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Vehicle window glass with onboard camera

Abstract

A vehicle window glass with an onboard camera includes a vehicle window glass configured to be mounted to a vehicle; a bracket fixed to an inner side surface of the vehicle window glass; an onboard camera attached to the bracket; and a hood member disposed on a vehicle forward side of the onboard camera; wherein the hood member has a surface facing the vehicle window glass and exhibiting a black appearance having an L value of at most 27.0 and is made of a material having a gloss value of less than 6.0 measured based on JIS Z 8741-1997.

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Background/Summary

TECHNICAL FIELD

(1) The present invention relates to a vehicle window glass with an onboard camera.

BACKGROUND ART

(2) It has been known that a metal or resin bracket is attached to an inner side surface of a vehicle window glass, and an onboard camera is attached to the bracket to acquire information in front of the vehicle window glass through the vehicle window glass in a vehicle, such as an automobile. It has also been known that in front of the onboard camera, there is disposed a hood member, which is formed in a substantially isosceles trapezoid shape to spread in a width direction of the vehicle toward a vehicle forward direction.

(3) For example, Patent Document 1 listed below discloses that a hood member is a resin member colored in black in order to prevent rays transmitting through the vehicle window glass from being reflected on the hood member such that the reflected rays are projected into an onboard camera.

PRIOR ART DOCUMENTS

Patent Documents

(4) Patent Document 1: JP-A-2020-131809

DISCLOSURE OF INVENTION

Technical Problem

(5) However, when the hood member is merely colored in black, rays transmitting through the vehicle window glass could be reflected on the hood member such that a reflected image is projected on an inner side surface of the vehicle window glass. When the reflected image is projected on the inner side surface of the vehicle window glass, the onboard camera could detect the reflected image, resulting in an incorrect detection as if an obstacle exists in front of the vehicle.

(6) The present invention is proposed in consideration of the above-mentioned problem. It is an object of the present invention to provide a vehicle window glass with an onboard camera, which is capable of preventing a ray transmitting through the vehicle window glass from being reflected on a hood member such that a reflected image is projected on an inner side surface of the vehicle window glass.

Solution to Problem

(7) According to one aspect of the present invention, there is provided a vehicle window glass with an onboard camera, which includes a vehicle window glass configured to be mounted to a vehicle; a bracket fixed to an inner side surface of the vehicle window glass; an onboard camera attached to the bracket; and a hood member disposed on a vehicle forward side of the onboard camera; wherein the hood member has a surface facing the vehicle window glass and exhibiting a black appearance having an L value of at most 27.0 and is made of a material having a gloss value of less than 6.0 measured based on JIS Z 8741-1997.

Advantageous Effects of Invention

(8) In accordance with the vehicle window glass with an onboard camera, to which the present invention is applied, it is possible to prevent a ray transmitting through the vehicle window glass from being reflected on a hood member such that a reflected image is projected on an inner side surface of the vehicle window glass.

Description

BRIEF DESCRIPTION OF DRAWINGS

(1) FIG. 1 is a schematic view of a vehicle window glass with an onboard camera, which is seen

from an inner side.

(2) FIGS. 2A to 2C are plan views of a bracket, a hood member and the onboard camera, which are seen from an outer side.

(3) FIGS. 3A and 3B are a plan view illustrating the bracket, the hood member and the onboard camera, and a plan view illustrating a cover, where these members are seen from the inner side.

(4) FIGS. 4A and 4B are enlarged views of the vehicle window glass with an onboard camera, which is seen from the outer side.

(5) FIGS. 5A and 5B are cross-sectional views taken along line 5A-5A and line 5B-5B in FIG. 4A, respectively.

(6) FIG. 6 is a schematic view illustrating the installation angle of the vehicle window glass with an onboard camera, which is mounted to a vehicle.

DESCRIPTION OF EMBODIMENTS

(7) Now, embodiments of the vehicle window glass with an onboard camera according to the present invention will be described in reference to the accompanying drawings. It should be noted that the elements and members referred to in the following embodiments are merely examples, and the present invention is not limited to a mode including these elements and members. In Description, the terms of “upward”, “downward”, “forward”, “rearward”, “left”, “right”, “outer” and “inner” are indicative of directions in a case where a vehicle travels forward.

