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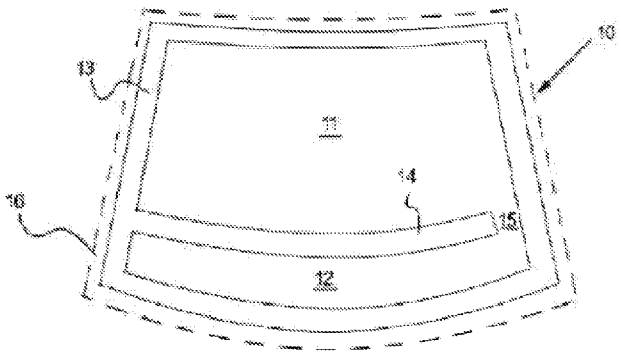


Figure 1

(57) Abstract: The present invention is a vehicle glass (10) coated with electrical conductor and having a view area (11) and a wiper area (12) and developed for use in motorized vehicles, characterized by comprising: a first stripping region (13) positioned in a manner encircling said vehicle glass (10); a first busbar (30) positioned inside said first stripping region (13); a second stripping region (14) which partially separates said view area (11) and said wiper area (12) from each other; a second busbar (31) positioned in a manner partially contacting the coating along the length of an edge of said second stripping region (14); at least one connection element (20) connected to at least one of the first busbar (30) and the second busbar (31) and at least one second connection element (21) which carries charges which are in different pole from the connection element (20) and which is connected to at least one of the first busbar (30) and the second busbar (31).

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A HEATABLE VEHICLE GLASS EMBODIMENT

TECHNICAL FIELD

The present invention relates to a vehicle glass coated with electrical conductors and having a view area and a wiper area and developed for use in motorized vehicles.

PRIOR ART

It is important that particularly motorized vehicle front glasses are heated in a rapid and effective manner. Studies related to heating the view area and wiper area in a separate and efficient manner are continuing.

The patent with publication number EP0349916 (A1) relates to a temperature control device for a heatable front glass comprising a resistance element which is sensitive to temperature which extends to critical areas of the front glass in order to monitor front glass temperature and in order to prevent overheating. Voltage decrease is compared with an adjusted voltage decrease since power is applied to the front glass and since the front glass is heated. When the voltage decrease exceeds the adjusted value, the power on the heatable front glass is automatically interrupted for preventing overheating. In said patent, overheating is prevented by means of a measurement system and not by means of the design of the coating. This may lead to an additional cost.

The patent with publication number US6559419 (B1) relates to a heatable vehicle glass comprising at least three different heating regions. A conductive coating is separated into at least three different heatable coating parts which are spaced apart from each other. An upper busbar rod comprises a step or a protruded part which extends towards the lower busbar. This protruded part enables a rain sensor or a passage device for transmitting and / or receiving the signals in an effective manner without delimitation. Since the coating is separated into at least three different heatable coating parts, an approximately firm current distribution is provided even in the part which protrudes along the upper busbar for reducing the overheating risk. However, this invention cannot particularly provide rapid heating of the wiper region.

As a result, because of all of the abovementioned problems, an improvement is required in the related technical field.

BRIEF DESCRIPTION OF THE INVENTION

The present invention relates to vehicle glasses where a view area and a wiper area can be heated, for eliminating the above mentioned disadvantages and for bringing new advantages to the related technical field.

An object of the present invention is to provide a vehicle glass with accelerated heating duration.

Another object of the present invention is to provide a vehicle glass where particularly the wiper region heating performance is increased.

Another object of the present invention is to provide a vehicle glass where the overheating regions are reduced.

Another object of the present invention is to provide a vehicle glass where homogeneous heating areas are obtained.

Another object of the present invention is to provide a vehicle glass where the number of connectors needed for heating is reduced.

