

SPECIFICATION

MULTIPLE GLAZING

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[TECHNICAL FIELD]

The present invention relates to a multiple glazing, and more particularly to a multiple glazing which intends to improve heat-insulating performance by e.g. minimizing presence of any substance which can act as
10 heat transfer medium within a gap between a pair of plate glasses (e.g. by evacuating it). For instance, between the pair of plate glasses, there are interposed a number of spacers spaced apart from each other along the sheet faces, with the gap between the sheet glasses being depressurized and sealed.

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[BACKGROUND ART]

Conventionally, with this type of multiple glazing, in order to prevent the glazing from hindering the light transmission therethrough, the
20 spacers are formed with a small diameter so as not to be conspicuous and the pair of sheet glasses are provided respectively as a transparent sheet glass. And, by setting the inter-spacing of the spacers according to the strength of the sheet glasses, the entire glazing is formed thin, yet providing high heat-insulating performance.

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With this conventional multiple glazing, it is impossible, of course, to prevent viewing through the multiple glazing. However, depending on the location and purpose of its use, it is required that the glazing be capable of blocking the view while allowing light transmission therethrough.

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Then, as a means to achieve the above object, it is conceivable to employ e.g. frosted sheet glasses as the sheet glasses used in the glazing.



However, the frosted sheet glass has fine unevenness on its surface. Then, the condition of the face of the frosted sheet glass which the spacers abut varies from one place to another on the face, thus leading to instability of the spacers for instance. As a result, an unexpectedly strong stress may be applied to the frosted sheet glass, whereby the frosted sheet glass may be broken.

Moreover, concerning also a sealing treatment of the outer peripheries of the opposed sheet glasses, the unevenness of the frosted sheet glass is apt to present weakness in the sealing. If the depressurized sealed condition of the gap cannot be maintained, the heat-insulating performance may deteriorate.

Accordingly, an object of the present invention is to solve the above-described shortcoming of the prior art by providing a multiple glazing which can hinder the view while allowing light transmission and which also can maintain a high heat-insulating performance for a long period of time.

[DISCLOSURE OF THE INVENTION]

The above-noted object is achieved by the invention set forth in the claims. Namely;

The characterizing feature of a multiple glazing according to the present invention lies in that at least one of the pair of plate glasses between which the plurality of spacers are interposed comprises a frosted sheet glass which is disposed so as to have an unevenly treated face thereof oriented away from the gap between the pair of sheet glasses.

According to this construction, at least one of the pair of plate glasses between which the plurality of spacers are interposed comprises a frosted sheet glass. Then, it is possible to block the view while allowing light transmission therethrough (this effect will be referred to hereinafter as cloudiness effect).



As the frosted sheet glass is disposed so as to have an unevenly treated face thereof oriented away from the gap between the pair of sheet glasses, both of the sheet glass faces which the spacers abut are formed even and smooth, thus preventing the spacers from being destabilized. Accordingly, there will be less irregularity in the support conditions of the sheet glasses by the spacers and there will not occur a breakage accident due to occur local concentration of the stress associated with the depressurized sealing. That is to say, it becomes possible to maintain the cloudiness effect and the heat-insulating effect for a long period of time.

Moreover, concerning also the sealing treatment of the outer peripheries of the opposed sheet glasses, the sealed condition with the sealant may be good since the sheet glass faces facing the gap are formed flat and smooth, so that a high sealing effect may be achieved.

Further, according to the invention, a coating film may be formed on at least one of faces of a pair of sheet glasses between which a plurality of spacers are interposed, the faces facing away from a gap between the pair of sheet glasses.

With this construction, it is also possible to employ, as the coating film, mixture of more than two kinds of materials having differing refractive indexes thus providing a light scattering property. In this case, the view may be blocked while light transmission is allowed.

And, in comparison with a case where the coating film is formed on a face facing the gap, the degree of depressurized sealing of the gap may be maintained high, whereby the cloudiness effect and the heat-insulating effect may be maintained for an extended period of time. That is, if the coating film is disposed so as to face the depressurized gap, there will be the risk that gas may be generated from the coating film thereby to reduce the degree of depressurization of the gap. In addition, as the coating film may be present within the sealing of the outer peripheries of the opposed sheet glasses, ambient air may inadvertently penetrate the border portion, thus



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reducing the degree of depressurization of the gap. However, the present invention without such shortcomings may achieve the above-noted object easily and reliably.

