639528

COMMONWEALTH of AUSTRALIA
Patents Act 1952

APPLICATION FOR A STANDARD PATENT

I/We

Flachglas Aktiengesellschaft

of

Otto–Seeling–Promenade 10–14, 8510 Fürth/Bayern, Germany

hereby apply for the grant of a Standard Patent for an invention entitled:

Facade plate and its use

which is described in the accompanying complete specification.

Details of basic application(s):–

Number	Convention Country	Date
P 4003851.3–25	Germany	6 February 1990

The address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

DATED this SIXTH day of FEBRUARY 1991

To: THE COMMISSIONER OF PATENTS

M 024550 060291

....
a member of the firm of DAVIES & COLLISON for and on behalf of the applicant(s)

Davies & Collison, Melbourne

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

DECLARATION IN SUPPORT OF CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT

Insert title of invention.

In support of the Application made for a patent for an invention entitled: "Facade plate and its use"

Insert full name(s) and address(es) of declarant(s) being the applicant(s) or person(s) authorized to sign on behalf of an applicant company.

I ~~We~~ GUNTHER STOCKMANN and TILLMANN STOBEROCK
of Flachglas Aktiengesellschaft
of Otto-Seeling-Promenade 10 - 14
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Germany

Cross out whichever of paragraphs 1(a) or 1(b) does not apply

1(a) relates to application made by individual(s)

1(b) relates to application made by company; insert name of applicant company.

do solemnly and sincerely declare as follows :–

1. (a) ~~XXX We are xxxxxxxxxxxxxxxxxxxxxxxxxxxx~~

or (b) ~~XXXX~~ We are authorized by

Flachglas Aktiengesellschaft

the applicant............. for the patent to make this declaration on its ~~their~~ behalf.

Cross out whichever of paragraphs 2(a) or 2(b) does not apply

2(a) relates to application made by inventor(s)

2(b) relates to application made by company(s) or person(s) who are not inventor(s); insert full name(s) and address(es) of inventors.

2. (a) ~~XXX We are xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx~~

or (b) Rolf Groth
of Holzstr. 218
4630 Bochum 6

and Axel Nothe
of Ringstr. 49
4620 Castrop-Rauxel

Both of Germany

~~is~~ are the actual inventorS......... of the invention and the facts upon which the applicant............ is ~~are~~ entitled to make the application are as follows :–

State manner in which applicant(s) derive title from inventor(s)

The applicant would, if a patent were granted on an application made by the said inventors, be entitled to have the patent assigned to it.

Cross out paragraphs 3 and 4 for non-convention applications. For convention applications, insert basic country(s) followed by date(s) and basic applicant(s).

3. The basic application........... as defined by Section 141 of the Act was ~~were~~ made

in Germany on the 6 February 1990

by FLACHGLAS AKTIENGESELLSCHAFT

in .... on the ....

by ....

in .... on the ....

by ....

4. The basic application.......... referred to in paragraph 3 of this Declaration was ~~were~~ the first application......... made in a Convention country in respect of the invention the subject of the application.

Insert place and date of signature.

Declared at Bayern this 29th day of March 1991.

Signature of declarant(s) (no attestation required)

FLACHGLAS AKTIENGESELLSCHAFT

[signatures]

Note: Initial all alterations.

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(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 639528

(54) Title
FACADE PLATE AND ITS USE

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(56) Prior Art Documents
US 5112693
US 4773717
AU 57513/90 E04C 1/42

(57) Claim

1. Facade plate for covering the facade between window openings of a building provided with transparent glass panes, said facade plate comprising when in use a transparent glass carrier which has on its inner surface an inner coating matching the external view of the facade plate in both reflection and shade to that of the transparent glass panes, an intermediate metal oxide layer applied to the inner coating and a substantially optically dense, outer layer applied to the metal oxide layer on the side thereof remote from the glass carrier, characterized in that the inner coating comprises a light-transmitting metal or metal alloy coating having a thickness such that it reduces the light transmission of the glass carrier coated therewith compared with an uncoated glass carrier by 30 to 85%, that the intermediate metal oxide layer comprises a dielectric coating of at least one metal oxide and has an optical thickness in the range 60 to 180 nm, that the outer layer comprises a metal or metal alloy coating, that the light transmission of the completely coated glass carrier is $< 5\%$ and its light reflection in external view is 8 to 25% and that the metals used for the inner coating and the outer layer are so selected that the ratio n/k of the real part n and imaginary part k of the complex refractive index of said coatings is between 0.2 and 5.

