over only an upper portion of the surface area of the glazing (“upper” relative to the orientation of the glazing when installed in a vehicle). This upper portion may correspond to the area of a glazing commonly referred to as a shadeband in a vehicle windscreen. Advantageously in either of these circumstances, potential interference of the IR absorbing material with operation of an optical sensor may be minimised/prevented by physical removal of a portion of the IR absorbing material in the region of the sensor (and replacement with an appropriately sized piece of, e.g. clear PVB), or by laser “bleaching” an area of the IR absorbing material in the region of the sensor, e.g as taught in WO 2006/072797.

A glazing according to both the first and second aspects of the invention may have a visible light transmittance (LT_A) greater than or equal to 70 % and a total energy transmittance (TE) less than or equal to 60 % at thicknesses greater than or equal to approximately 4.2 mm (preferably around 5 mm). Such a glazing meets the current demand for a reasonably reduced degree of transmitted energy whilst maintaining high visible light transmission.

Preferably however the glazing has a visible light transmittance (LT_A) greater than or equal to 75 % and a total energy transmittance (TE) less than or equal to 60 % (preferably around 58 %) at thicknesses greater than or equal to approximately 4.2 mm (preferably around 5 mm). The very high light transmission of this glazing means that it may be installed in any aperture in a vehicle, including as a windscreen in a vehicle destined for the European market.

The pane of body-tinted glass comprised in the glazing may have a thickness of less than 2.6 mm, preferably around 2.1 mm. In this thickness, an optimum balance between the weight of the glass (and the glazing) and its solar control performance may be achieved.

The second ply of glazing material may be a pane of clear glass, which may have a thickness less than 2.6 mm, preferably 2.1 mm or less, further preferably around 1.6 mm. Of course clear glass, itself having LT_A of around 89 % in 3 mm thickness, typically

will not have any significant influence the visible light transmittance, total energy transmittance (TE) or transmittance in the range 400 to 2100 nm of the glazing. Its role is to provide extra rigidity to the laminate, and as such in the thicknesses quoted, an optimum balance may be achieved between its weight and the rigidity it imparts.

The overall thickness of the glazing may therefore be less than 5.7 mm, preferably around 5.2 mm and possibly as little as around 4.7 mm, for its reduced weight to have an effect.

It may be that a laminated vehicle glazing according to the invention has an optical sensor, especially a LIDAR sensor, mounted on its innermost surface. The innermost surface of the glazing is the surface of the inner glass ply which faces inwardly into a vehicle into which the glazing may be fitted. The optical sensor may be attached by use of a transparent, durable thin film adhesive.

Preferably the glazing has a colour specified by the colour coordinates $-6 \leq a^* \leq -2$ and $0 \leq b^* \leq 3$, further preferably by the coordinates $-5 \leq a^* \leq -3$ and $0.5 \leq b^* \leq 2.5$. These coordinates are measured using the D65 Illuminant with a 10° observer angle.

A laminated vehicle glazing according to the invention may be fitted into any window opening in the bodywork of a vehicle. It may especially be used as a windscreen.

For a better understanding, the present invention will now be more particularly described, by way of non-limiting example, with reference to and as shown in the accompanying schematic drawings (not to scale) and plots wherein:

Figure 1 is a plot of percentage transmission (y-axis) against wavelength (nm)(x-axis) for the prior art glazing discussed earlier in the preamble to the invention;

Figure 2 is plan view of a laminated vehicle glazing according to the invention;

Figure 3 is a cross-sectional view taken along the line A-A of Figure 2;

Figure 4 is a plot similar to that shown in Figure 1 but for a first embodiment of the invention;

Figure 5 is a plot similar to that shown in Figures 1 and 4 but for a second embodiment of the invention and

Figure 6 is a plot similar to that shown in Figures 1, 4 and 5 but for a third embodiment of the invention.

Figure 2 shows a laminated vehicle glazing, in the form of a windscreen 10. Around the periphery of windscreen 10 there is an obscuration band 14, which is there to

disguise and protect the sealant (not shown) that is used to fix the glazing into a vehicle (not shown). Obscuration band 14 is made from opaque ink that has been screen printed onto the glazing and subsequently fired. However, it may be composed of and applied using any other known means, or it need not be there at all.

An optical sensor, in the form of a LIDAR-type CV sensor 15 is mounted in the upper half of windscreen 10. A CV sensor such as this one is currently available from Continental Teves AG & Co. oHG, PO Box 900120, D-60441 Frankfurt, Guerickestrasse 7, Germany. CV sensor 15 is attached to the innermost surface of glazing 10 by adhesive 16, or by use of a bracket (not shown), normally in a separate step after production of the glazing.