5 According to the present invention, in the glazing comprising a pair of sheet glasses and a plurality of spacers spaced apart from one another along faces of the sheet glasses, with a gap between the plate glasses being depressurized and sealed, instead of or integrally with at least one of the pair of sheet glasses, there is provided a glass having a liquid crystal sheet capable of releasing blocking of the view in association with supply of
10 electricity thereto.

With this construction too, the aforementioned object may be achieved effectively.

[BRIEF DESCRIPTION OF THE DRAWINGS]

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Fig. 1 is a partially cutaway perspective view showing a multiple glazing according to a first embodiment,

Fig. 2 is a section view showing the multiple glazing according to the first embodiment,

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Fig. 3 is a section view showing a multiple glazing according to a second embodiment, and

Fig. 4 is a section view showing a multiple glazing according to a further embodiment.

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[BEST MODES OF EMBODYING THE INVENTION]

Embodiments of a multiple glazing relating to the present invention will be described in details with reference to the drawings.

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[first embodiment]



Figs. 1, 2 show a first embodiment of the multiple glazing according to the present invention.

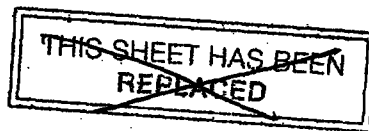
5 The multiple glazing P includes a pair of sheet glasses 1 and a number of spacers 2 spaced apart from one another along faces of the sheet glasses, with a gap V between the two sheet glasses 1A, 1B being depressurized and sealed.

10 The one sheet glass 1A of the pair of sheet glasses 1 is provided as a transparent float plate glass. The other sheet glass 1B is provided as a frosted sheet glass. This frosted sheet is disposed in such a manner that an unevenly treated face 3 thereof faces away from the gap V. Incidentally, both of the sheet glasses 1 are float plate glasses (thickness dimension: 2.65-3.2 mm) and as for the other sheet glass 1B, the unevenly treated face 3 is formed by subjecting the float plate glass to a sand blasting, etching or
15 the like, so that this is finished as a frosted sheet glass which shields the view while allowing transmission of light therethrough.

Along and between the outer peripheries of the two sheet glasses 1A, 1B, there is provided a sealing portion 4 of low melting-point glass (for instance, solder glass), so as to seal the gap V. This gap V is rendered into
20 a depressurized condition (1.0×10^{-3} Torr or lower) by such a method as manufacture of the multiple glazing in a vacuum environment, evacuation after the manufacture of the multiple glazing, and so on.

Incidentally, the outer peripheries of the two sheet glasses 1 are formed so that either one of the sheet glasses projects along the face of the
25 sheet glass. With this formation of a projecting portion 5, in forming the sealing portion 4, it becomes possible to efficiently and reliably seal the outer periphery of the gap V while the sealant is being placed on this projecting portion 5.

30 Preferably, the spacer 2 is formed of a material having a compression strength of 5 t/cm² or higher. In this embodiment, each spacer



is formed of stainless steel (e.g. SUS304 according to JIS). If the strength of the spacer is low, the spacer 2 may be broken by the atmospheric pressure applied to the sheet glasses 1, thus being unable to form the gap V, and the heat-insulating performance will deteriorate.

5 As for the shape of the spacer 2, it is preferred that this is formed substantially cylindrical. Its dimensions are set as: 0.3-1.0 mm in diameter and 0.15 mm~ in height (spacer diameter dimension). As the spacer is formed substantially cylindrical, there is formed no angular portions tending to invite stress concentration in areas thereof abutting the two
10 sheet glasses 1. Hence, it is possible to gently support the sheet glasses 1 and effectively protecting them from breakage.

On the other hand, the spacers 2 respectively are arranged, vertically and laterally along the faces of the sheet glasses with a disposing pitch of 7 mm~ ($6.5 \times \text{thickness dimension of the sheet glass} + 0.5$) mm.

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(second embodiment)

Fig. 3 shows a second embodiment of the multiple glazing according to the present invention.