(8) FIG. 1 is a schematic view of the vehicle window glass with an onboard camera according to an embodiment of the present invention, which is seen from an inner side.

(9) The vehicle window glass with an onboard camera **10** shown in FIG. 1 is applied as a windshield formed in a substantially trapezoidal shape. Nevertheless, the vehicle window glass with an onboard camera according to the present invention is also applicable to other vehicle window glasses, such as a backlite, in addition to the windshield.

(10) The vehicle window glass with an onboard camera **10** includes a vehicle window glass **12** configured to be mounted to a vehicle, a bracket **20**, an onboard camera **40** (see FIG. 2C), and a hood member **30**.

(11) When the vehicle window glass with an onboard camera **10** according to this embodiment is mounted to a front opening of the vehicle, the vehicle window glass has an edge **10A**, an edge **10B**, an edge **10C** and an edge **10D** serving as a top side, a bottom side, a left side and a right side. The vehicle window glass **12** forming the vehicle window glass with an onboard camera **10** preferably has an optical shielding area **14** on an outer peripheral edge on an inner side surface. The optical shielding area **14** may be formed by, e.g., applying, to a glass plate, a color ceramic paste including a black pigment-containing soluble glass frit, and baking the applied paste. The optical shielding area **14** forms a dark and opaque layer on a peripheral area of the vehicle window glass **12**.

(12) As shown in FIG. 1, the optical shielding area **14** may include not only a peripheral edge area **14A** extending along the edges **10A**, **10B**, **10C** and **10D** but also a protruding area **14B** protruding toward the edge **10B** from a central portion of the peripheral edge area **14A** extending along the edge **10A**.

(13) The vehicle window glass **12** may be a glass plate, which is made of, for example, soda-lime glass, borosilicate glass, alkali-free glass, or quartz glass. Among them, soda-lime glass is particularly preferable. The glass plate may be made of either non-tempered glass or tempered glass. The tempered glass may be either physically tempered glass (such as glass tempered by air quenching) or chemically tempered glass. The non-tempered glass is prepared by forming molten glass in a plate shape and annealing the formed glass. The tempered glass is prepared by producing a compressive stress layer in the surface of non-tempered glass. When the glass plate is made of physically tempered glass, the glass plate may have a glass surface tempered by uniformly heating the glass plate and quenching the heated glass plate from a temperature close to its softening point to produce compressive stress in the glass surface by its temperature difference between the glass surface and the inside of the glass plate. When the glass plate is made of chemically tempered

glass, the glass plate may have a glass surface tempered by producing compressive stress in the glass surface by ion exchange or the like. Although the glass plate is preferably transparent, the glass plate may be colored to a degree not to deteriorate transparency. Although there is no particular limitation to the thickness of the glass plate, the thickness is preferably at least 0.5 mm and at most 5.0 mm. The thickness is more preferably 0.3 mm to 3.0 mm.

(14) The vehicle window glass **12** may be a laminated glass including a plurality of glass plates. The laminated glass is made of a plurality of glass plates and an interlayer bonding the glass plates.

(15) When the vehicle window glass **12** is a laminated glass, a glass plate that is positioned on an outer side after being mounted to a vehicle has a thickness of preferably at least 1.1 mm, more preferably at least 1.8 mm, in terms of resistance against a flipped stone or the like. The glass plate has a thickness of preferably at most 3.0 mm, more preferably at most 2.8 mm, in terms of weight reduction of the laminated glass. A glass plate that is positioned on an inner side after mounting the laminated glass to the vehicle has a thickness of preferably at most 0.3 mm in terms of handling, and preferably at most 2.3 mm in terms of weight reduction of the laminated glass. It should be noted that the glass plates used in the laminated glass may have the same thickness or different thicknesses.