Figure 3 provides more detail about the construction of windscreen 10 in that it comprises outer ply of glazing material, in the form of a pane of green body-tinted glass 11 and inner pane of glazing material, in the form of a pane of clear glass 12. Interleaved between outer pane 11 and inner pane 12 is a ply of interlayer material 13, which has a thickness of 0.76 mm. Although obscuration band 14 is shown as being on the inner surface of outer pane 11 (known in the art as "surface 2"), it is equally possible that it could instead or in addition be on the outer surface of inner pane 12 (known in the art as "surface 4").

Green-tinted glass ply 11, when according to the first aspect of the invention, has a base glass composition including (by weight) 72.49 % SiO₂, 0.14 % Al₂O₃, 13.59 % Na₂O, 0.05 % K₂O, 8.66 % CaO, 3.93 % MgO, 0.13 % SO₃ and impurities, and a colourant portion consisting of (by weight) 0.75 % total iron (calculated as Fe₂O₃) and 0.26 % TiO₂. Glass of this composition exhibits, at 2.1 mm, an LT_A of 82.5 % and TE of 64.7 %. It has a dominant wavelength of 522 nm and an excitation purity of 1.2 % (both measured using Illuminant D65 and a 10° observer angle). Its colour is defined as a* = -3.7 and b* = 1.7. Such a glass is currently available as EZKOOL™ from Pilkington Group Limited, Prescott Road, St Helens, WA10 3TT, United Kingdom.

Green-tinted glass ply 11, when according to the second aspect of the invention, has a base glass composition including (by weight) 72.49 % SiO₂, 0.14 % Al₂O₃, 13.59 % Na₂O, 0.05 % K₂O, 8.66 % CaO, 3.93 % MgO, 0.13 % SO₃ and impurities, and a colourant portion consisting of (by weight) 0.56 % total iron (calculated as Fe₂O₃). Glass of this composition exhibits, at 2.1 mm, an LT_A of 85 % and TE of 70 %. Its colour is

defined as $a^* = -3.1$ and $b^* = 0.7$. Such a light-green tinted glass is also currently available from Pilkington Group Limited.

Inner glass ply 12 is a clear glass ply which has a typical composition including: 72.1 % SiO_2 , 1.1 % Al_2O_3 , 13.5 % Na_2O , 0.6 % K_2O , 8.5 % CaO , 3.9% MgO , 0.10 % Fe_2O_3 and 0.2 % SO_3 . For the avoidance of doubt, although outer glass ply 11 has been described as the glass ply that is tinted, it is equally possible that inner glass ply 12 could be tinted alternatively or additionally to outer glass ply 11.

Laminated glazing 10 has a thickness of 4.96 mm when constructed from outer glass ply 11 and inner glass ply 12, each of 2.1 mm thickness, and clear PVB interlayer ply 13 of 0.76 mm thickness. In the case when glass ply 11 is green tinted (EZKOOL™) and glass ply 12 is clear glass, glazing 10 exhibits 80.9 % LT_A and 58.1 % TE. Figure 4 shows the transmission curve for this glazing over the wavelength range 400-2100 nm; glazing 10 exhibits 34 % transmission in the range 750-1300 nm. At 905 nm, its transmission is 38 %. Its overall tint is defined by $a^* = -4.9$ and $b^* = 1.8$.

Laminated glazing 10 has a thickness of 4.46 mm when constructed from outer glass ply 11 in 2.1 mm thickness, inner glass ply 12 in 1.6 mm thickness, and clear PVB interlayer ply 13 in 0.76 mm thickness. When glass ply 11 is green tinted (EZKOOL™) and glass ply 12 is clear glass, glazing 10 exhibits 81.2 % LT_A and 58.7 % TE. Figure 5 shows the transmission curve for this glazing over the wavelength range 400-2100 nm; glazing 10 exhibits 35 % transmission in the range 750-1300 nm. At 905 nm, its transmission is 39 %. Its overall tint is defined by $a^* = -4.8$ and $b^* = 1.8$.

Laminated glazing 10 has a thickness of 4.46 mm when constructed from outer glass ply 11 in 2.1 mm thickness, inner glass ply 12 in 1.6 mm thickness, and IR absorbing interlayer ply 13 in 0.76 mm thickness. IR absorbing interlayer is currently available as SCF Film from Sekisui Chemical Co. Ltd.. When glass ply 11 is light-green tinted and glass ply 12 is clear glass, glazing 10 exhibits 82.7 % LT_A and 54.9 % TE. Figure 6 shows the transmission curve for this glazing over the wavelength range 400-2100 nm; glazing 10 exhibits 30 % transmission in the range 750-1300 nm. At 905 nm, its transmission is 46 %. Its overall tint is defined by $a^* = -4.6$ and $b^* = 2.2$.