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11. Use of a facade plate according to any one of the preceding claims for the construction of a glass facade, in which in the window openings are inserted transparent glass panes with low light reflection and weak shading in the external view.

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COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

COMPLETE SPECIFICATION

NAME & ADDRESS
OF APPLICANT:

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NAME(S) OF INVENTOR(S):

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COMPLETE SPECIFICATION FOR THE INVENTION ENTITLED:

Facade plate and its use

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

The invention relates to a facade plate, particularly for covering the facade between window openings of a building provided with transparent glass panes, e.g. insulating glass panes for producing a glass facade which is optically uniform in external view, with a transparent glass carrier, which has on its back a coating matching the external view of the facade plate in both reflection and shade to that of the transparent glass panes and having a metal oxide layer and a substantially optically dense, outer layer applied thereto on the side remote from the glass carrier.

When designing facades of buildings there exists in many cases a need to use in the non-light-transmitting facade area, i.e. between the window openings, as external elements facade plates and in particular coated glass panes, plates or panels, which are harmoniously matched in brightness and colour in external view to the window area. Usually a significant coincidence is sought between the window and window railing area, so as to obtain a glass facade with a uniform appearance.

In the window area use is made of single panes or insulating glass with normal or mass-coloured glass panes. Use is also made of coated panes if the heat absorption or sun protection are to be improved. In particular, semitransparent metal coatings, e.g. of gold and silver are suitable for this purpose and are frequently combined with additional interference coatings so as to form a multicoating system. With such multicoating systems it is possible to obtain very good technical values with respect to the heat absorption or sun protection and simultaneously prevent in external view an undesired reflection of such panes. As a result of their sensitivity to scratching and the risk of coating changes due to the action of the external atmosphere, such coating systems are generally used in conjunction with insulating glass with a hermetic edge connection of the individual panes.

For many applications it is desirable that the light reflection to the outside is not excessive, in order to eliminate undesired dazzle. This e.g. applies to inner cities with a high building density and generally with a view to not destroying the character of the historical city intense colouring for such panes is undesired.

In order to largely eliminate dazzle the light reflection should generally not exceed approximately 25%. This requirement is fulfilled by standard insulating glass. Thus, the light reflection of a single pane of clear glass is approximately 8%, that of a double pane of clear glass approximately 14 to 15% and that of a triple pane approximately 20%. When using mass-coloured glasses the corresponding values are lower.

In order to obtain an adaptation of the non-transparent area to the window area, it is known there to use insulating glass panes having the same construction as in the window area, whilst additionally applying to the pane facing the building interior a light-proof or opaque enamel or dye coating, in order to prevent observation of the wall elements located behind the facade element. Such solutions are completely satisfactory with respect to an optically uniform glass facade. However, the costs are very high, because insulating glass must also be used in the non-transparent facade area. In addition, due to the absorption of the additional opaque coating on the inner pane there are significant warming effects to such facade elements in the case of solar radiation. Such effects are so high when using clear insulating glass, which has a very high permeability for solar radiation, that temperatures above 80°C can occur when there is no back ventilation of the facade plates and would lead to the loading capacity of the edge connection being exceeded, so that the insulating glass pane would be destroyed. However, even in the case of panes where the outer pane has a sun protection effect and consequently the loading of the inner pane is reduced, significant additional loading occurs, which decreases the insulating glass life. In addition, to avoid heat jumps the glass must be tempered, which gives rise to additional costs.