(16) Although there is no particular limitation to the material for the interlayer, the interlayer is preferably made of a thermoplastic resin, for example. Examples of the thermoplastic resin include a plasticized polyvinyl acetal-based resin, a plasticized polyvinyl chloride-based resin, a saturated polyester-based resin, a plasticized saturated polyester-based resin, a polyurethane-based resin, a plasticized polyurethane-based resin, an ethylene-vinyl acetate copolymer-based resin, an ethylene-ethylacrylate copolymer-based resin, a cycloolefin polymer resin, and an ionomer resin. The resin composition that contains a hydrogenation product of a modified block copolymer composition disclosed in Japanese Patent No. 6065221 is also preferably applicable. Among them, the plasticized polyvinyl acetal-based resin is more preferable because of providing an excellent balance in various performances, such as transparency, weathering resistance, strength, adhesion, penetration resistance, impact energy absorbability, humidity resistance, heat insulation, and sound insulation. Examples of the polyvinyl acetal-based resin include a polyvinyl formal resin obtainable by reacting polyvinyl alcohol (PVA) and formaldehyde, a narrowly-defined polyvinyl acetal-based resin obtainable by reacting PVA and acetaldehyde, and a polyvinyl butyral resin (PVB) obtainable by reacting PVA and n-butylaldehyde. Among them, PVB is more preferable because of providing an excellent balance in various performances, such as transparency, weathering resistance, strength, adhesion, penetration resistance, impact energy absorbability, humidity resistance, heat insulation, and sound insulation. A single kind of polyvinyl acetal-based resin, or a combination of two kind or more of polyvinyl acetal-based resins may be used.

(17) The vehicle window glass **12** may be curved. When the vehicle window glass **12** is a laminated glass, the glass plates, which are positioned on the outer side and on the inner side after being mounted to the vehicle, may be processed and curved so as to have certain radiuses of curvature, respectively. The radiuses of curvature of the glass plates range from 1,000 to 100,000 mm. When the vehicle window glass **12** is curved, the vehicle window glass **12** may be curved so as to be convex toward the outer side after being mounted to the vehicle. When the glass plates are made of inorganic glass formed in a curved shape, the glass plates may be bent by gravity bending, press bending or the like after formation by the float process. Bending is made by heating the glass or softening. The heating temperature of the glass at bending is at least about 550° C. and at most about 700° C. The vehicle window glass **12** may be formed in a single bent shape to be bent only in one of an upward and downward direction or a right and left direction, or in a compound bent shape to be bent in the upward and downward direction and the right and left direction. When the vehicle window glass **12** is a laminated glass, the glass plates, which are positioned on the outer side and the inner side after being mounted to the vehicle, may have the same radius of curvature or different radiuses of curvature.

(18) The bracket **20** is fixed to the inner side surface of the vehicle window glass **12**. The bracket **20** is preferably fixed to the vehicle window glass **12** in the optical shielding area **14**.

(19) The bracket **20** serves as a member required for attaching onboard parts, such as the onboard camera **40**, to the inner side surface of the vehicle window glass **12**. The bracket **20** can be disposed between the onboard camera **40** and the vehicle window glass **12** to facilitate the attachment work of the onboard camera **40** to the inner side surface of the vehicle window glass **12**.

(20) FIGS. 2A to 2C are plan views illustrating the bracket, the hood member and the onboard camera, which are seen from the outer side after the bracket is attached to the vehicle window glass. FIG. 2A is a plan view of the bracket, FIG. 2B is a plan view where the hood member is attached to the bracket, and FIG. 2C is a plan view where the onboard camera is attached to the bracket.

(21) As shown in FIG. 2A, the bracket **20** is formed of a plate having an opening **21** as one example. The opening **21** includes a rectangular opening formed in a substantially central portion of the bracket **20**, and an isosceles trapezoidal opening continuous to the rectangular opening. The isosceles trapezoidal opening spreads in a forward direction. The bracket **20** has two engaged portions **22** disposed thereon.

(22) As shown in FIG. 2B, the hood member **30** is disposed, for example, on the inner side so as to cover the isosceles trapezoidal opening of the bracket **20**. The hood member **30** has, for example, a cutout portion **31** formed in an oval shape so as to extend toward the forward direction in a portion adjacent the shorter base of the isosceles trapezoidal shape.