In order to realize all of the abovementioned objects and the objects which are to be deducted from the detailed description below, the present invention is a vehicle glass coated with electrical conductor and having a view area and a wiper area and developed for use in motorized vehicles. Accordingly, said invention is characterized by comprising:

- a first stripping region positioned in a manner encircling said vehicle glass;
- a first busbar positioned inside said first stripping region;
- a second stripping region which partially separates said view area and said wiper area from each other;
- a second busbar positioned in a manner partially contacting the coating along the length of an edge of said second stripping region;
- two connection elements connected to the first busbar and to the second busbar at different poles from each other.

In a preferred embodiment of the present invention, at least one first busbar tab and at least one second busbar tab are provided which extend from the first busbar towards the second busbar.

In a preferred embodiment of the present invention, at least one third busbar tab and at least one fourth busbar tab are provided which extend from the second busbar towards the first busbar.

In a preferred embodiment of the present invention, said second busbar tab and said first busbar tab are embodied in a curved form.

In a preferred embodiment of the present invention, said third busbar tab and said fourth busbar tab are embodied in a curved form.

In a preferred embodiment of the present invention, said first busbar tab is embodied in “S-like” form.

In a preferred embodiment of the present invention, said fourth busbar tab is embodied in a “C-like” form.

In a preferred embodiment of the present invention, the temperature difference in the vicinity of the fourth busbar tab is at most 3 degrees.

In a preferred embodiment of the present invention, the temperature difference in the vicinity of said first busbar tab is at most 5 degrees.

In a preferred embodiment of the present invention, the first busbar contacts the coating, existing in the view area, along the length thereof.

In a preferred embodiment of the present invention, the second busbar contacts the coating, existing in the view area, along the length thereof.

In a preferred embodiment of the present invention, at least one of the first busbar tab, the second busbar tab, the third busbar tab and the fourth busbar tab has an angle between 1/8π and 2/3π.

In a preferred embodiment of the present invention, the amount of energy used in the wiper area is at most 80 watt/cm^2.

In a preferred embodiment of the present invention, the width of the first busbar tab, the second busbar tab, the third busbar tab and the fourth busbar tab is between 6 mm and 80 mm.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a representative general view of the stripping regions.

Figure 2 is a representative general view of the busbars.

Figure 3 is the thermal view of the vehicle glass where the subject matter embodiment is applied.

Figure 4 is a representative general view of the busbars.

REFERENCE NUMBERS

10 Vehicle glass
11 View area
12 Wiper area
13 First stripping region
14 Second stripping region
15 Passage area
16 Painted area
20 Connection element
21 Second connection element
30 First busbar
301 First busbar tab
302 Second busbar tab
31 Second busbar
311 Third busbar tab
312 Fourth busbar tab

DETAILED DESCRIPTION OF THE INVENTION

In this detailed description, the subject matter vehicle glass (10) is explained with references to examples without forming any restrictive effect only in order to make the subject more understandable.

The subject matter vehicle glass (10) essentially comprises a view area (11) whereon electrically conductive coating is provided and a wiper area (12) provided in the vicinity of said view area (11) and whereon electrically conductive coating is provided. A first stripping region (13) is embodied to at least partially encircle said view area (11) and said wiper area (12) and a second stripping region (14) is embodied which essentially separates the view area (11) and the wiper area (12). The second stripping region (14) intersects with the first stripping region (13) at one end and it does not intersect at the other end thereof, and here, a passage area (15) is defined. In other words, the second stripping region (14) partially separates the view area (11) and the wiper area (12) partially and not completely. There is a painted area (16) positioned so as to remain at the outer side of the first stripping region (13). The first stripping region (13) and the second stripping region (14) have insulator characteristics and there is no electrically conductive coating thereon.

There is a first busbar (30) placed onto the first stripping region (13); there is a second busbar (31) placed onto the second stripping region (14). There is at least one connection element (20) connected to the first busbar (30) or to the second busbar (31). There is at least one second connection element (21) connected to the first busbar (30) or to the second busbar (31). The connection element (20) and the second connection element (21) carry charges which are in different poles from each other. In the preferred application, there is a connection element (20) and a second connection element (21). The connection element (20), the second connection element (21), the first busbar (30) and the second busbar (31) define an electrical circuit.