All of these embodiments of the invention are lighter in weight than the green-tinted prior art glazing discussed earlier, all have a TE less than 60 % and all have optical

transmissions which make them suitable for use with an optical sensor, especially a LIDAR type sensor.

Claims:

1. A laminated vehicle glazing, suitable for use with an optical sensor, comprising:
first and second plies of glazing material joined together by a ply of interlayer material between them,
the first ply of glazing material being a pane of body-tinted glass having a colourant portion consisting of 0.70 to 1.00 % by weight total iron (calculated as Fe_2O_3), 0 to 1.0 % titania (calculated as TiO_2) and 0 to 2.0 % ceria (calculated as CeO_2),
wherein the glazing has a transmittance of at least 30 % in the wavelength range 400 to 2100 nm.
2. A laminated vehicle glazing as claimed in claim 1 wherein the glazing has a transmittance of at least 32 % in the wavelength range 750 to 1300 nm.
3. A laminated vehicle glazing, suitable for use with an optical sensor, comprising:
first and second plies of glazing material joined together by a ply of interlayer material between them,
the first ply of glazing material being a pane of body-tinted glass having a colourant portion consisting of 0.30 to 0.80 % by weight total iron (calculated as Fe_2O_3), 0 to 1.0 % titania (calculated as TiO_2) and 0 to 2.0 % ceria (calculated as CeO_2), and
the ply of interlayer material being a solar absorbing material,
wherein the glazing has a transmittance of at least 30 % in the wavelength range 750 to 1300 nm.
4. A laminated vehicle glazing as claimed in claim 3 wherein the glazing has a transmittance of at least 35 % in the wavelength range 750 to 1300 nm.
5. A laminated vehicle glazing as claimed in any of claims 1 to 4 wherein the sensor is a light detection and ranging (LIDAR) type of sensor.

6. A laminated vehicle glazing as claimed in any preceding claim wherein the glazing has a visible light transmittance (LT_A) greater than or equal to 70 % and a total energy transmittance (TE) less than or equal to 60 % at thicknesses greater than or equal to approximately 4.2 mm.
7. A laminated vehicle glazing as claimed in claim 6 wherein the glazing has a visible light transmittance (LT_A) greater than or equal to 75 % and a total energy transmittance (TE) less than or equal to 60 % at thicknesses greater than or equal to approximately 4.2 mm.
8. A laminated vehicle glazing as claimed in any of claim 1 to 7 wherein the pane of body-tinted glass has a thickness of less than 2.6 mm, preferably around 2.1 mm.
9. A laminated vehicle glazing as claimed in any preceding claim wherein the second ply of glazing material is a pane of clear glass.
10. A laminated vehicle glazing as claimed in claim 9 wherein the pane of clear glass has a thickness of less than 2.6 mm, preferably less than or equal to around 2.1 mm.
11. A laminated vehicle glazing as claimed in any preceding claim having an optical sensor, especially a LIDAR type of sensor, mounted on its innermost surface.
12. A laminated vehicle glazing as claimed in any preceding claim having a colour specified by the colour coordinates (D65, 10° observer): $-6 \leq a^* \leq -2$ and $0 \leq b^* \leq 3$.
13. A laminated vehicle glazing as claimed in claim 12 having a colour specified by the colour coordinates (D65, 10° observer): $-5 \leq a^* \leq -3$ and $0.5 \leq b^* \leq 2.5$.
14. Use of a laminated vehicle glazing as claimed in any preceding claim as a windscreen.

