

SMART GLASS FIXED DOOR OF MULTIMEDIA SYSTEM OF PLATFORM SCREEN DOOR

TECHNICAL FIELD

The present application relates to the technical field of fixed doors of platform screen doors, and more particularly relates to a smart glass fixed door of a multimedia system of a platform screen door.

BACKGROUND

Currently, common tempered glass or ordinary transparent laminated glass and the like are prevalently adopted for platform screen doors in various large urban subway platforms, and the passengers on the platform can see the advertising lamp boxes opposite to the screen doors when waiting for the train, and the fixed lamp box advertisement has been a mainstream of the current platform screen doors advertisement. However, the defect that a fixed lamp box advertisement has poor advertising effect due to the fact that a static picture cannot attract passengers is overcome, so that the advertising mode of dynamic projection imaging is more and more popular with advertisement delivery providers. The smart glass, as a special glass with transparency performance when being energized and opacity performance when being not energized, can be used for projection imaging of a platform screen doors system. When the smart glass is not electrified, it is in a frosted, fogged and opaque state, and at the moment, the projector projects light from the back to the fixed door to serve as a back projection screen for projection imaging, the dynamic video advertisement is played. The smart glass is changed into a transparent state like common transparent glass after being electrified, the projector stops projecting and playing when the train enters the station, the fixed door provides passengers with real-time visual information of the train arrival as the common transparent glass.

A patent application with Publication No. CN105047108A, titled "A projection

patent application for a projection imaging device for a metro glass screen door", refers to a projection scheme, where a layer of smart film is pasted on an existing fixed screen door, and the effect of projection is achieved by utilizing the photoelectric performance of the smart film. This scheme has the following problems: a. the smart film is exposed in air, and the normal use of the smart film can be severely influenced by impurities such as condensate water and dust in the tunnel; b. the shielding of each edge part of the smart film needs to use a wide metal frame, and the visual effect is poor; c. the existing smart film in the length of 2500 mm need to use a driving voltage more than 48 V, which is higher than the safety voltage 36 V, and has potential safety hazards.

SUMMARY

One object of the present application is to provide a smart glass fixed door of a multimedia system of a platform screen door, wherein the smart film can be driven by using a 24 V or 36 V safety voltage in a large-size dimming projection system, and is not affected by an external environment; the width of the fixed metal frame of the fixed door can be effectively reduced, thereby improving the safety factor of the fixed door.

In order to solve the above problems, the technical scheme adopted by the present application is as follows.

A smart glass fixed door of a multimedia system of a platform screen door, includes laminated smart glass, a metal outer frame, an electrode, a power supply and an insulating wrapping layer, wherein, the metal outer frame is wrapped and secured around the laminated smart glass; an insulating wrapping layer is arranged and being bonded via glass cement at a connection of the metal outer frame and the laminated smart glass; wherein the electrode extends from a side seam of the laminated smart glass and is connected with the power supply through a wire, and an upper computer of a subway control system is configured to control the energization and deenergization of the laminated smart glass through control of the smart film power supply;

the laminated smart glass includes a front tempered glass with a colored glaze frame, a front organic polymer bonding layer, a smart film, a rear organic polymer bonding layer and a rear tempered glass which are sequentially stacked; the front tempered glass with the colored glaze frame is installed to face towards a passenger side, and the rear tempered glass is installed to face towards a projection side.

According to an aspect of the present application, the front tempered glass with the colored glaze frame and the rear tempered glass are at least 5 mm in thickness, respectively.

According to an aspect of the present application, the smart film is driven by the power supply at a voltage of 24 V or 36 V.

According to an aspect of the present application, the colored glaze frame is printed on the front tempered glass by a screen printing equipment.

According to an aspect of the present application, each of the front organic polymer bonding layer and the rear organic polymer bonding layer is a PVB interlayer or an EVA interlayer or an SGP interlayer.