20 Like the first embodiment, the multiple glazing P includes a pair of sheet glasses 1 and a number of spacers 2 spaced apart from one another along faces of the sheet glasses, with a gap V between the two sheet glasses 1A, 1B being depressurized and sealed.

Next, differences from the first embodiment will be described.

25 The other sheet glass 1B is provided, not as a frosted sheet glass, but as a float glass having a coating film 6 formed on a face of the float glass facing away from the gap V.

30 The coating film 6 is formed by first coating on the face of the sheet glass 1B paint consisting of PbO (32%), SiO₂ (20%), TiO₂ (25%), fine powder of metal oxide (5%) and oil component (18%) and then baking the coated face



at 200-700°C. With this coating film 6, it is possible to shield the view while allowing light transmission, just like the frosted sheet glass described hereinbefore.

5 [other embodiments]

Next, other embodiments of the present invention will be described.

10 (1) The frosted sheet glass is not limited to the type described in the foregoing embodiment in which the unevenly treated face 3 is formed by subjecting a float sheet glass to sand-blasting, etching or the like. The glass may be formed by other known treating methods. These glasses are generically referred to as the frosted sheet glass in this invention.

15 The unevenly treated face 3 is not limited to the one in which the unevenness is provided over the entire glass face. Alternatively, the unevenness may be provided only at a portion of the glass face or the unevenness may be provided in some pattern (e.g. grating pattern). Further alternatively, it may be provided in a pattern in differing degrees of unevenness. These will be generically referred to as the unevenly treated
20 face in this invention.

(2) The spacer is not limited to the stainless spacer described in the foregoing embodiments. Alternatively, this may be formed of inconel 718, or metal, quartz glass, ceramics or the like having a compression
25 strength of 5 t/cm² or higher. In short, it may be any that has a compression strength of 5 t/cm² or higher and can effectively resist deformation to prevent the opposed sheet glasses from coming into contact with each other when subjected to an external force.

30 (3) The coating film is not limited to the one described in the

foregoing embodiment. For instance, it may include inorganic silicate as a main component thereof and includes, in addition, fine particles of silica/alumina. Or, it may include silicone acrylic resin as a main component thereof and includes, in addition, fine particles of silica/alumina. Further alternatively, it may include as a main component thereof, not the silicone acrylic resin described above, but urethane acrylic resin, or fluororesin, or epoxy resin or the like. In short, it may be any that can provide the multiple glazing with the function of shielding the view while allowing light transmission.

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(4) In the multiple glazing described hereinbefore in the second embodiment, as shown in Fig. 4, another sheet glass 1C may be provided integrally on the outer side of the coating film 6. In this case, a laminated glass is formed of the glasses 1B, 1C and the coating film 6. So that, the strength may be further enhanced and also degradation of the coating film 6 may be restricted.

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(5) The multiple glazing according to the present invention is not limited to those described in the foregoing respective embodiments in which the unevenly treated face or the coating film is provided to only one of the sheet glasses of the multiple glazing. Alternatively, the unevenly treated face or the coating film may be provided to each of the sheet glasses opposed to each other across the gap therebetween.

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(6) Instead of providing the other sheet glass 1B of the two sheet glasses 1 as a frosted sheet glass, this glass 1B may be provided as a float glass, with affixing, by means of e.g. adhesive, a liquid-crystal sheet to the face of the two sheet glasses facing away from the gap, so that the view may be shielded in association with ON/OFF of the voltage to this liquid-crystal sheet. That is to say, in this liquid-crystal sheet, transparent electrodes are formed, by means of vacuum deposition or the like, on opposing faces of a pair of transparent sheets formed of plastic material such as

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polyethylene terephthalate (PET); and also a liquid-crystal layer is interposed between the pair of transparent sheets. And, the transparent electrodes are connected via switches to a power source.

5 As the liquid-crystal layer, as disclosed in Japanese laid-open patent gazette Sho. 58-501631, it is possible to employ one in which nematic liquid crystal is encapsulated within capsules in the form of spherical shells made of high molecular matter such as polyvinyl alcohol (PVA) dispersed within a dispersion medium.