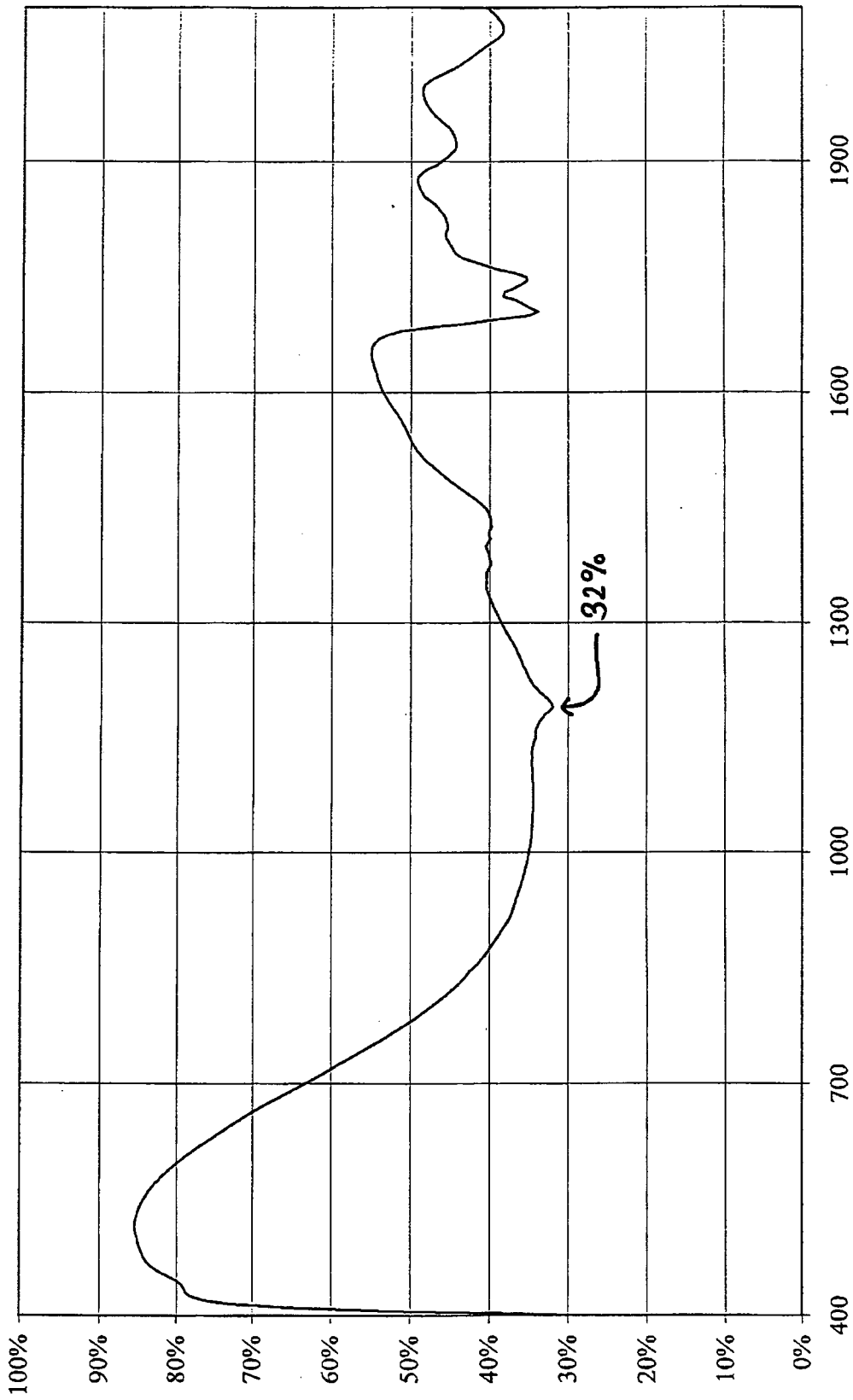


FIG 1

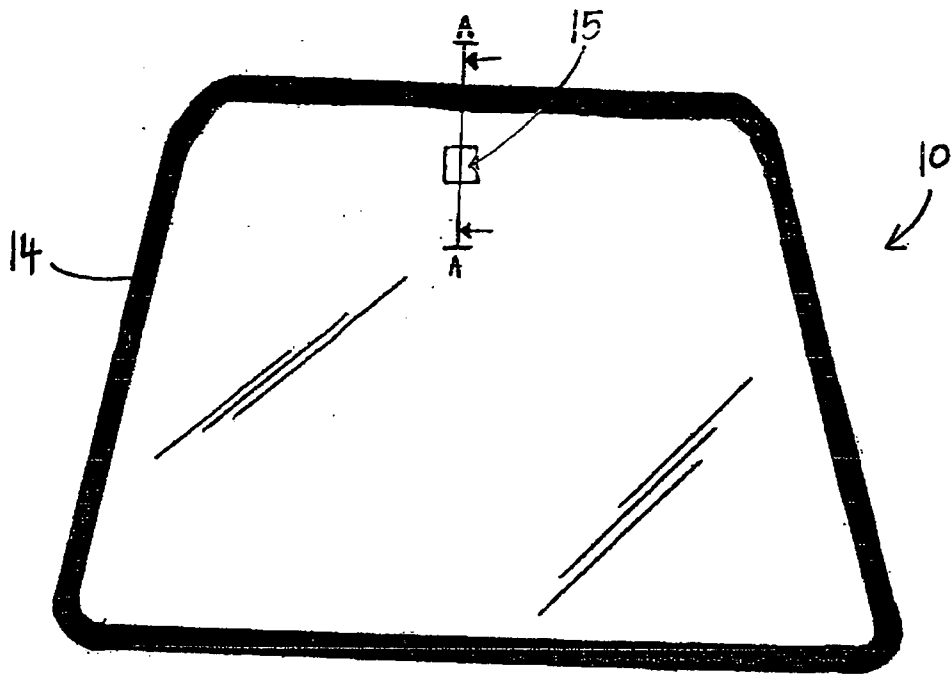


FIG 2

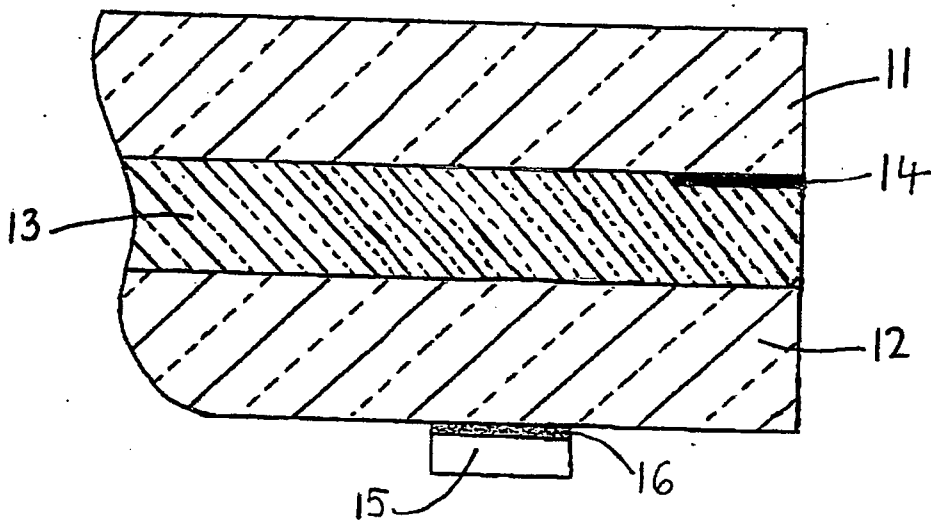


FIG 3

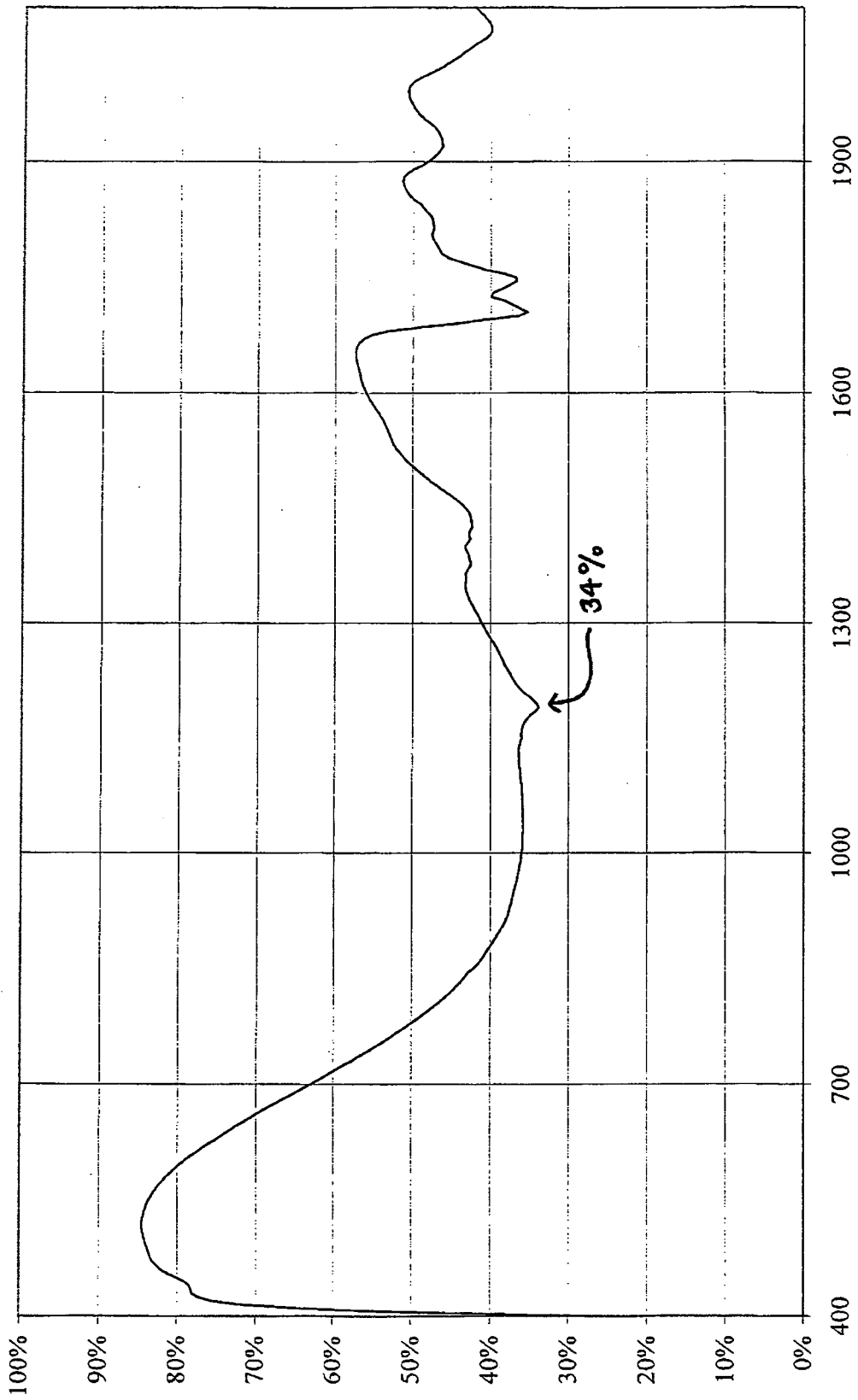


FIG 4

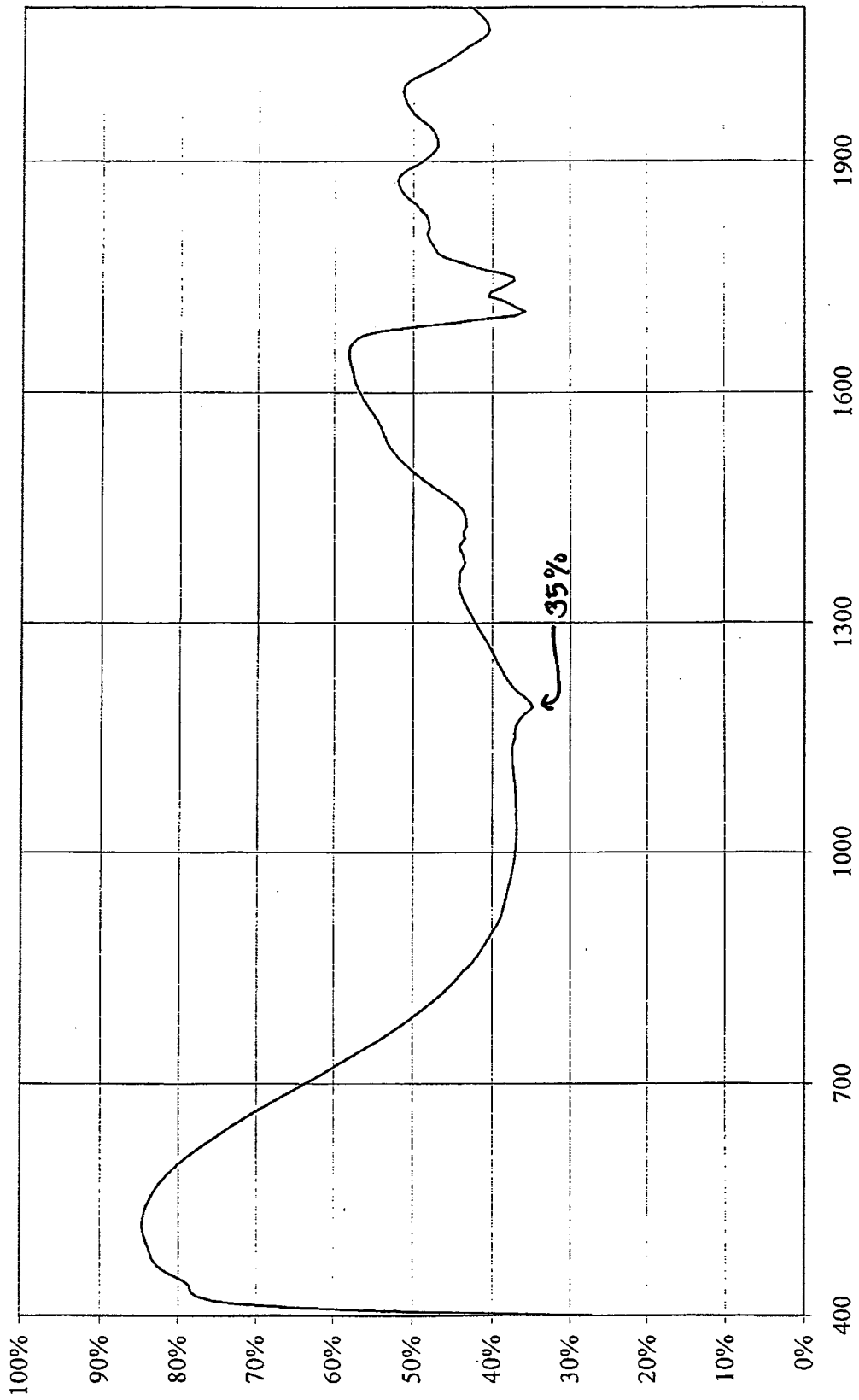


FIG 5