(23) The bracket **20** and the hood member **30** are formed as individual parts. The hood member **30** has two engageable portions **32** disposed thereon while the bracket **20** has the two engaged portions **22** formed thereon so as to be engageable with the engageable portions **32**. The hood member **30** and the bracket **20** are coupled by engagement of the engageable portions **32** with the engaged portions **22**. The hood member **30** is preferably disposed on the bracket **20**. Thus, it becomes easily to handle the bracket **20** and the hood member **30**.

(24) The bracket **20** may be a first resin material, and the hood member **30** may be a second resin material. The first resin material and the second resin material are preferably different from each other. When the bracket **20** and the hood member **30** are made of a resin material (or the first resin material and the second resin material), both members can be easily molded in shapes suited to the vehicle. When the first resin material and the second resin material are different from each other, the bracket **20** and the hood member **30** can achieve to have their appropriate properties.

(25) Although it is shown in FIG. 2B that the bracket **20** and the hood member **30** are coupled by engagement of the engageable portions **32** with the engaged portions **22**, the coupling of both members is not limited to this mode. The hood member **30** may be bonded to the bracket **20** by an adhesive or a double-sided tape.

(26) As another embodiment, the bracket **20** and the hood member **30** may be wholly formed as a single molded product. The bracket **20** and the hood member **30** may be formed as a two-color molded product. In a case where the bracket **20** and the hood member **30** are made of the first and second resin materials, respectively, such that the first and second resin materials are different from each other, both members can be more easily produced as a two-color molded product. Examples of the first resin material include PBT (polybutylene terephthalate), EPDM (ethylene-propylene-diene rubber), PS (polystyrene), PC (polycarbonate), PP (polypropylene), TPO (olefin-based elastomer), an ABS resin, natural rubber, chloroprene rubber, PEI (polyether imide), and PA66 (nylon 66). Examples of the second resin material include PBT (polybutylene terephthalate), EPDM (ethylene-propylene-diene rubber), PS (polystyrene), PC (polycarbonate), PP (polypropylene), TPO (olefin-based elastomer), an ABS resin, natural rubber, chloroprene rubber, PEI (polyether imide), and PA66 (nylon 66).

(27) As shown in FIG. 2C, the onboard camera **40** equipped with a photographic lens **42** is attached to the bracket **20** so as to be disposed at the opening **21**. The photographic lens **42** of the onboard

camera **40** is positioned at the cutout portion **31** of the hood member **30**. There is no specific limitation to the shape of the opening **21** so long as the photographic lens **42** is exposed.

(28) As shown in FIG. 2C, the hood member **30** is disposed in front of the onboard camera **40** and is formed in the isosceles trapezoidal shape, which spreads a vehicle width direction toward the forward direction. When the bracket **20** is attached to the vehicle window glass **12** (not shown), the photographic lens **42** of the onboard camera **40** is directed to the vehicle window glass **12** through the opening **21** of the bracket **20**. By the hood member **30**, rays coming from the inner side are prevented from being reflected on the inner side surface of the vehicle window glass **12** such that a reflected image is projected into the photographic lens **42** of the onboard camera **40**.

(29) The hood member **30** is formed in the isosceles trapezoidal form spreading toward the vehicle width direction as described above. The isosceles trapezoidal shape is not only a complete isosceles trapezoidal shape but also a substantially isosceles trapezoidal shape regarded as an isosceles trapezoidal shape at a glance. It should be noted that the shape of the hood member is not limited to the isosceles trapezoidal shape. It is sufficient that the hood member **30** is formed in a shape spreading in the vehicle width direction. The hood member may be formed in a hexagonal shape, an octagonal shape or fan shape.

(30) FIGS. 3A and 3B are a plan view illustrating the bracket, the hood member and the onboard camera, and a plan view illustrating a cover, which are seen from the inner side after attaching the bracket to the vehicle window glass. FIG. 3A is a plan view illustrating the bracket, the hood member and the onboard camera while FIG. 3B is a plan view illustrating the cover, which is attached to the bracket.