It is also known to use monolithic glass panes for the non-transparent facade area and which have on the outside an oxide coating, such as e.g. of titanium dioxide as the interference coating (cf. German Patent 26 46 513). With such facade plates the back is provided with an opaque enamel or lacquer, so as to prevent observation of the building parts behind the facade plate. A serious disadvantage of such monolithic facade plates is that considerable costs are involved in cleaning the outside of the facade plate. Firmly adhering dirt is difficult to remove, because it is not possible to use in such cases the cleaning methods conventionally employed for uncoated glass, namely the use of abrasive agents, steel blades, etc., because this would scratch the oxide coating. With a light reflection above 30%, said oxide interference coatings reflect too much to permit an adaptation of the non-transparent facade area to the window area in accordance with the aforementioned requirements (low light reflection).

The difficulties occurring when cleaning a facade plate according to German Patent 26 46 513 are avoided with a facade plate according to the preamble and as known from US Patent 3 951 525, in that in the same way as the transparent glass panes of the window area, they are provided on their back with a reflecting metal oxide coating, which is directly applied to the glass carrier. To adapt the external view of the window and window railing area, the same metal oxide coating is used in both areas, the material and thickness of said coating being chosen in such a way that a sun protection action occurs in the window area. On the metal oxide coating the facade plates additionally have an opaque outer enamel coating, whose function is to prevent observation of the building parts behind the same. However, as the location of an enamel coating directly on the reflecting metal oxide coating leads to an inferior adaptation to glass panes inserted in the window area with a metal oxide coating adjacent to the air, according to US Patent 3 951 525 an at least partial compensation is achieved in that the colour and material of the outer enamel coating used are appropriately selected. This method does not lead to an esthetically satisfactory adaptation between the window and the facade plate. Unlike the metal oxide coating with a directional reflection, such enamel coatings reflect in a diffuse manner, i.e. the degree of adaptation is dependent on the locally and time varying composition of the incident sky light.

For darkening purposes it is also known to apply in the non-transparent facade area to the rear, partly permeable coating opaque lacquers or coloured films. Due to the different reflection at the metal oxide coating - air interface in the window area and the metal oxide coating - lacquer/coloured film in the non-transparent facade area there is an unsatisfactory coincidence with regards to the shade and the reflection, as when using an enamel. Such darkening coatings are also exposed to the action of light and UV-radiation through the glass pane and the partly permeable metal oxide coating, which particularly in the case of lacquers and plastic films can lead to an inadequate aging resistance. The application of an additional darkening coating to the metal oxide coating, which is either pyrolytic or applied by a vacuum coating process proves to be expensive.

The known facade plates are not suitable for the window railing area to be adapted as regards height and shade to the light reflection if use is made in the window area of a glazing of clear glass, light-absorbing glass or transmission-reducing, coated panes with, as a function of the pane combination, different, but certainly lower light reflection and weaker colouring. With such coating systems it is admittedly fundamentally possible to achieve a substantially colour-neutral external view of such panes, but there is always a slight colour cast. This cannot always be detected in a building which is exclusively glazed with similar panes. However, if corresponding facade plates are used for an all-glass facade, they must very accurately coincide as regards light reflection and shade with the transparent glass panes in the window area. Thus, when directly comparing juxtaposed panes, the human eye is able to detect even minor tints or reflectance divergences. This leads to a non-uniform overall impression of such an all-glass facade.

The problem of the invention is to provide a monolithic facade plate of the aforementioned type which, whilst being economic to manufacture, prevents any disturbing observation of wall elements behind the facade plate. By means of simple and relatively inexpensive measures a brightness and colour adaptation to a plurality of panes inserted in the window area with low light reflection is to be made possible. From the colour standpoint this involves an adaptation to an external view which is largely neutral. However, in conjunction with the aforementioned uses, it is sometimes desired to have an external view, which has a subdued shade, e.g. towards the bronze, but more noticeable colours, i.e. those with a high colour saturation must be excluded.