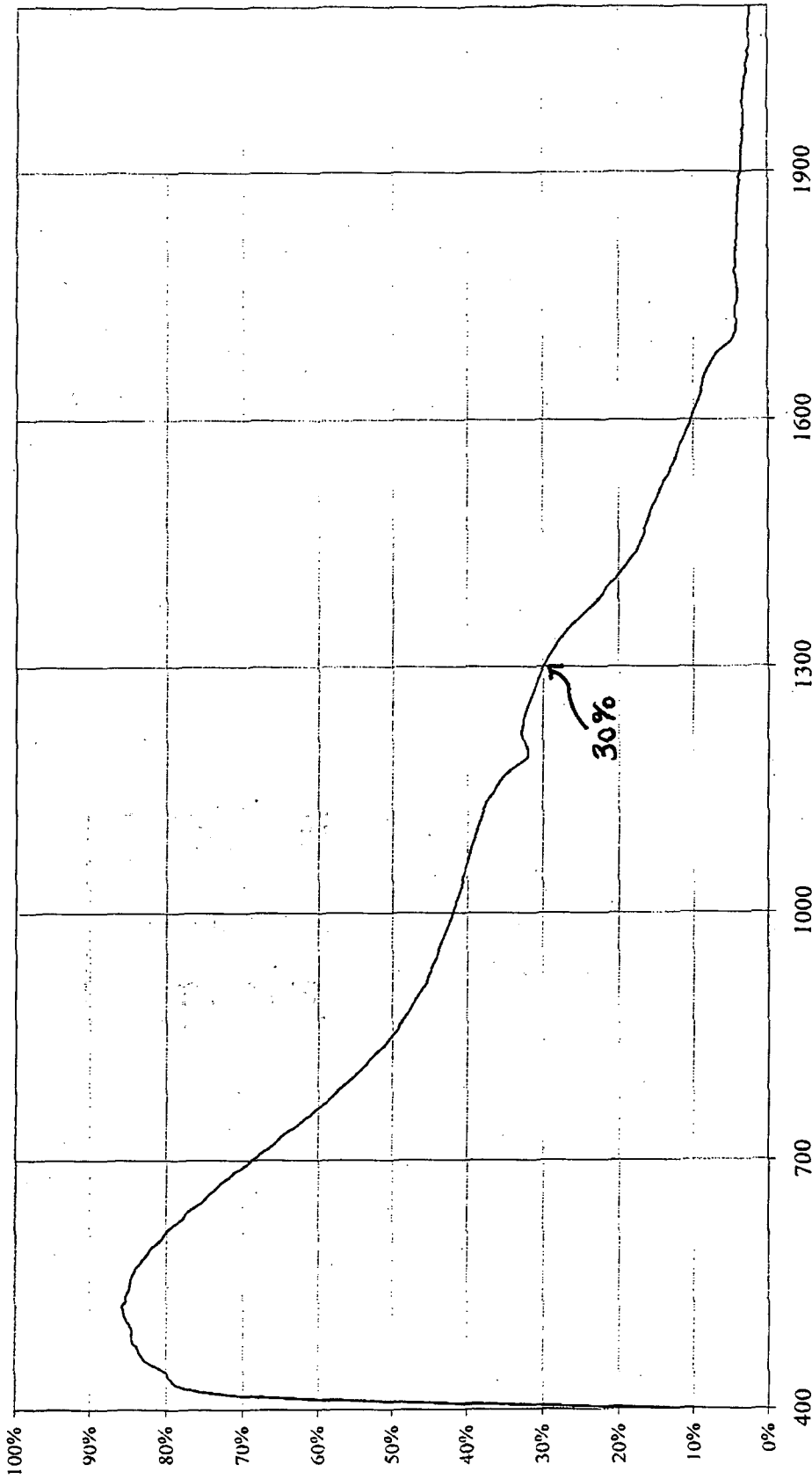


FIG 6

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2008/001919

A. CLASSIFICATION OF SUBJECT MATTER

INV. B32B17/10 C03C27/12 C03C4/08
ADD. G01S17/93 C03C3/095

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)
B32B C08K C03C G01S

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 068 914 A (BOIRE PHILIPPE [FR] ET AL) 30 May 2000 (2000-05-30) Example 8 and Comparative Example 8 column 13, line 38 - column 14, line 65; table 4	1,5-10, 12-14
X	US 6 686 032 B1 (NAGAI KUNIKO [JP]) 3 February 2004 (2004-02-03) column 2, line 46 - column 4, line 35 column 4, line 44 - column 6, line 18 -& WO 01/19748 A (ASAHI GLASS CO LTD [JP]; NAGAI KUNIKO [JP]) 22 March 2001 (2001-03-22) figures 2a,2b	3-10,14