10 With this type of liquid-crystal sheet, when a voltage is not impressed across the pair of transparent electrodes, the liquid-crystal sheet, like the frosted sheet glass described hereinbefore, can shield the view by means of scattering of the light. Then, when e.g. an alternating voltage of 24 V is impressed across the transparent electrodes, the liquid crystal becomes aligned toward an electric field developed in accordance with the
15 impressed voltage, so that the light will not be scattered and the view is allowed.

Further alternatively, another sheet glass may be provided integrally on the outer side of the liquid-crystal sheet, thus forming a laminated glass.

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[WHAT IS CLAIMED IS]

1. A multiple glazing comprising: a pair of sheet glasses (1) and a plurality of spacers (2) interposed between the pair of sheet glasses (1) and spaced apart from one another along faces thereof, with a gap (V) between the pair of sheet glasses (1) being depressurized and sealed;
wherein at least one of the pair of plate glasses (1) comprises a frosted sheet glass which is disposed so as to have an unevenly treated face (3) thereof oriented away from the gap (V).
2. A multiple glazing comprising: a pair of sheet glasses (1) and a plurality of spacers (2) interposed between the pair of sheet glasses (1) and spaced apart from one another along faces thereof and having a gap (V) between the pair of sheet glasses (1) depressurized and sealed;
wherein a coating film (6) is formed on at least one of the faces of the pair of sheet glasses (1) which faces away from the gap (V).
3. The multiple glazing according to claim 1 or 2, wherein the spacer (2) is formed of a material having a compression strength of 5 t/cm² or higher.
4. The multiple glazing according to claim 1 or 2, wherein in said pair of sheet glasses (1), the outer periphery of one sheet glass forms a projecting portion (5) which projects, along the sheet face, from the outer periphery of the other sheet glass.
5. The multiple glazing according to claim 1 or 2, wherein a sealing portion (4) of low melting-point glass is provided between and along the outer peripheries of the pair of sheet glasses (1), so as to seal the gap (V).

6. The multiple glazing according to claim 2, wherein the coating film (6) is formed of a material which provides, when applied to the glass face, a function of shielding the view while allowing transmission of light therethrough.

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7. The multiple glazing according to claim 6, wherein the coating film 6 is formed by first coating on the face of the one sheet glass (1) paint containing as main components thereof PbO , SiO_2 , TiO_2 and then subjecting the coated face to a baking at $200-700^\circ\text{C}$.

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8. The multiple glazing according to claim 6, wherein the coating film (6) is formed of material including, as a main component thereof, inorganic silicate, silicone acrylic resin, urethane acrylic resin, fluororesin, or epoxy resin.

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9. The multiple glazing according to claim 2, wherein a sheet glass (1C) is provided integrally on the outer side of the coating film (6).

10. A multiple glazing comprising: a pair of sheet glasses (1) and a plurality of spacers (2) interposed between the pair of sheet glasses (1) and spaced apart from one another along faces thereof, with a gap (V) between the pair of sheet glasses (1) being depressurized and sealed;

wherein, the pair of sheet glasses (1) includes, in place of or integrally with the at least one sheet glass, a glass having a liquid crystal sheet capable of releasing shielding of view in association with supply of electricity thereto.

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[ABSTRACT OF THE DISCLOSURE]

A multiple glazing includes a pair of sheet glasses and a plurality of spacers interposed between the pair of sheet glasses and spaced apart from one another along faces of the sheet glasses. So far, there has existed no multiple glazing which has the function of shielding the view while allowing transmission of light therethrough and which also can maintain a high heat-insulating performance for a long period of time. This invention provides a multiple glazing in which at least one of the pair of sheet glasses is provided as a frosted sheet glass which is arranged to have an unevenly treated face (3) thereof oriented away from the gap or a coating film (6) is formed on the face thereof facing away from the gap (V). For this reason, the face of the sheet glass abutting the spacers may be maintained flat and smooth, thus avoiding local stress concentration due to unstable abutment condition and maintaining a cloudiness effect and high heat-insulating effect for an extended period of time.