According to an aspect of the present application, a raw glass sheet of the front tempered glass is white or ultra-white with or without coating.

According to an aspect of the present application, a raw glass sheet of the rear tempered glass is white or ultra-white with or without coating.

According to an aspect of the present application, each of the front tempered glass and the rear tempered glass is an ordinary tempered glass subjected to a homogenization process or a toughened fireproof glass formed of a single pane.

Compared with the prior art, the smart glass fixed door of a multimedia system of a platform screen door according to the embodiments of the present application has the following beneficial effects:

1. The laminated smart glass of the present application has higher safety factor compared with ordinary tempered glass or ordinary laminated glass;
2. The organic polymer subbing film in the interlayer can firmly bond the glass, so that when the smart glass can be impacted and crushed, the glass fragments are bonded in the film, thereby the glass fragments are prevented from splashing to the

human body;

3. An intermediate film of the laminated smart glass has a sound damping effect, various noise can be effectively blocked, and a good sound insulation effect can be achieved;

4. The PDLC smart film driven by using low voltage, and can be driven by using a 36 V safety voltage in a large-size dimming projection system;

5. The smart film is hot-presses into a glass bonding layer, the smart film can be effectively protected from being influenced by an external environment, and the service life of the smart film is prolonged;

6. The passenger side adopts the tempered glass printed with the colored glaze frame, so that the fixed metal frame of the fixed door can be effectively reduced, and the visual effect is good.

7. The tempered glasses of the present application are subjected to a homogenization process, the spontaneous detonation rate of the tempered glass dropped from less than 1.5 ‰ to less than one ten thousandth, greatly increasing the safety factor of the tempered glass.

8. A fireproof glass can be chose as necessary, which solves a fatal weakness that the ordinary tempered glass and ordinary laminated glass fire safety is poorly secure, greatly improving the safety factor of the rail transit screen door.

BRIEF DESCRIPTION OF THE DRAWINGS

In order to make the technical solutions in the embodiments of the present application clearer, the accompanying drawings to be used in the embodiments and the description of the prior art will be briefly introduced below, it is apparent that the drawings in the following description are merely some embodiments of the present application and that other drawings may be obtained by those skilled in the field without departing from the inventive nature of the application.

FIG.1 shows an overall configuration schematic view of a smart glass fixed door of a multimedia system of a platform screen door according to one embodiment of

the present application.

FIG.2 is a cross-sectional view of laminated smart glass of smart glass fixed door of a multimedia system of a platform screen door according to one embodiment of the present application.

FIG.3 is a cross-sectional view of a smart film of smart glass fixed door of a multimedia system of a platform screen door according to one embodiment of the present application.

FIG. 4 is a schematic view of a conventional dimming projection glass of the prior art.

The drawings are marked accordingly as follows:

1 - laminated smart glass	2 - metal outer frame
3- electrode	4 - power supply
5 - insulation wrapping layer	6 - tempered glass
7 - silica gel layer	8 - smart film
11 - front tempered glass	12 - colored glaze frame
13 - front organic polymer bonding layer	14 - smart film
15 - rear organic polymer bonding layer	16 - rear tempered glass
41 - front transparent PET film layer	42 - front transparent ITO conductive film layer
43 - polymer-dispersed liquid crystal (PDLC) layer	44 - rear transparent ITO conductive film layer
45 - rear transparent PET film layer	

DETAILED DESCRIPTION OF THE EMBODIMENTS

The embodiment of the present application is described in detail below, and examples of said embodiments are shown in the drawings, where the same or similar labels represent the same or similar components or components having the same or

similar functions. The embodiments described in the reference FIG. 1 to FIG. 3 are illustrative, which are intended to be explain the present application and cannot be construed as limiting the present application.