According to the invention this problem is solved in that to the glass carrier is applied an inner coating constructed as a light-transmitting metal or metal alloy coating having a thickness such that it reduces the light transmission of the glass carrier coated therewith compared with the uncoated glass carrier by 30 to 85%, that the metal oxide coating connected to the inner coating is constructed as a dielectric coating of at least one metal oxide and has an optical thickness in the range 60 to 180 nm, that the outer coating is constructed as a metal or metal alloy coating, that the light transmission of the completely coated glass carrier is $< 5\%$ and its light reflection in external view is 8 to 25% and that the metals used for the inner coating and the outer coating are so selected that the ratio n/k of the real part n and imaginary part k of the complex refractive index of said coatings is between 0.2 and 5.

The facade plate according to the invention can be characterized by an inner coating thickness such that it reduces the light transmission of the glass carrier coated therewith by 40 to 85% compared with the uncoated glass carrier.

The facade plate according to the invention can also be characterized in that the optical thickness of the metal oxide coating is 70 to 140 nm.

According to the invention the material of the inner and/or outer coating can have at least a preponderant content of at least one metal or metal alloy from the group of elements of numbers 22 to 28 and 30 of the periodic system.

According to the invention the material of the inner and/or outer coating has at least a preponderant content of at least one metal or metal alloy from the group chromium, nickel, iron and titanium. The invention more particularly proposes that the inner and/or outer coating is of chromium.

According to a further embodiment of the invention the inner and/or outer coating is of high-grade steel.

In the facade plate according to the invention the metal oxide coating can be of SnO_2, ZnO, In_2O_3, TiO_2 or mixed oxides of the corresponding metals.

It can also have between the metal oxide coating and the outer coating a 2 to 10 nm thick adhesive coating, particularly of a chrome-nickel alloy or an optionally doped In_2O_3.

Preferably the facade plate according to the invention can be used for the construction of a glass facade, in which in the window area are used transparent glass panes with low light reflection and a weak shade in external view.

As a result of the interaction of the inventively proposed coatings, it is surprisingly possible in an economic manner to precisely and reproducibly adjust the desired optical characteristics.

Facade plates according to the invention can be manufactured in a particularly advantageous manner in that the coatings are applied in vacuo according to the magnetron cathodic sputtering process. When using continuously operating equipment this process makes it possible to economically coat large glass surfaces. The metal oxide coating is produced in a particularly advantageous manner by reactive magnetron cathodic sputtering using metallic or alloy targets in an oxygen-containing atmosphere. The inner and outer coatings are applied by sputtering in an oxygen-free atmosphere. However, it can be advantageous to add small oxygen quantities to the coating atmosphere for obtaining minor modifications to the optical coating characteristics. It has been found that the inventive coating system is particularly suitable in conjunction with magnetron cathodic sputtering in continuously operating equipment for the manufacture in an economic manner of facade plates adapted in different ways in the external view. Thus, a corresponding multiplicity of facade plates with adaptation to different panes in the window area can be obtained in that only the partial coating thicknesses are adapted, whilst using the same materials. This means that a large product range can be produced with colour tints and light reflection differences without having to change the target materials. As is known, in such continuously operating equipment this involves a significant expenditure, because for target change purposes the equipment must be ventilated and a significant time is needed for reaching the vacuum conditions necessary for coating purposes.

According to the invention the inner and outer coatings are produced from metals, in which the ratio of the real to the imaginary part n/k of the complex refractive index n-ik is between 0.2 and 5 in the visible spectral range. Preference is given to those metals where n and k are roughly the same. These materials only reflect to a moderate extent in the visible light range and in an approximately colour-neutral manner. Thus, they solve the problem of the invention in an optimum manner.

Chromium has proved to be particularly suitable for producing the inner and outer coatings. For producing the dielectric metal oxide coating in particular SnO_2, ZnO, In_2O_3, TiO_2 or mixed oxides of the corresponding metals are especially suitable and can be economically produced by reactive magnetron sputtering.

It falls within the scope of the invention to replace the metal oxide coating by two or more partial coatings of different metal oxides, whose total optical thickness is in the range claimed for the metal oxide coating. When producing the inventive coating system by magnetron cathodic sputtering, it has also proved to be advantageous to place a thin film of optionally doped indium oxide on the metal oxide coating. This makes it possible to significantly improve the adhesion of the outer coating if e.g. the metal oxide coating is of SnO_2. The optical thickness of the metal oxide coating must be correspondingly reduced in this case.