FIG. 1

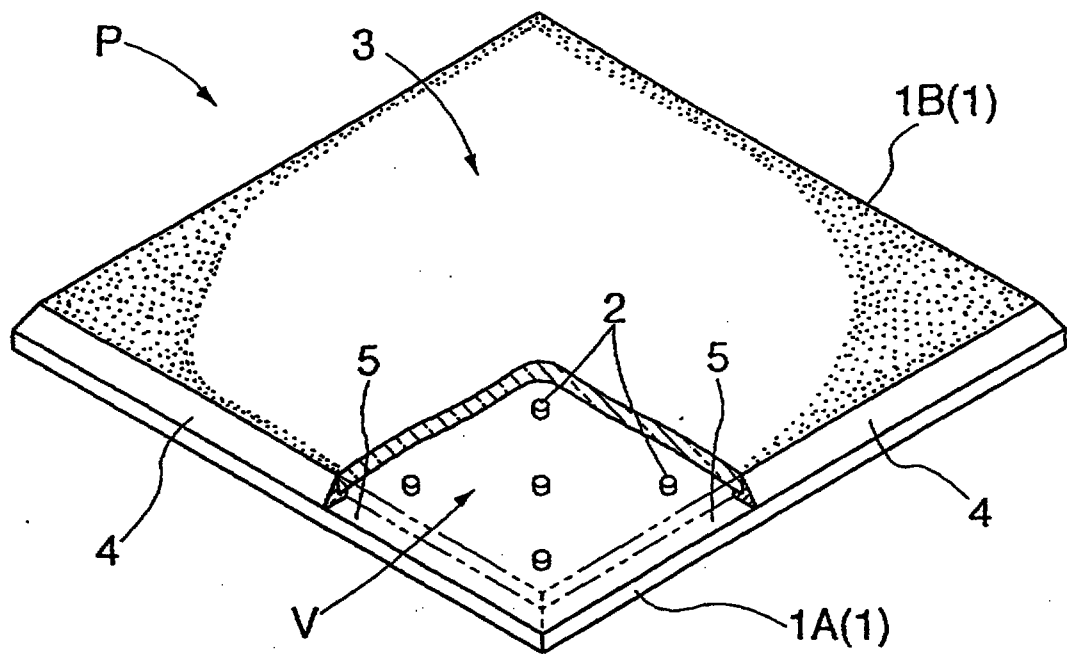


FIG. 2

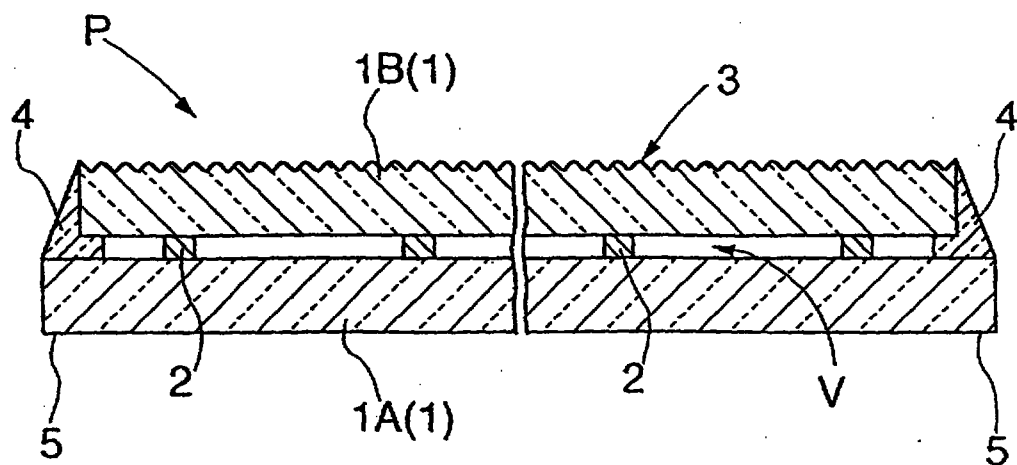


FIG. 3

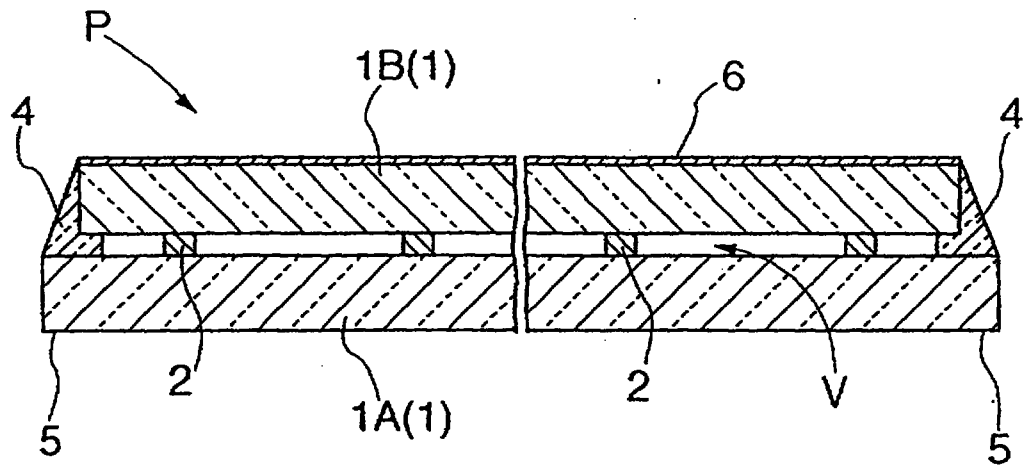
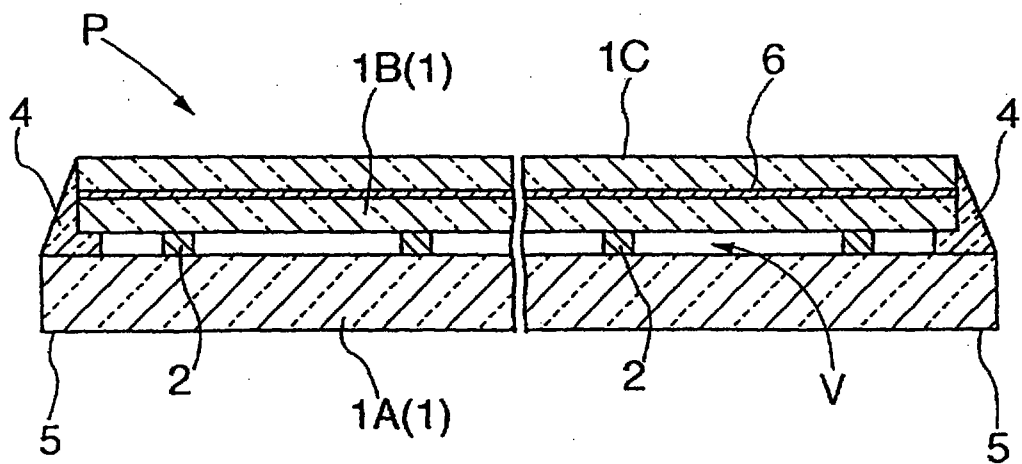


FIG. 4



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[WHAT IS CLAIMED IS]

1. (amended) A multiple glazing comprising: a pair of sheet glasses (1)
and a plurality of spacers (2) interposed between the pair of sheet glasses
5 (1) and spaced apart from one another along faces thereof, with a gap (V)
between the pair of sheet glasses (1) being depressurized and sealed;

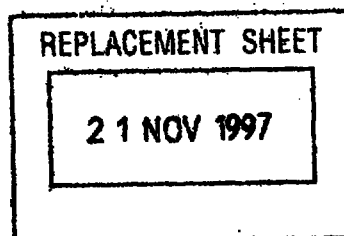
wherein at least one of the pair of plate glasses (1) comprises a
frosted sheet glass which is disposed so as to have an unevenly treated
face (3) thereof oriented away from the gap (V) and also the spacer (2)
10 includes a flat and smooth face, so that the spacer (2) and the pair of
sheet glasses (1) may abut each other through the flat and smooth faces.

2. (amended) A multiple glazing comprising: a pair of sheet glasses (1)
and a plurality of spacers (2) interposed between the pair of sheet glasses
15 (1) and spaced apart from one another along faces thereof, with a gap (V)
between the pair of sheet glasses (1) being depressurized and sealed;

wherein a coating film (6) is formed on at least one of the faces of
the pair of sheet glasses (1) which faces face away from the gap (V), and
also the spacer (2) includes a flat and smooth face, so that the spacer (2)
20 and the pair of sheet glasses (1) may abut each other through the flat
and smooth faces.

3. The multiple glazing according to claim 1 or 2, wherein the
spacer (2) is formed of a material having a compression strength of 5
25 t/cm² or higher.