The first busbar (30) and the second busbar (31) are conductive metal pastes or conductive materials for providing electrical current onto the coating and for heating. In the preferred application, silver print is used. For silver print, serigraphy method is used and a mixture comprising high proportion of silver in paste form is used. The wet thickness of the silver print is between 15 and 30 microns and the dry thickness of the silver print is between 3 microns and 30 microns and preferably between 5 and 15 microns. The width of the first busbar (30) and the second busbar (31) which are in silver print form is between 3 mm and 50 mm. Thus,

by means of usage in said thickness and width ranges, the silver print is prevented from reaching high temperatures.

The first busbar (30) is placed into the first stripping region (13) in a manner substantially encircling the vehicle glass (10). The first busbar (30) is placed into the first stripping region (13) in a manner completely encircling the vehicle glass (10). The first busbar (30) at least partially contacts only to the coating on the upper part of the view area (11). In the preferred application, the first busbar (30) contacts the coating of the view area (11) along the length of the upper part. The width of the first busbar (30) is greater in the upper part of the vehicle glass (10) when compared with the thickness in the lateral parts of the vehicle glass (10). At the same time, the width of the first busbar (30) becomes thinner as from the middle of the coating of the view area (11) towards the edges thereof. Thus, an effective electricity exchange can be provided between the second busbar (31) and the first busbar (30), and the view area (11) can be sufficiently heated. At the same time, the first busbar (30) extends along the lower edge of the vehicle glass (10) so as not to contact the coating of the wiper area (12). In other words, the first busbar (30) is positioned in the insulator region at the lower edge and at the lateral edges of the vehicle glass (10) without contacting the coatings in the view area (11) and in the wiper area (12), and at the upper edge, it is positioned in the conductor region in a manner contacting the coating of the view area (11).

The second busbar (31) does not contact the wiper area (12) and it at least partially contacts only to the edge of the view area (11) which faces the wiper area (12). Preferably the second busbar (31) contacts the coating of the view area (11) only along the edge of the view area (11) facing the wiper area (12).

There is a first busbar tab (301) embodied in curved form and which extends from the first busbar (30) towards the second busbar (31). In the preferred embodiment of the present invention, said first busbar tab (301) and said second busbar tab (302) embodied in a similar form to said first busbar tab (301) are provided. There is a third busbar tab (311) embodied in curved form and which extends from the second busbar (31) towards the first busbar (30). In the preferred embodiment of the present invention, there is said third busbar tab (311) and there is said fourth busbar tab (312) embodied in a similar form to said third busbar tab (311). In alternative embodiments, the number of busbar tabs used can change. The first busbar tab (301), the second busbar tab (302), the third busbar tab (311) and the fourth busbar tab (312) are placed onto the wiper area (12) and they contact the electrically conductive coating provided at the wiper area (12).

The first busbar (30) and the second busbar (31) are at opposite poles with respect to each other. The first busbar tab (301) and the second busbar tab (302) connected to the first busbar (30) have equal poles with the first busbar (30). The third busbar tab (311) and the fourth busbar tab (312) connected to the second busbar (31) have equal poles with the second busbar (31).

In the wiper area (12), the first busbar tab (301), the second busbar tab (302), the third busbar tab (311) and the fourth busbar tab (312) are positioned respectively from the left towards the right when viewed from inside of the vehicle. Thus, electrical current is provided through the coating which is electrically conductive in the wiper area (12), and the wiper area (12) can be heated in a rapid manner.