(31) As shown in FIG. 3A, the onboard camera **40** is attached to an inner side surface of the bracket **20**. The photographic lens **43** is partly covered by the hood member **30**.

(32) Although only the onboard camera **40** is shown in FIG. 3A, to the inner side surface of the bracket **20** is attached at least one of onboard parts, such as onboard sensors including a raindrop sensor (rain sensor), a defrost sensor, a temperature sensor, a humidity sensor and a millimeter wave sensor; an ETCS (electronic toll collection system) antenna, an antenna for radio communication or digital terrestrial television; and communication equipment including an intercommunication radio wave module and a radio wave receiving amplifier.

(33) As shown in FIG. 3B, the bracket **20** is preferably provided with the cover **50** on the inner side for example. The onboard parts, such as the onboard camera **40**, are hardly visible from the inner side and are protected by the cover **50**.

(34) The cover **50** may be formed of a bottom surface **51** opposing the bracket **20**, and a side surface **52** continuous with the bottom surface and protruding toward the bracket **20**. The side surface **52** is disposed along the entire periphery of the bottom surface **51** so as to surround the bottom surface **51**. The cover **50** preferably has slits **53** formed therein. The slits **53** serve to release heat generated by the onboard parts, to outside.

(35) FIGS. 4A and 4B are enlarged views where the vehicle window glass with an onboard camera is seen from the outer side. FIG. 4A is a plan view illustrating how the bracket **20** is fixed to the vehicle window glass **12** in the optical shielding area **14** of the vehicle window glass **12**.

(36) In this embodiment, the bracket **20** is fixed in the peripheral edge area **14A** and the protruding area **14B** as shown in FIG. 4A. The bracket **20** is preferably fixed to the vehicle window glass **12** in the optical shielding area **14** because when the bracket **20** is seen from the outer side, the bracket **20** is mostly shielded by the optical shielding area **14** such that it is possible not only to prevent the appearance from being impaired but also to protect the adhesive for bonding the bracket **20** to the vehicle window glass **12**.

(37) The optical shielding area **14** has an opening **14C** formed in the protruding area **14B**. The opening **14C** is formed so as not to obstruct the visual field of the photographic lens **42** of the onboard camera **40**. The opening **14C** corresponds to the viewing angle range of the photographic lens **42**. The photographic lens **42** of the onboard camera **40** is directed to the forward side of the

vehicle from the opening **21** of the bracket **20** through the opening **14C** of the protruding area **14B**. The hood member **30** is exposed from the opening **14C** and faces the outer side.

(38) FIG. **4B** is a plan view where a portion of the optical shielding area **14** corresponding to the bracket **20** is omitted in FIG. **4A**. It is clarified that the bracket **20** is fixed in the optical shielding area **14**.

(39) FIGS. **5A** and **5B** are cross-sectional views of FIG. **4A**, more specifically a cross-sectional view taken along line **5A-5A** of FIG. **5A** and a cross-sectional view taken along line **5B-5B** of FIG. **5A**.

(40) As shown in FIG. **5A**, the engageable portions **32** of the hood member **30** are brought into engagement with the engaged portions **22** of the bracket **20**. The engageable portions **32** and the engaged portions **22** shown in FIG. **5A** are formed in a snap-fit structure. Each of the engageable portions **32** is formed by a pair of claw parts **32A** extending from a flat surface of the hood member **30** toward the bracket **20**. The paired claw parts **32A** have wide portions **32B** formed at leading edges. The paired claw parts **32A** are formed so as to be elastically deformable at root portions protruding from the hood member **30**. Each of the engaged portions **22** is formed of an opening.

(41) When paired claw parts **32A** are inserted into the opening of their corresponding engaged portion **22**, the paired claw parts **32A** are elastically deformed such that the wide portions **32B** can pass through the engaged portion **22** as the opening. After the wide portions **32B** pass through the engaged portion **22** as the opening, the paired claw parts **32A** return to the shape prior to elastic deformation. In this state, the wide portions **32B** are made larger than the opening of the engaged portion **22** such that the engageable portion **32** and the engaged portion **22** are brought into engagement with each other to prevent detachment.