In the description of the present application, "length", "width", "upper", "lower", "front", "back", "left" and "right", "vertical", "horizontal", "top", "bottom", "inside", "outside" and other terms indicating the orientation or positional relationship are based on orientation or positional relationship shown in the drawings, only for the purpose of facilitating the description of the invention and simplifying the description, instead of indicating or implying that the indicated device or component must have a specific orientation and constructed and operated in a particular orientation, and therefore it cannot be construed as limiting the invention.

In addition, the terms "first" and "second" are for illustrative purposes only and should not be construed as indicating or implying a relative importance or implicitly indicating the number of technical features indicated. Therefore, a feature that defines "first" and "second" may expressly or implicitly include one or more of the features. In the description of the present application, "multiple" means two or more than two, unless otherwise particularly defined.

In the present application, "install", "interconnect", "connect", "fix" and other terms should be understood in a broad sense, such as a fixed connection, a detachable connection, or an integrated connection; a mechanical connection or an electrical connection; or direct connection, indirect connection via the medium, or internal connections of the two elements or the interaction relationship of two elements. The specific meaning of the above terms in the present application could be understood by those ordinary skilled in the field according to specific circumstances.

In order to illustrate the technical solution of the present application, the implementation of a smart glass fixed door of a multimedia system of a platform screen door according to the present application will now be described more fully hereinafter with reference to the accompanying drawings through specific embodiments.

FIG. 1 and FIG. 2 show a preferred embodiment of the present application. The

embodiments serve to illustrate the application, but not to limit the scope of the application.

As shown in FIG. 1, the fixed door of platform screen doors according to one embodiment of the present application, includes a metal outer frame 2 wrapped and secured around the laminated smart glass 1, an insulating wrapping layer 5 is arranged and being bonded via glass cement at a connection of the metal outer frame 2 and the laminated smart glass 1; wherein the electrode 3 extends from a side seam of the laminated smart glass 1 and is connected with the power supply 4 through a wire, and an upper computer is configured to control the energization and deenergization of the laminated smart glass 1 through control of the smart film power supply 4.

As shown in FIG. 2, the laminated smart glass 1 according to one embodiment of the present application, includes a front tempered glass 11 with a colored glaze frame 12, a front organic polymer bonding layer 13, a smart film 14, a rear organic polymer bonding layer 15 and a rear tempered glass 16, which are sequentially stacked by hot pressing. The front tempered glass 11 and the rear tempered glass 16 on both sides are at least 5 mm in thickness respectively. The front tempered glass 11 with the colored glaze frame 12 is installed to face towards a passenger side, and the rear tempered glass 16 is installed to face towards a projection side. In order to avoid stress concentration, the tempered glass 11 and 16 can be chamfered at right angles. The colored glaze frame 12 is screen printed on the edge of the front tempered glass 11. A middle interlayer of a laminated glass includes the front organic polymer bonding layer 13, the rear organic polymer bonding layer 15 and the liquid crystal smart film 14 of the laminated smart glass 1. The front organic polymer bonding layer 13 and the rear organic polymer bonding layer 15 have a bonding effect. The liquid crystal smart film 14 is sandwiched between two transparent conductive films by low-voltage PDLC, and then is processed through processes such as hot pressing and the like. When the liquid crystal smart film 14 is not electrified, it is in a frosted and a fogged state, and the laminated glass will turn to transparent when the liquid crystal smart film 14 is electrified and the molecular arrangement state is changed.

According to an aspect of the present application, as for the fixed door of the platform screen doors, the metal outer frame 2 is wrapped and secured around the laminated smart glass 1, and the insulating wrapping layer 5 is arranged and being bonded via glass cement at a connection of the metal outer frame 2 and the laminated smart glass 1, which also plays the role of anti-vibration.

According to an aspect of the present application, as for the fixed door of the platform screen doors, the electrode 3 extends from a side seam of the laminated smart glass 1 and is connected with the power supply 4 through a wire, and an upper computer is configured to control the energization and deenergization of the laminated smart glass 1 through control of the smart film power supply 4.