No additional darkening coating need be applied to the coating system, e.g. in the form of a coloured lacquer or a stuck-on, dark coloured film, e.g. of polyester or polyethylene. However, it falls within the scope of the invention to cover with an organic protective coating or film the coating side of the glass pane, e.g. for protecting against damage during transportation or installation. For a significant period of time the coating system has an adequate resistance to the action of the atmosphere, particular importance being attached to the moisture resistance, because frequently condensate is deposited on the inside of such facade plates. It has surprisingly been found that the inventively provided outer metal or metal alloy coatings of the overall coating system give the necessary corrosion resistance with respect to the influences of the ambient air and in particular water condensate films without an additional protective coating being necessary. This is completely unexpected, because metal oxide coatings of the inventive nature produced by reactive magnetron cathodic sputtering do not have the necessary moist room resistance. Thus, if e.g. SnO_2 coatings are exposed to a moist room test at 40°C and 100% relative atmospheric humidity, corrosion starts after roughly 60 hours. The coating has separated in large-area manner after 150 hours. Large-area coating separations occur after only 60 hours when the test is performed at 70°C. The other inventively claimed metal oxide coatings reveal a simiiar behaviour.

However, the coating system according to the invention leads to a significant improvement in the moist room resistance. No coating changes were detected after 2000 hours at 70°C and 100% relative atmospheric humidity. This high corrosion resistance is surprising, because it would be expected that moisture would diffuse through the pinholes always present in the metal or metal alloy coating and would attack and travel under the underlying moisture-sensitive metal oxide coating, so that coating separation would occur in said areas. This high corrosion resistance of the coating system is also surprising because under the aforementioned test conditions soda-lime-silica glass normally used for such applications is no longer corrosion-resistant. Thus, at 70°C and 100% relative atmospheric humidity after only 200 hours action surface corrosion of the uncoated glass commences.

As a result of the coating according to the invention the glass carrier corrosion resistance is improved by more than a power of 10. This is a very important criterion for the use of such facade plates, especially if there is an air gap, which is not completely back-ventilated, between the facade plate and the insulating material behind it. Under such conditions the corrosion resistance of soda-lime-silica glass is not sufficient to prevent glass surface corrosion on a long term basis.

The invention is described in greater detail hereinafter relative to embodiments and the diagrammatic drawing, which shows a facade plate according to the invention in section at right angles to the pane plane.

As is revealed by the drawing, the facade plate according to the invention has a transparent soda-lime-silica glass carrier 10, an inner coating 12 applied thereto by magnetron cathodic sputtering, a following SnO_2 metal oxide coating 14 and a SnO_2-doped In_2O_3 adhesive coating, as well as an outer coating 16 following onto the same and which, in the same way as the inner coating 12, is made from chromium and like the latter is produced by magnetron cathodic sputtering. The metal oxide coating 14 is also produced by magnetron cathodic sputtering, namely reactively using metal targets in an oxygen-containing atmosphere. When constructing an all-glass facade the facade plate diagrammatically shown in the drawing is positioned in such a way that the outside of the glass carrier 10 remote from the coatings 12,14 and 16 faces the atmosphere.

Facade plates according to the invention can be manufactured according to the following examples.

Example I.

In a vacuum coating plant equipped with magnetron cathodic sputtering coating equipment, to a 40 x 40 cm, 4 mm thick soda-lime-silica float glass pane were applied the following coatings:

- A chromium coating by sputtering a chromium target in an argon atmosphere at a pressure of $1.3 \cdot 10^{-1}$ with a thickness such that the float glass pane light transmission was reduced by 76%;

- a 60 nm thick SnO_2 coating by the reactive sputtering of a tin target in a argon-oxygen atmosphere at a pressure of $3.5 \cdot 10^{-1}$ Pa;

- a SnO_2-doped In_2O_3-coating with a thickness of 4 nm by the reactive sputtering of an In90/Sn10 target under the same conditions as for the SnO_2 coating; and

- a chromium coating under the same conditions as for the first coating and in a thickness such that the light transmission of the float glass pane provided with all four coatings was $< 1\%$.