4. The multiple glazing according to claim 1 or 2, wherein in said
pair of sheet glasses (1), the outer periphery of one sheet glass forms a
projecting portion (5) which projects, along the sheet face, from the outer
30 periphery of the other sheet glass.





5. The multiple glazing according to claim 1 or 2, wherein a sealing portion (4) of low melting-point glass is provided between and along the outer peripheries of the pair of sheet glasses (1), so as to seal the gap (V).

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6. The multiple glazing according to claim 2, wherein the coating film (6) is formed of a material which provides, when applied to the glass face, a function of shielding the view while allowing transmission of light therethrough.

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7. (amended) The multiple glazing according to claim 6, wherein the coating film 6 is formed by first being coating on the face of the one sheet glass (1) paint containing as main components thereof PbO , SiO_2 , TiO_2 and then subjecting the coated face to a baking at $200-700^\circ\text{C}$.

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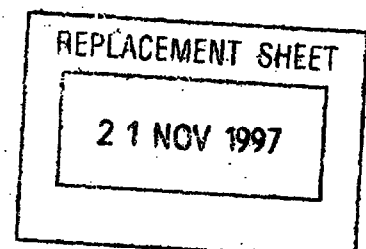
8. The multiple glazing according to claim 6, wherein the coating film (6) is formed of material including, as a main component thereof, inorganic silicate, silicone acrylic resin, urethane acrylic resin, fluororesin, or epoxy resin.

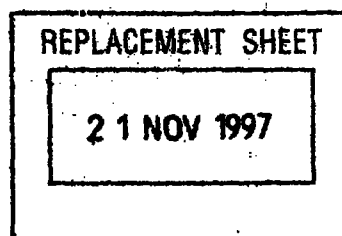
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9. The multiple glazing according to claim 2, wherein a sheet glass (1C) is provided integrally on the outer side of the coating film (6).

10. canceled

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Accordingly, an object of the present invention is to solve the above-described shortcoming of the prior art by providing a multiple
5 glazing which can hinder the view while allowing light transmission and which also can maintain a high heat-insulating performance for a long period of time.

[DISCLOSURE OF THE INVENTION]

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The above-noted object is achieved by the invention set forth in the claims. Namely;

The characterizing feature of a multiple glazing according to the present invention lies in that at least one of the pair of plate glasses
15 between which the plurality of spacers are interposed comprises a frosted sheet glass which is disposed so as to have an unevenly treated face thereof oriented away from the gap between the pair of sheet glasses and also that the spacers has a smooth and flat face so that the spacers and the pair of sheet glasses may abut each other through the flat and
20 smooth faces; and further that the spacers have a diameter of 0.3-1.0 mm.

According to this construction, at least one of the pair of plate glasses between which the plurality of spacers are interposed comprises a frosted sheet glass. Then, it is possible to block the view while
25 allowing light transmission therethrough (this effect will be referred to hereinafter as cloudiness effect).

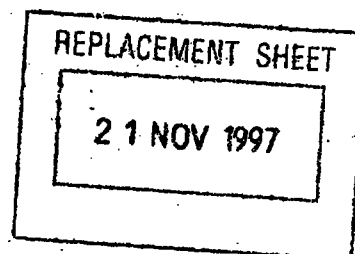
As the frosted sheet glass is disposed so as to have an unevenly treated face thereof oriented away from the gap between the pair of sheet glasses, both of the sheet glass faces which the spacers abut are formed
30 even and smooth, thus preventing the spacers from being destabilized.

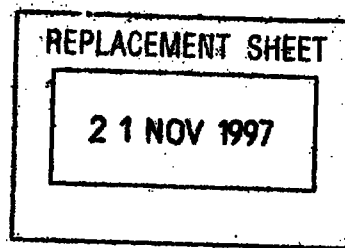
Accordingly, there will be less irregularity in the support conditions of the sheet glasses by the spacers and there will not occur a breakage accident due to occur local concentration of the stress associated with the depressurized sealing. That is to say, it becomes possible to maintain the cloudiness effect and the heat-insulating effect for a long period of time.