(42) As shown in FIG. **5A**, the hood member **30** extends downward toward the opening **21** of the bracket **20**, and further extends in the forward direction. The hood member **30** are preferably bent stepwise at two portions as shown in FIG. **5A** such that the cutout portion **31** is formed so as to extend across the two bent portions.

(43) As shown in FIG. **5B**, the onboard camera **40** is attached to the bracket **20**. The photographic lens **42** of the onboard camera **40** is directed to the outer side through the opening **21** and the opening **14C**. The hood member **30** is disposed so as to extend in the forward direction in front of the onboard camera **40** beyond the onboard camera **40**.

(44) It is shown in FIG. **6** how the vehicle window glass with an onboard camera **10** has been attached to the vehicle **1**. As shown in FIG. **6**, the bracket **20** with the hood member **30** and the onboard camera **40** attached thereto is fixed to the inner side of the vehicle window glass **12**.

(45) The vehicle window glass **12** is mounted to the vehicle **1** in an installation angle θ of preferably from 20 to 80 degrees. The installation angle θ means an angle formed by a centerline and a horizontal plane (plane parallel with a horizontal ground surface) wherein the centerline is formed by subsequently connecting center points of the vehicle window glass **12** in the horizontal width direction from the top side to the bottom side.

(46) Now, the projection made by the hood member **30** will be described in reference to FIGS. **5A** and **5B**.

(47) In general, the hood member **30** is formed of a resin member colored in black such that rays **L** coming from the outer side are prevented from being projected into the onboard camera **40**. Nevertheless, rays **L** transmitting through the vehicle window glass **12** from the outer side are reflected toward the vehicle window glass **12** on the hood member **30** in some cases as shown in FIGS. **5A** and **5B**.

(48) For example, rays **L** from the outer side are reflected toward the vehicle window glass **12** on the hood member **30** as shown in FIG. **5A**. The reflected rays **L** are applied to the optical shielding area **14** on the inner side of the vehicle window glass **12** as indicated with dotted lines in FIG. **5A**. In this case, the reflected image is prevented from being projected into the photographic lens **42** of the onboard camera **40**.

(49) Likewise, rays L from the outer side are reflected toward the vehicle window glass **12** on the hood member **30** as indicated with dotted lines in FIG. 5B. Further, the reflected rays L are applied to the vehicle window glass **12** through the opening **14C** of the optical shielding area **14** as shown with a dotted line in FIG. 5B. In this case, the hood member **30** is also disposed in a position in front of the onboard camera **40**, a reflected image from the vehicle window glass **12** could be projected into the photographic lens **42** of the onboard camera **40**, causing the onboard camera **40** to make an incorrect detection in some cases unless some measures are taken.

(50) As a result of intensive studies by the inventors, it has been found as explained in the examples described later that when the hood member **30** has a surface facing the vehicle window glass **12** and provided with a black appearance having an L value of at most 27.0 and is made of a material having a gloss value of less than 6.0 measured based on JIS Z 8741-1997, rays transmitting through the vehicle window glass **12** are prevented from being reflected on the hood member **30** such that a reflected image is projected on the vehicle window glass **12**. It should be noted that the L value indicates a brightness in a color space, where a lower value indicates darker. The gloss value represents mirror surface glossiness, where a higher gloss value represents a stronger glossiness while a lower gloss value represents a weaker glossiness. In the embodiments, the L value is preferably at most 27.0, and the gloss value is preferably less than 6.0. The L value is more preferably at most 26.0, and the gloss value is more preferably at most 3.0. When the surface of the hood member **30** has an L value of at most 27.0 and a gloss value of less than 6.0, the onboard camera **40** is prevented from incorrectly detecting a reflected image since rays transmitting through the vehicle window glass **12** are prevented from being reflected on the hood member **30** such that a reflected image is projected on the vehicle window glass **12**.

EXAMPLES

(51) Now, Examples of the present invention will be presented, and these examples will be described in detail. It should be noted that the present invention is not limited to these Examples.