According to an aspect of the present application, the laminated smart glass 1 includes a front tempered glass with a colored glaze frame, a front organic polymer bonding layer, a smart film, a rear organic polymer bonding layer and a rear tempered glass, which are sequentially stacked by hot pressing.

Among them, the glasses on the both sides of the laminated smart glass 1 is at least 5 mm in thickness, respectively. Of course, the glasses on the both sides of the laminated smart glass 1 can also be at least 6 mm in thickness, respectively. This ensures that laminated smart glass 1 is strong enough not to break.

According to an aspect of the present application, the tempered glass with colored glaze frame 12 is prepared by screen printing. The colored glaze frame 12 can effectively shield each side of the smart film 8, thereby reducing the width of the metal outer frame 2 and improving the visual effect. The glazed glass faces towards the passenger side.

According to an aspect of the present application, the component of the organic polymer bonding layer is polyvinyl butyral / ethylene-vinyl acetate copolymer (PVB / EVA), which can serve as a bonding agent. Among them, PVB is short for polyvinyl butyral; EVA is short for ethylene-vinyl acetate copolymer.

According to an aspect of the present application, the smart film 8 is prepared by using low-voltage PDLC and combining with production process matching with same, and can also be driven by a 24 V or 36 V low-voltage power supply when the length

reaches 2500 mm, so that a good visual effect can be achieved. The low-voltage PDLC is mainly characterized in that the refractive index of the cured UV optical adhesive is consistent with that of the liquid crystal n_0 , the surface tension of the liquid crystal can be reduced by the surface active agent or the auxiliary agent of the UV optical adhesive, and the precipitation of the liquid crystal is promoted, and a proper production process is matched in the other polymerization initiation phase separation process, so that the speed of liquid crystal precipitation is close to the curing speed of the prepolymer, and therefore low starting voltage and low saturation voltage are achieved. The low-voltage PDLC is prepared by the following steps: under a light-shielding environment, acrylic ester and acrylic acid monomer, the surfactant or the assistant and the photoinitiator are respectively 45-80% and 10-45%, 1-10% and 2-5% by weight, and uniformly stirring to obtain the UV optical adhesive, 30% -60% of UV optical glue and 70% -40% of low molecular liquid crystal are mixed, and then full stirring is carried out, and then adding 1‰ to 8‰ of rigid micro-bead spacer particles to be mixed with the mixture, fully stirring and defoaming to obtain PDLC, and waiting for coating construction. Then, the PDLC is clamped in two transparent conductive films, and a liquid crystal film is formed by rolling, and then the liquid crystal film is cured by heating or ultraviolet light to prepare the light adjusting film.

According to an aspect of the present application, as the rigid micro-bead spacer particles, glass-rigid micro-bead spacer particles may be used.

According to an aspect of the present application, the mass proportion of the acrylic ester may be 45%, 50%, 55%, 60%, 65%, 70%, 75% or 80%; the mass proportion of acrylic monomers may be 10%, 15%, 20% 25%, 30%, 35%, 40% or 45%; the mass proportion of the surfactant or the assistant may be 1%, 2%, 3%, 4%, 5%, 6%, 7%, 8%, 9% or 10%; and the mass proportion of the assistant can be 2%, 3%, 4% or 5%.

According to an aspect of the present application, the mass proportion of the UV optical adhesive to the low molecular liquid crystal is 30% -60%: 70% -40%. Specifically, the mass proportion of the UV optical adhesive to the low molecular

liquid crystal may be 30%: 70%, 40%: 60%, 50%: 50% or 60%: 40%.

According to an aspect of the present application, the rigid micro-bead spacer particles may use glass-rigid micro-bead spacer particles which account for 1 ‰, 2 ‰, 3 ‰, 4 ‰, 5 ‰, 6 ‰, 7 ‰ or 8 ‰ of the sum of the masses of the mixture of the UV optical glue and the low molecular liquid crystal.