Moreover, concerning also the sealing treatment of the outer peripheries of the opposed sheet glasses, the sealed condition with the sealant may be good since the sheet glass faces facing the gap are formed flat and smooth, so that a high sealing effect may be achieved.

Further, according to the invention, a coating film may be formed on at least one of faces of a pair of sheet glasses between which a plurality of spacers are interposed, the faces facing away from a gap between the pair of sheet glasses.

With this construction, it is also possible to employ, as the coating film, mixture of more than two kinds of materials having differing refractive indexes thus providing a light scattering property. In this case, the view may be blocked while light transmission is allowed.





And, in comparison with a case where the coating film is formed on a face facing the gap, the degree of depressurized sealing of the gap may be maintained high, whereby the cloudiness effect and the heat-insulating effect may be maintained for an extended period of time. That is, if the coating film is disposed so as to face the depressurized gap, there will be the risk that gas may be generated from the coating film thereby to reduce the degree of depressurization of the gap. In addition, as the coating film may be present within the sealing of the outer peripheries of the opposed sheet glasses, ambient air may inadvertently penetrate the border portion, thus reducing the degree of depressurization of the gap. However, the present invention without such shortcomings may achieve the above-noted object easily and reliably.

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[BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 is a partially cutaway perspective view showing a multiple glazing according to a first embodiment,

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Fig. 2 is a section view showing the multiple glazing according to the first embodiment,

Fig. 3 is a section view showing a multiple glazing according to a second embodiment, and

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Fig. 4 is a section view showing a multiple glazing according to a further embodiment.

[BEST MODES OF EMBODYING THE INVENTION]

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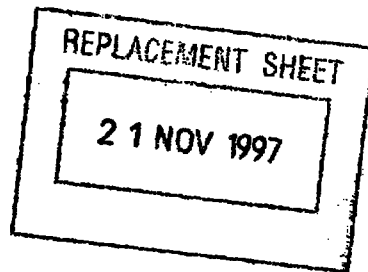
Embodiments of a multiple glazing relating to the present

invention will be described in details with reference to the drawings.

[first embodiment]

5 Figs. 1, 2 show a first embodiment of the multiple glazing according to the present invention.

 The multiple glazing P includes a pair of sheet glasses 1 and a number of spacers 2 spaced apart from one another along faces of the sheet glasses, with a gap V between the two sheet glasses 1A, 1B being
10 depressurized and sealed.





[WHAT IS CLAIMED IS]

REPLACEMENT SHEET

21 NOV 1997

1. (amended) A multiple glazing comprising: a pair of sheet glasses (1)
and a plurality of spacers (2) interposed between the pair of sheet glasses
5 (1) and spaced apart from one another along faces thereof, with a gap (V)
between the pair of sheet glasses (1) being depressurized and sealed;

wherein at least one of the pair of plate glasses (1) comprises a
frosted sheet glass which is disposed so as to have an unevenly treated
face (3) thereof oriented away from the gap (V) and also the spacer (2)
10 includes a flat and smooth face, so that the spacer (2) and the pair of
sheet glasses (1) may abut each other through the flat and smooth faces,
and also the spacers (2) have a diameter of 0.3-1.0 mm.

15 2. A multiple glazing comprising: a pair of sheet glasses (1) and a
plurality of spacers (2) interposed between the pair of sheet glasses (1)
and spaced apart from one another along faces thereof, with a gap (V)
between the pair of sheet glasses (1) being depressurized and sealed;

wherein a coating film (6) is formed on at least one of the faces of
20 the pair of sheet glasses (1) which faces away from the gap (V), and
also the spacer (2) includes a flat and smooth face, so that the spacer (2)
and the pair of sheet glasses (1) may abut each other through the flat
and smooth faces.

25 3. The multiple glazing according to claim 1 or 2, wherein the
spacer (2) is formed of a material having a compression strength of 5
t/cm² or higher.

4. The multiple glazing according to claim 1 or 2, wherein in said
30 pair of sheet glasses (1), the outer periphery of one sheet glass forms a



projecting portion (5) which projects, along the sheet face, from the outer periphery of the other sheet glass.

5. The multiple glazing according to claim 1 or 2, wherein a sealing portion (4) of low melting-point glass is provided between and along the outer peripheries of the pair of sheet glasses (1), so as to seal the gap (V).