Test Example

(52) Hood members were prepared so as to be made of materials from Test Example 1 to Test Example 11, and evaluation was made for the respective Test Examples.

Test Example 1

(53) The hood member of Test Example 1 was made of PBT-GF30 (polybutylene terephthalate: glass fibers contained in a blending amount of 30% by weight based on the total weight of the resin material and the glass fibers). The hood member of Test Example 1 had a coated film formed on a surface facing a vehicle window glass, the coated film being made of a primer and a black synthetic resin coating containing delustering pigment.

Test Example 2

(54) The hood member of Test Example 2 was made of PBT-GF30 (polybutylene terephthalate: glass fibers contained in a blending amount of 30% by weight based on the total weight of the resin material and the glass fibers), as in Test Example 1, except that the coated film was disposed on a surface facing the vehicle window glass.

Test Example 3 to Test Example 11

(55) Regarding the hood members of Test Example 3 to Test Example 11, the surfaces facing the vehicle window glass were made of the following materials. Test Example 3 was made of an EPDM (ethylene propylene diene rubber) sponge. Test Example 4 was made of PS (polystyrene) having a first embossed pattern (embossed sample TH166A of TANAZAWA HAKKOSHA CO., LTD.). Test Example 5 was made of PS having a second embossed pattern (embossed sample TH118 on TANAZAWA HAKKOSHA CO., LTD.). Test Example 6 was made of an NR (natural rubber) sponge. Test Example 7 was made of chloroprene rubber. Test Example 8 was made of sandpaper #180. Test Example 9 was made of sandpaper #400. Test Example 10 was made of PP (polypropylene) having a third embossed pattern (embossed sample GR-001 of MOLD-TECH JAPAN: 100%). Test Example 11 was made of PA6 (polyamide 6 (nylon 6)).

(56) <Evaluation>

(57) The measurement of the L value of the black appearance, the measurement of the gloss value measured based on JIS Z8741-1997, and the evaluation of reflection to the glass were made for the hood member of each of Test Example 1 to Test Example 11. The measurement of the L value was made by use of CM-700d (colorimeter: manufactured by KONICA MINOLTA, INC.). The light source was D65, and the viewing angle was set at 10 degrees. The measurement of the gloss value was made by use of VG7000 (manufactured by NIPPON DENSHOKU INDUSTRIES CO., LTD.).

(58) The evaluation of the reflection to the glass was made by visual inspection with the hood member of each of Test Example 1 to Test Example 11 being disposed in front of an onboard camera as shown in FIG. 5B. Test Example 1 that prevented reflection to the glass, and Test Examples that had the same level as Test Example 1 in terms of reflection are determined as being “excellent”, Test Examples that although there were a bit of reflection to the glass, there were no problem in use were determined as being “acceptable”, and Test Examples that the reflection to the glass was caused to bring about a problem in actual use were determined as being “unacceptable”.

(59) Table 1 shows the measurement results and the evaluation results for Test Example 1 to Test Example 11. As seen from Table 1, it is understood that Test Examples that had a black appearance an L value of at most 27.0 and a gloss value of less than 6.0 measured based on JIS Z8741-1997 are determined as being “excellent” or “acceptable” in terms of evaluation of the reflection to the glass, except for Test Example 4. What is important is that a material having a black appearance with an L value of at most 27.0 and a gloss value of less than 6.0 are applicable to the hood member without no particular limitation, and can prevent reflection to the glass.

(60) TABLE-US-00001

TABLE 1	Blackness	Gloss	Reflection	Material	(L value)	value to glass			
1	PBT-GF30	22.04	0.4	Excellent (having coated film)	2	PBT-GF30	25.71	0.7	Excellent (having no coated film)
3	EPDM Sponge	18.84	0.1	Excellent	4	PS + first embossed pattern	27.33	3.6	Unacceptable
5	PS + second embossed pattern	26.54	2.7	Acceptable	6	NR Sponge	22.39	0.2	Excellent
7	Chloroprene rubber	22.73	6	Unacceptable	8	Sandpaper #180	18.92	0.1	Excellent
9	Sandpaper #400	23	0.3	Acceptable	10	PP + third embossed pattern	24.26	6.3	Unacceptable
11	PA6 (nylon 6)	74.45	10.5	Unacceptable					

Other Preferable Embodiments

(61) Now, preferred embodiments of the vehicle window glass with an onboard camera will be described.