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

& document member of the same patent family

Date of the actual completion of the international search

4 September 2008

Date of mailing of the international search report

12/09/2008

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2260 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl;
Fax: (+31-70) 340-3016

Authorized officer

Lindner, Thomas

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2008/001919

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 979 804 A (NIPPON SHEET GLASS CO LTD) 16 February 2000 (2000-02-16) page 2, line 14 - line 34 page 4, line 57 - page 5, line 34	1,5-8,14
A	page 9, line 38 - page 13, line 37; table 7 page 16, line 47 - line 56 claims 1-8,20-26,39,40	3
X	US 5 077 133 A (CHENG J JOSEPH) 31 December 1991 (1991-12-31)	1,5-8,14
A	column 3, line 32 - column 9, line 65; table III claims 20-29	3
X	EP 0 488 110 A (CENTRAL GLASS CO LTD) 3 June 1992 (1992-06-03) page 2, column 2, line 36 - page 3, column 3, line 58 page 4, column 5, line 20 - column 6, line 56 page 5, column 7, line 27 - column 8, line 15	1,5-8,14
A	Comparative Examples 1 and 2 page 6, column 10, line 51 - page 7, column 11, line 53	3
X	US 5 214 008 A (BECKWITH STEVEN P [US] ET AL) 25 May 1993 (1993-05-25) column 4, line 62 - column 5, line 58; claims 1-5	1,5-8, 12-14
A	EP 0 616 883 A (SAINT GOBAIN VITRAGE [FR]) 28 September 1994 (1994-09-28) page 3, column 4, line 42 - page 4, column 6, line 27 page 7, column 11, line 15 - line 37; claims	1-10, 12-14
A	WO 94/19705 A (SHACHTER ISRAEL [IL]; SILICON HEIGHTS LTD [IL]; YAVNAYI AMOTZ [IL]; GA) 1 September 1994 (1994-09-01) page 6, line 3 - line 13 page 11, line 16 - line 21; figures 2a,2b page 26, line 12 - line 27; figures 16,17	1,3,5,11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2008/001919

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6068914	A	30-05-2000	AT 244690 T 15-07-2003
			BR 9702221 A 23-02-1999
			CZ 9800127 A3 17-06-1998
			DE 69723392 D1 14-08-2003
			DE 69723392 T2 15-04-2004
			EP 0839122 A1 06-05-1998
			ES 2202616 T3 01-04-2004
			FR 2748743 A1 21-11-1997
			WO 9743224 A1 20-11-1997
			JP 11509513 T 24-08-1999
			PL 324499 A1 25-05-1998
			PT 839122 T 28-11-2003
			US 6686032
WO 0119748 A1 22-03-2001			
WO 0119748	A	22-03-2001	EP 1136457 A1 26-09-2001
			US 6686032 B1 03-02-2004
EP 0979804	A	16-02-2000	WO 9933759 A1 08-07-1999
			US 6607832 B1 19-08-2003
US 5077133	A	31-12-1991	NONE
EP 0488110	A	03-06-1992	DE 69120509 D1 01-08-1996
			DE 69120509 T2 31-10-1996
US 5214008	A	25-05-1993	AT 179684 T 15-05-1999
			AU 3319093 A 21-10-1993
			BR 9301559 A 26-10-1993
			CA 2085264 A1 18-10-1993
			CN 1077438 A 20-10-1993
			CZ 9300600 A3 16-11-1994
			DE 69324726 D1 10-06-1999
			DE 69324726 T2 09-12-1999
			DK 565835 T3 01-11-1999
			EP 0565835 A2 20-10-1993
			ES 2133335 T3 16-09-1999
			HU 68637 A2 28-07-1995
			JP 6166536 A 14-06-1994
			JP 7121815 B 25-12-1995
			MX 9301842 A1 28-02-1994
			NO 931416 A 18-10-1993
			NZ 247433 A 27-09-1994
			PL 298501 A1 10-01-1994
			RU 2094402 C1 27-10-1997
			SK 33193 A3 10-11-1993
			TR 28283 A 17-04-1996
			ZA 9302086 A 15-10-1993
			EP 0616883
WO 9419705	A	01-09-1994	AU 6008594 A 14-09-1994
			EP 0685077 A1 06-12-1995
			JP 8507371 T 06-08-1996