On observing from the glass side, the coated pane had a light reflection of 14% and had no detectable colour cast. The colour loci in reflection measured in the L, a, b-colour system (according to R.S. Hunter, Photoelectric Color Difference Meter, in J. Opt. Soc. Am. 48, 1958, pp. 985 to 955) were at a = -1.0 and b = -0.8.

In the external view, i.e. on observing from the glass side, the reflectivity and colour locus of the pane coincided very well with an insulating glass pane comprising two 6 mm thick float glass panes. The latter had a light reflection of 14.3% and a colour locus of a = -1.0 and b = -0.7.

Example II.

In the vacuum coating plant according to Example I onto the float glass pane of the latter and under the same coating conditions were successively applied the following coatings:

- A chromium coating with a thickness such that the light transmission of the float glass pane was reduced by 78%;

- a 61 nm thick SnO_2 coating;

- a 4 nm thick, SnO_2-doped In_2O_3 coating and

- a chromium coating with a thickness such that the light transmission of the float glass pane provided with all four coatings was $< 1\%$.

In external view, i.e. on observing from the glass side, the coated pane had a light reflection of 16%. The external view was almost neutral with a slight colour cast in the blue direction. The colour loci in reflection were at a = -0.8 and b = -5.2.

With respect to the light reflection and the colour, the pane corresponded very well to an insulating glass pane of two 6 mm thick float glass panes, in which an interference coating system with silver as the heat reflecting coating was applied to the outer pane as a sun protection coating on the side facing the gap. This pane had a light transmission of 51%. The light reflection was 16% and the colour loci in reflection were at a = -1.0 and b = -4.9.

Example III.

In the vacuum coating plant according to Example I and under the same coating conditions as in the latter, the following coatings were successively applied to a float glass pane as in Example I:

- A chromium coating in a thickness such that the light transmission of the float glass pane was reduced by 53%;
- a 34 nm thick SnO_2 coating;
- a 4 nm thick, SnO_2-doped In_2O_3 coating; and
- a chromium coating with a thickness such that the light transmission of the float glass pane provided with all four coatings was $< 1\%$.

In external view, i.e. when viewing from the glass side, the coated pane had a matt bronze shade. The light reflection was 16.5% and the colour loci in reflection were at a = 1.1 and b = 7.2.

With regards to the light reflection and colour in external view, the pane corresponded very well to an insulating glass pane of two

6 mm thick float glass panes, in which a gold interference coating system was applied to the outer pane on the side facing the gap. The light transmission of the insulating glass pane was 49%, the light reflection 16% and the colour loci in reflection at a = 1.0 and b = 7.5.

Example IV.

As in Example I, successively the following coatings were applied to a float glass pane:

- A high-grade steel coating with a thickness such that the light transmission of the float glass pane was reduced by 79%;
- a 59 nm thick SnO_2 coating; and
- a high-grade steel coating with a thickness such that the light transmission of the float glass pane provided with all three coatings was $< 1\%$.

On observing from the glass side, the coated pane had a light reflection of 20%. Its external view was almost neutral with a slight colour cast in the green direction. The colour loci in reflection were at a = -2.7 and b = -0.7.

With respect to the light reflection and the colour in the external view, the pane coincided very well with an insulating glass pane formed from two 6 mm thick float glass panes, in which a chromium coating was applied for sun protection coating purposes on the outer pane side facing the gap. The light transmission of the insulating glass pane was 18%, the light reflection 22% and the colour loci in reflection at a = -3.0 and b = -0.5.

The inventive features disclosed in the description, drawings and claims can be essential to the realization of the different embodiments of the invention either singly, or in random combinations.

List of Reference Numerals.