As applied in the present art, when the busbar tabs extend outwardly in a linear manner from the busbars, overheating problems may occur particularly in the wiper area (12). In the present invention, in order to equalize the lengths and areas of busbars and busbar tabs in the irregular geometric regions, different shapes are provided like zigzag, radius, etc. to the busbar tabs in narrow areas at the window edges. Thus, as the busbar and busbar tab lengths are equalized, thermal homogeneity is provided. In the subject matter embodiment, the first busbar tab (301), the second busbar tab (302), the third busbar tab (311) and the fourth busbar tab (312) are embodied in curved form so as to have an angle between 2/3π – 1/8π radians. In an application of the present invention, the width of the first busbar tab (301), the second busbar tab (302), the third busbar tab (311) and the fourth busbar tab (312) is between 6 mm and 80 mm. In an application of the present invention, the width of the first busbar tab (301), the second busbar tab (302), the third busbar tab (311) and the fourth busbar tab (312) is between 3 mm and 50 mm. Preferably the width of the first busbar tab (301), the second busbar tab (302), the third busbar tab (311) and the fourth busbar tab (312) is between 4 mm and 30 mm. Moreover, the second busbar tab (302) and the third busbar tab (311) extend in the same direction with each other. Preferably the second busbar tab (302) and the third busbar tab (311) extend in the same direction so as to be parallel to each other. Thus, when current with opposite poles is applied to the first busbar (30) and to the second busbar (31) on the connection elements (20), thermal differences on the wiper area (12) are reduced, and heating regions, having increased homogeneity, can be obtained on the coating. On the wiper area (12), the area which remains between the two busbars is increased in an optimum manner in the part which is close to the second busbar (31), and overheating (known as hotspot in the technical field) regions are prevented. In an alternative embodiment, the busbar tabs are embodied in zig-zag form, “"כ", "ר“, “O”, “C” or “S” like form. Here, the main critical subject is that the lengths of all busbar tabs, which change due to the

fact that the wiper area (12) is wide in the symmetry axis because of the shape of the glass but the wiper area (12) gradually narrows towards the edges, are provided in “"כ", "ר“, “O”, “C” or “S” like form, and they are equalized to each other and current homogeneity is provided.

The fourth busbar tab (312) does not contact the second stripping region (14) and it is positioned on the coating in a manner extending towards the coating in the wiper region (12) completely from the passage area (15). Because of the vehicle glass (10) geometry, since the distance between the lower and upper parts of the glass towards the lateral parts is narrower, the amount of electricity used here and the distribution of said electricity are very important for occurrence of overheating regions. The fourth busbar tab (312) has a geometrical form which is similar to semi-circle, and it is close to the first busbar (30), which has opposite pole when compared with the fourth busbar tab (312) and which encircles the edge of the vehicle glass (10), at the optimum level. Thus, the area between the fourth busbar tab (312) and the second busbar tab (302) which extends from the first busbar (30) towards the wiper area (12) is increased, and overheating in the wiper area (12) can be prevented.

Figure 3 represents the view of the vehicle glass when the vehicle is viewed from outside of the vehicle. In the subject matter embodiment given in Figure 3, the temperature difference in the fourth busbar tab (312) can be reduced to $\Delta T=3^{\circ}C$ and to lower values. In other words, the temperature difference in the fourth busbar tab (312) region is at most 3 degrees.

The first busbar tab (301) has an “S-like” geometrical form in the preferred application and it is close to the third busbar tab (311), which has an opposite pole when compared with the first busbar tab (301), at optimum level. Thus, the area between the first busbar tab (301) and the third busbar tab (311) which extends from the second busbar (31) towards the wiper area (12) is increased, and overheating in the wiper area (12) can be prevented. With reference to the thermal view obtained in the subject matter embodiment given in Figure 3, the temperature difference in the first busbar tab (301) can be reduced to $\Delta T=4^{\circ}C$ and to lower values. In other words, the temperature difference in the first busbar tab (301) region is at most 4 degrees.

Vehicle glass (10)											
Example	Left side °Celsius +Li1					Right side °Celsius - Li2					Mid °C
	SP_L	Line	Line	Line	ΔT	SP_R	Line	Line	Line	ΔT	SP_R

		Max	Min	Average	5 °C		Max	Min	Average	5 °C	
1	35.3	36.1	33.9	35.2	2.2	35.7	36.2	34.1	35.1	2.1	32.0
2	37.3	37.1	34.8	35.9	2.3	35.7	37.0	35.5	35.9	1.5	32.2
3	34.8	35.4	34.2	34.9	1.2	33.9	38.3	34.4	36.4	3.9	31.8
4	35.0	36.8	34.2	35.2	2.6	33.0	37.5	33.7	35.7	3.8	31.8

As given in the table and in Figure 3, thanks to the subject matter embodiment, overheating regions, named as hot spot, on the vehicle glass (10) are prevented.