(62) The above-mentioned bracket **20** is preferably mainly made of PBT-GF30 because of being required to have rigidity and be hardly to expand under high temperatures.

(63) Likewise, the hood member **30** may be made of PBT-GF30. In this case, the hood member **30** is required to have a gloss value of less than 6.0 for the purpose of reducing projection. In order to set the gloss value at less than 6.0, treatment is applied to provide irregularities to the surface of a mold for molding the hood member **30** and transfer the irregularities onto the hood member **30**. However, since PBT-GF30 contains glass fibers in a blending amount of 30% by weight based on the total weight of the resin material and the glass fibers, the glass fibers could erode irregularities on the surface of the mold to make the gloss value unstable.

(64) From this point of view, the first resin material applied to the bracket **20** is preferably made of a resin material containing glass fibers in a blending amount of at least 30% by weight based on the total weight of the resin material and the glass fibers, and the second resin material applied to the hood member **30** is preferably made of a resin material containing glass fibers in a blending amount of less than 30% by weight based on the total weight of the resin material and the glass fibers. The wording “containing glass fibers in a blending amount of less than 30% by weight” covers a case where no glass fibers are contained. In this way, it is possible to achieve a gloss value of less than 6.0.

(65) Embodiments of the present invention have been described. The present invention is not limited to the above-mentioned embodiments. Various improvements and modifications can be

made without departing from the spirit of the present invention.

(66) The entire disclosure of Japanese Patent Application No. 2021-048530 filed on Mar. 23, 2021 including specification, claims, drawings and summary is incorporated herein by reference in its entirety.

Claims

1. A vehicle window glass with an onboard camera, comprising: a vehicle window glass configured to be mounted to a vehicle; a bracket fixed to an inner side surface of the vehicle window glass; an onboard camera attached to the bracket; and a hood member disposed on a vehicle forward side of the onboard camera; wherein the bracket is made of a first resin material, the hood member is made of a second resin material, and the first resin material and the second resin material are different from each other; wherein the first resin material comprises a resin material comprising glass fibers in a blending amount of at least 30% by weight based on the total weight of the first resin material and the glass fibers, and the second resin material comprises a resin material comprising glass fibers in a blending amount of less than 30% by weight based on the total weight of the second resin material and the glass fibers; wherein the hood member has a surface facing the vehicle window glass and exhibiting a black appearance having an L value of at most 27.0 measured using a colorimeter with a D65 light source and a viewing angle of 10 degrees, wherein the L value indicates a brightness in a color space, wherein lower L values indicate darker; and wherein the hood member is made of a material having a gloss value of less than 6.0 measured based on JIS Z 8741-1997.
 2. The vehicle window glass according to claim 1, wherein the hood member is disposed on the bracket.
 3. The vehicle window glass according to claim 1, wherein the bracket and the hood member are an integrally molded product.
 4. The vehicle window glass according to claim 3, wherein the bracket and the hood member are a two-color molded product.
 5. The vehicle window glass according to claim 1, wherein the bracket and the hood member are individual parts, and the hood member is bonded to the bracket by an adhesive or a double-sided tape.
 6. The vehicle window glass according to claim 1, wherein the bracket and the hood member are individual parts, the hood member has an engageable portion formed thereon, and the bracket has an engaged portion thereon; and wherein the hood member and the bracket are configured to be coupled by bringing the engageable portion and the engaged portion into engagement.
 7. The vehicle window glass according to claim 1, wherein the vehicle window glass has an optical shielding area disposed on an outer peripheral edge of the inner side surface, and the bracket is fixed to the vehicle window glass in the optical shielding area.
 8. The vehicle window glass according to claim 1, wherein the vehicle window glass is mounted to the vehicle at an installation angle of 20 to 80 degrees.
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