As shown in FIG. 3, in this present embodiment, the smart film 14 includes a front transparent PET film layer 41, a front transparent ITO conductive film layer 42, a polymer-dispersed liquid crystal layer 43, and a rear transparent ITO conductive film layer 44 and rear transparent PET film layer 45. Among them, PET is short for polyethylene terephthalate; ITO is short for N-type oxide semiconductor-indium tin oxide; and PDLC is short for polymer-dispersed liquid crystal. In particular, the polymer-dispersed liquid crystal layer 43 functions as a liquid crystal display, the front transparent PET film layer 41 and the rear transparent ITO conductive film layer 44 both function as electrical connections, and the ET transparent film layer 41 and rear transparent PET Film layer 45 plays a protective role.

According to an aspect of the present application, both the front organic polymer bonding layer 13 and the rear organic polymer bonding layer 15 have a thickness of 0.76 mm. Of course, the thickness can be selected from other thickness values as necessary.

According to an aspect of the present application, each of the front organic polymer bonding layer 13 and the rear organic polymer bonding layer 15 is a PVB interlayer or an EVA interlayer or an SGP interlayer. Among them, PVB is short for polyvinyl butyral; EVA is abbreviation of ethylene-vinyl acetate copolymer; SGP is short for viscoelastic material. Specifically, the smart film 14 is protected by the front organic polymer bonding layer 13 or the rear organic polymer bonding layer 15 made of the PVB layer, the EVA layer or the SGP layer to form the middle interlayer of the laminated smart glass 1, so as to effectively protect the smart film 14 from an external environment, and prolong the service life of the smart film 14.

According to an aspect of the present application, a raw glass sheet of the front tempered glass 11 is white or ultra-white with or without coating.

According to an aspect of the present application, a raw glass sheet of the rear tempered glass 16 is white or ultra-white with or without coating.

According to an aspect of the present application, each of the front tempered glass 11 and the rear tempered glass 16 is an ordinary tempered glass subjected to a homogenization process or a tempered fireproof glass formed of a single pane. Specifically, the tempered monolithic fireproof glass has fireproof properties that can control the spread of fire or smoke, thereby improving the overall safety of laminated smart glass 1.

The embodiments of the present application further provide a method for preparing laminated smart glass 1, which includes the following steps:

S201: providing a front tempered glass 1 and cleaning the front tempered glass 1;

S202: providing a front organic polymer bonding layer 13, and laying the front organic polymer bonding layer 13 on the front tempered glass 1;

S203: providing a smart film 14, placing the smart film 14 on the front organic polymer bonding layer 13, and the smart film 14 is opposite to the front tempered glass 11;

S204: providing a rear organic polymer bonding layer 15, laying the rear organic polymer bonding layer 15 on the smart film, and the rear organic polymer bonding layer 15 is opposite to the front organic polymer bonding layer 13;

S205: providing a rear tempered glass 16 and cleaning the rear tempered glass 16, laying the rear tempered glass 16 on the rear organic polymer bonding layer 15, and the rear tempered glass 16 is opposite to the smart film;

S206: cropping the front organic polymer bonding layer 13 beyond the edge of the front tempered glass 11 and the rear organic polymer bonding layer 15 beyond the edge of the rear tempered glass 16, ensuring no overlap between the front tempered glass 11, the front organic polymer bonding layer 13, the smart film, the rear organic polymer bonding layer 15 and the rear tempered glass 16;

S207: Placing the front tempered glass 11, the front organic polymer bonding layer 13, the smart film, the rear organic polymer bonding layer 15 and the rear

tempered glass 16 that are in a stacked state, into a vacuum bag, then evacuating and heating and laminating to obtain the laminated smart glass 1.

In comparison, common dimming projection glass in the prior art is shown in FIG. 4, and the smart film 8 is directly adhered to the tempered glass 6 through a silica gel layer 7, the tempered glass 6 is installed to face towards the passenger side, and the smart film 8 is installed to face towards the projection side.