By means of the subject matter embodiment, since the first busbar (30) and the second busbar (31) are in contact with the coating positioned in the view area (11), electrical flow is provided between the two busbars, and the view area (11) is heated. The heating duration of the view area (11) is partially longer than the heating duration of the wiper area (12). Because the temperature of the wiper area increases more rapidly, the wipers, adhered to the glass, are expected to be dissolved.

By means of the subject matter embodiment, at least two connection elements (20), having different poles from each other, are used, and heating can be provided. Moreover, by means of said embodiment, two different heating regions are obtained. By means of the changes in busbar geometry and number, desired and homogeneous heating profiles are obtained in the wiper area (12). By means of the subject matter embodiment, heating, which is at most 80 watt/cm^2, can be provided in the view area (11) and wiper areas (12). In the preferred application, heating, which is at most 80 watt/cm^2, can be provided in the view area (11) and heating, which is at most 80 watt/cm^2, can be provided in the wiper area (12). In another preferred embodiment, heating, which is at most 40 watt/cm^2, can be provided in the view area (11) and heating, which is at most 40 watt/cm^2, can be provided in the wiper area (12).

The first stripping region (13) and the second stripping region (14) are obtained by means of stripping the coatings in the view area (11) and in the wiper area (12). The coating in the view area (11) and in the wiper area (12) can also be stripped in irregular geometries. Thus, overheating regions which may occur on the first busbar (30), the second busbar (31), the first busbar tab (301), the second busbar tab (302), the third busbar tab (311) and the fourth busbar tab (312) are prevented, and homogeneous heating is provided. By means of different geometrical shape combinations of the coating, the surface area where current passes is increased, and regional, linear and pointwise abnormal heat differences are prevented.

The protection scope of the present invention is set forth in the annexed claims and cannot be restricted to the illustrative disclosures given above, under the detailed description. It is because a person skilled in the relevant art can obviously produce similar embodiments under the light of the foregoing disclosures, without departing from the main principles of the present invention.

CLAIMS

1. A vehicle glass (10) coated with electrical conductor and having a view area (11) and a wiper area (12) and developed for use in motorized vehicles, **characterized** by comprising:
   - a first stripping region (13) positioned in a manner encircling said vehicle glass (10);
   - a first busbar (30) positioned inside said first stripping region (13);
   - a second stripping region (14) which partially separates said view area (11) and said wiper area (12) from each other;
   - a second busbar (31) positioned in a manner partially contacting the coating along the length of an edge of said second stripping region (14);
   - at least one connection element (20) connected to at least one of the first busbar (30) and the second busbar (31) and
   - at least one second connection element (21) which carries charges which are in different pole from the connection element (20) and which is connected to at least one of the first busbar (30) and the second busbar (31).

2. The coated vehicle glass (10) according to claim 1, **wherein** at least one first busbar tab (301) and at least one second busbar tab (302) are provided which extend from the first busbar (30) towards the second busbar (31) at the lower part of the vehicle glass (10).

3. The coated vehicle glass (10) according to claim 1, **wherein** at least one third busbar tab (311) and at least one fourth busbar tab (312) are provided which extend from the second busbar (31) towards the first busbar (30) which extends at the lower part of the vehicle glass (10).

4. The coated vehicle glass (10) according to claim 2, **wherein** said second busbar tab (302) and said first busbar tab (312) are embodied in a curved form.

5. The coated vehicle glass (10) according to claim 3, **wherein** said third busbar tab (311) and said fourth busbar tab (312) are embodied in a curved form.

6. The coated vehicle glass (10) according to claim 2, **wherein** said first busbar tab (312) is embodied in “S-like” form.