10 Glass carrier

12 Inner coating

14 Metal oxide coating

16 Outer coating

The reference numerals in the following claims do not in any way limit the scope of the respective claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Facade plate for covering the facade between window openings of a building provided with transparent glass panes, said facade plate comprising when in use a transparent glass carrier which has on its inner surface an inner coating matching the external view of the facade plate in both reflection and shade to that of the transparent glass panes, an intermediate metal oxide layer applied to the inner coating and a substantially optically dense, outer layer applied to the metal oxide layer on the side thereof remote from the glass carrier, characterized in that the inner coating comprises a light-transmitting metal or metal alloy coating having a thickness such that it reduces the light transmission of the glass carrier coated therewith compared with an uncoated glass carrier by 30 to 85%, that the intermediate metal oxide layer comprises a dielectric coating of at least one metal oxide and has an optical thickness in the range 60 to 180 nm, that the outer layer comprises a metal or metal alloy coating, that the light transmission of the completely coated glass carrier is < 5% and its light reflection in external view is 8 to 25% and that the metals used for the inner coating and the outer layer are so selected that the ratio n/k of the real part n and imaginary part k of the complex refractive index of said coatings is between 0.2 and 5.

2. Facade plate according to claim 1, characterized in that the inner coating has a thickness such that it reduces the light transmission of the glass carrier coated therewith by 40 to 85% compared with an uncoated glass carrier.

3. Facade plate according to either claim 1 or claim 2, characterized in that the optical thickness of the intermediate metal oxide layer is 70 to 140 nm.

4. Facade plate according to any one of the preceding claims, characterized in that the material of the inner coating and/or outer layer has at least a preponderant content of at least one metal or a metal alloy from the group of elements of numbers 22 to 28 and 30 of the periodic system.

5. Facade plate according to claim 4, characterized in that the material of the inner coating and/or the outer layer has at least a preponderant content of at least one metal or a metal alloy from the group chromium, nickel, iron and titanium.

6. Facade plate according to claim 5, characterized in that the inner coating and/or the outer layer is of chromium.

7. Facade plate according to claim 5, characterized in that the inner coating and/or the outer layer is of high-grade steel.

8. Facade plate according to any one of the preceding claims, characterized in that the intermediate metal oxide layer is of SnO_2, ZnO, In_2O_3, TiO_2 or mixed oxides of the corresponding metals.

9. Facade plate according to any one of the preceding claims, characterized in that between the intermediate metal oxide layer and the outer layer, there is a 2 to 10 nm thick adhesive coating, particularly of a chrome-nickel alloy or optionally doped In_2O_3.

10. Facade plate according to any one of the preceding claims, characterized in that the inner coating, the intermediate metal oxide layer and the outer layer are applied by magnetron cathodic sputtering.

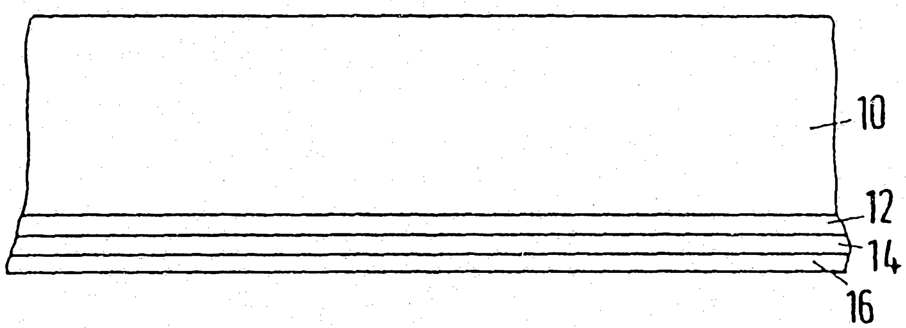
11. Use of a facade plate according to any one of the preceding claims for the construction of a glass facade, in which in the window openings are inserted transparent glass panes with low light reflection and weak shading in the external view.

12. A facade plate substantially as hereinbefore described with reference to the drawings and/or Examples.

13. Use of a facade plate substantially as hereinbefore described with reference to the drawings and/or Examples.

DATED this 26th day of May, 1993

FLACHGLAS AKTIENGESELLSCHAFT
by its Patent Attorneys
DAVIES COLLISON CAVE



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