The performance parameters of the dimming projection glass of the present application and the prior art are compared with the following Table 1.

The following Table 1 is about the performance parameters of the present application and the prior art.

Function		Unit	Present Application	Prior Art	Test Methods and Standards
Total Light Transmittance	On-state	W/m ²	≤2	<3	Multi-parameter Electrical Measuring Instrument
Total light transmittance	On-state	%	>81	>76	JISK 7105
	Off-state	%	>55	>50	
Haze	On-state	%	<5	<6	
	Off-state	%	>92	>90	
View Angle	On-state	Degrees	>150	>140	Laser Source Photomultiplier Tube
Response Time	On-state	ms	<45	<45	
	Off-state	ms	<45	<45	
Rated Voltage	On-state	V	24/36	48	Multimeter
Service Life	On-state	h	>80000	>50000	GB18910.5-2008

Compared with the dimming projection glass in the prior art, the laminated smart glass manufactured by the present application has the advantages of low power consumption, high total light transmittance, low haze, low rated voltage and long service life.

The aforementioned embodiments are only preferred embodiments of the present application, and are not intended for limiting the present application. Any modification, equivalent replacement, improvement, and so on, which are made within the spirit and the principle of the present application, should be included in the protection scope of the present application.

CLAIMS

What is claimed is:

1. A smart glass fixed door of a multimedia system of a platform screen door, comprising laminated smart glass (1), a metal outer frame (2), an electrode (3), a power supply (4) and an insulating wrapping layer (5), wherein, the metal outer frame (2) is wrapped and secured around the laminated smart glass (1); an insulating wrapping layer (5) is arranged and being bonded via glass cement at a connection of the metal outer frame (2) and the laminated smart glass (1); the electrode (3) extends from a side seam of the laminated smart glass (1) and is connected with the power supply (4) through a wire, and an upper computer of a subway control system is configured to control the energization and deenergization of the laminated smart glass (1) through control of the smart film power supply (4);
the laminated smart glass (1) comprising a front tempered glass (11) with a colored glaze frame (12), a front organic polymer bonding layer (13), a smart film (14), a rear organic polymer bonding layer (15) and a rear tempered glass (16) which are sequentially stacked; the front tempered glass (11) with the colored glaze frame (12) is installed to face towards a passenger side, and the rear tempered glass (16) is installed to face towards a projection side.
2. The smart glass fixed door of a multimedia system of a platform screen door of claim 1, wherein the front tempered glass (11) with the colored glaze frame (12) and the rear tempered glass (16) are at least 5 mm in thickness, respectively.
3. The smart glass fixed door of a multimedia system of a platform screen door of claim 1, wherein the smart film (14) is driven by the power supply (4) at a voltage of 24 V or 36 V.

4. The smart glass fixed door of a multimedia system of a platform screen door of claim 3, wherein the colored glaze frame (12) is printed on the front tempered glass (11) by a screen printing equipment.
5. The smart glass fixed door of a multimedia system of a platform screen door according to any one of claims 1 to 4, wherein each of the front organic polymer bonding layer (13) and the rear organic polymer bonding layer (15) is a PVB interlayer or an EVA interlayer or an SGP interlayer.
6. The smart glass fixed door of a multimedia system of a platform screen door according to any one of claims 1 to 4, wherein a raw glass sheet of the front tempered glass (11) is white or ultra-white with or without coating.
7. The smart glass fixed door of a multimedia system of a platform screen door according to any one of claims 1 to 4, wherein a raw glass sheet of the rear tempered glass (16) is white or ultra-white with or without coating.
8. The smart glass fixed door of a multimedia system of a platform screen door according to any one of claims 1 to 4, wherein each of the front tempered glass (11) and the rear tempered glass (16) is a common tempered glass subjected to homogenization process or a tempered fireproof glass formed of a single pane.