7. The coated vehicle glass (10) according to claim 5, **wherein** said fourth busbar tab (312) is embodied in a “C-like” form.

8. The coated vehicle glass (10) according to claim 7, **wherein** the temperature difference in the vicinity of the fourth busbar tab (312) is at most 3 degrees.

9. The coated vehicle glass (10) according to claim 6, **wherein** the temperature difference in the vicinity of said first busbar tab (312) is at most 5 degrees.

10. The coated vehicle glass (10) according to claim 1, **wherein** the first busbar (30) contacts the coating, existing in the view area (11), along the length thereof.

11. The coated vehicle glass (10) according to claim 1, **wherein** the second busbar (31) contacts the coating, existing in the view area (11), along the length thereof.

12. The coated vehicle glass (10) according to any one of the preceding claims, **wherein** at least one of the first busbar tab (301), the second busbar tab (302), the third busbar tab (311) and the fourth busbar tab (312) has an angle between 1/8π and 2/3π.

13. The coated vehicle glass (10) according to any one of the preceding claims, **wherein** the amount of energy used in the wiper area (12) is at most 80 watt/cm^2.

14. The coated vehicle glass (10) according to any one of the preceding claims, **wherein** the amount of energy used in the view area (11) is at most 80 watt/cm^2.

15. The coated vehicle glass (10) according to any one of the preceding claims, **wherein** the width of the first busbar tab (301), the second busbar tab (302), the third busbar tab (311) and the fourth busbar tab (312) is between 6 mm and 80 mm.

16. The coated vehicle glass (10) according to any one of the preceding claims, **wherein** the width of the first busbar tab (301), the second busbar tab (302), the third busbar tab (311) and the fourth busbar tab (312) is between 3 mm and 50 mm.

17. The coated vehicle glass (10) according to any one of the preceding claims, **wherein** the first busbar (30) and the second busbar (31) are in silver print form and the dry thickness thereof is between 3 microns and 30 microns.

18. The coated vehicle glass (10) according to any one of the preceding claims, **wherein** the view area (11) of the first busbar (30) contacts only to the upper part thereof.

19. The coated vehicle glass (10) according to claim 18, **wherein** the width and thickness of the first busbar (30) becomes thinner from the middle part of the coating of the view area (11) towards the edges thereof.

20. The coated vehicle glass (10) according to any one of the preceding claims, **wherein** the fourth busbar tab (312) is positioned on the coating in a manner extending completely from the passage area (15) towards the coating in the wiper area (12).

21. The coated vehicle glass (10) according to any one of the preceding claims, **wherein** the lengths of the first busbar tab (301), the second busbar tab (302), the third busbar tab (311) and the fourth busbar tab (312) are equalized and the thermal homogeneity in the coating in the view area (11) and the wiper area (12) is provided.

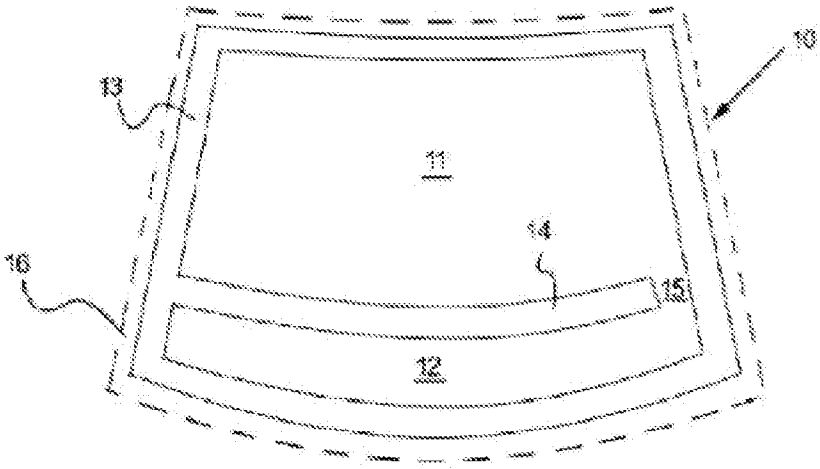


Figure 1

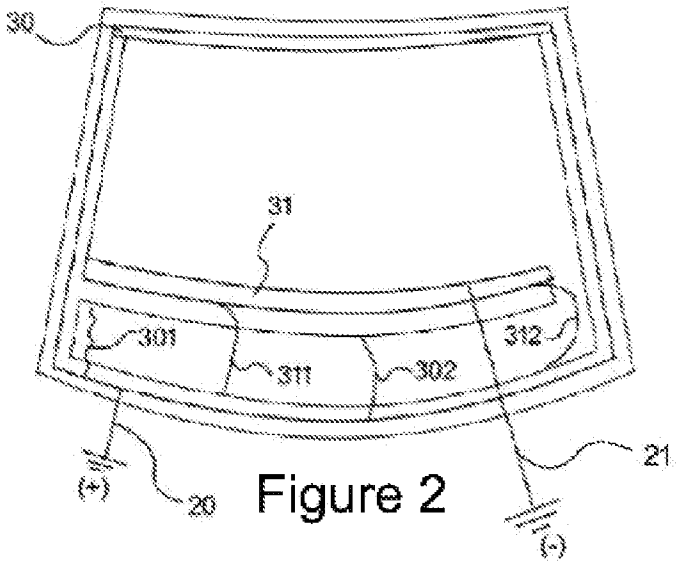


Figure 2

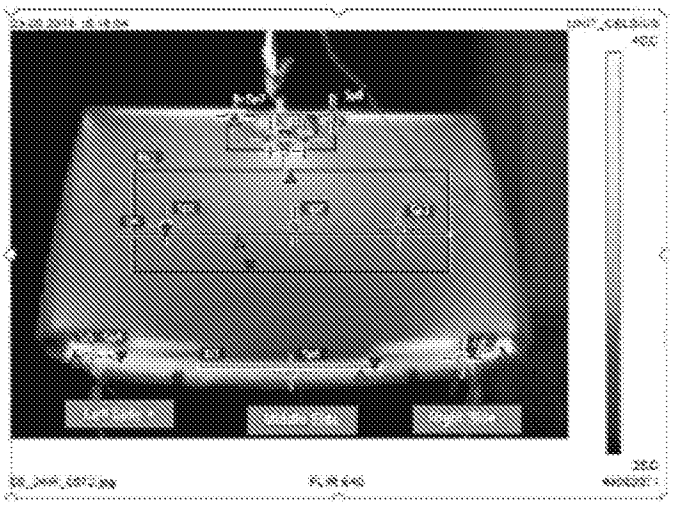


Figure 3

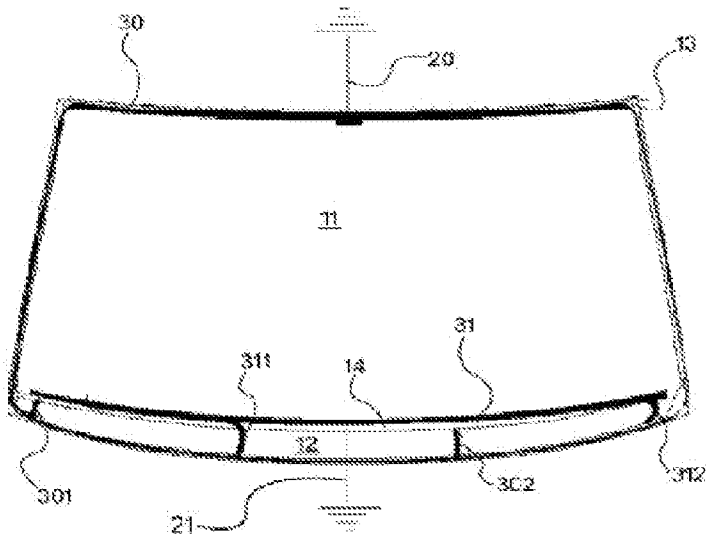


Figure 4