Title: SASH BAR SUITABLE FOR INSULATING WINDOW UNITS

Abstract: A sash bar suitable for provision in the interspace of an insulating glass unit comprising at least a first profile body 20 and a second profile body 30, which are configured to be connected before being mounted in the interspace.
SASH BAR SUITABLE FOR INSULATING WINDOW UNITS

TECHNICAL FIELD
The present invention relates to sash bars, and more particularly to sash bars that are disposed in the interspace between window panes of insulating glass units, e.g., double glazings.

DESCRIPTION OF THE RELATED ART
In insulating glass units providing warm edge conditions (e.g., US 6,339,909), maintenance of the warm edge conditions is important.

Furthermore, in some applications such as the renovation of old buildings or other applications where the optical appearance of windows divided by so-called sash bars is important, sash bars are used. If the insulating glass unit is manufactured by assembling a plurality of smaller insulating glass units, the resulting insulating glass unit is very expensive.

Another approach is the use of one full size insulating glass unit with adhered sash bars, which are glued onto the outer surfaces of the window panes. However, the optical appearance is not appealing.

A further approach is the use of such window units with sash bars adhered to the outside of the windows in which additional sash bars are inserted into the interspace between the window panes. Such insulating glass units are known as insulating glass units with "Vienna sash bars" (Wiener Sprosse).

A further approach is to provide the sash bars only in the interspace between the window panes without providing the sash bars adhered to the outside of window panes. Such insulating window units are called insulating window units with "Swiss sash bars" (Schweizer Sprosse or Kreuz) or with "window interspace sash bars" (SZR-Sprosse).

A hollow profile for a Swiss sash bar is known, for example, from EP 1 119 681 B1. Other approaches for Swiss sash bars are known from DE 196 44 544 C1 and DE 201 11 221 U1.

To maintain the warm edge conditions with such Swiss or Vienna sash bars, it is important that the sash bars inserted into the interspace between the window panes do not contact the
window panes. Furthermore, if the material used for the sash bars inserted into the interspace is aluminum or any other material having high heat conductivity, the insulating characteristics or property of the double glazing are significantly reduced. Therefore, the above indicated documents propose to use sash bars made of thermoplastic materials having a low thermal conductivity. However, these materials have a high thermal expansion. EP 1 119 681 B1 proposes to use an inner layer made of glass reinforced ABS and an outer layer made of PMMA. DE 201 11 221 U1 proposes to use a coextruded profile with an inner layer made of ASA or ABS having a lower thermal expansion coefficient and an outer layer made of PMMA.

None of the above known approaches enable the provision of different colors or appearances for the two different sides of the sash bar facing the two window panes, such as, e.g., one color or appearance for the side facing the inside of the building and another color or appearance for the side facing the outside of the building. Furthermore, the corresponding materials tend to release gases that may result in deterioration of the insulating characteristics or properties of the insulating glass unit and/or cause fogging of the inside of the window panes. In addition, the thermal expansion coefficient is still so high that, at high temperatures, bending of the sash bars may be visible to the human eye even at greater distances.

SUMMARY OF THE INVENTION

Therefore, it is an object of the present invention to overcome one or more of the above-noted problems of known double glazings.

This object is achieved by sash bars according to the independent claims.

Further developments of the invention are given in the dependent claims.

Further advantages and features of the present teachings will be readily understood from the following description of representative embodiments with reference to the figures and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 schematically shows a Vienna sash bar,

Fig. 2 schematically shows a Swiss sash bar, and
Fig. 3 schematically shows an assembled sash bar according to one embodiment of the present teachings.

DETAILED DESCRIPTION OF THE INVENTION

Fig 1 shows an insulating glass unit with a "Vienna sash bar". An insulating glass unit formed as a double glazing comprises a first window pane 1 and a second window pane 2 enclosing an interspace 3 formed therebetween. The interspace 3 may be sealed, for example, by spacer profiles, sealing material, window frame, etc., none of which are shown. The interspace 3 is usually filled with an inert gas, such as argon, before being sealed.

The window panes 1, 2 extend in the x-z plane shown in Fig. 1. A first sash bar 11 is adhered to the outside surface of the first window pane 1. A second sash bar 12 is adhered to the outer surface of the second window pane 2. The first and second sash bars 11, 12 can be made of wood or any other suitable material such as metal, plastic, composite materials, etc. The first and second sash bars 11, 12 extend in the z-direction (longitudinal direction). Naturally, if the sash bars are connected to form sash bar grids, or other sash bar combinations, the sash bars 11, 12 can also extend in other directions. However, for purpose of explaining the present teaching, it is only necessary to consider sash bars that extend in the longitudinal direction.

In the interspace 3 between the window panes 1, 2 and in the interspace between the first and second sash bars 11, 12, a third sash bar 10 is provided. This third sash bar 10 extends between and in parallel to the first and second sash bars 11, 12. The width (in the x-direction) of the third sash bar 10 is preferably selected so as to be equal to or less than the corresponding width of the first and second sash bars 11, 12.

The third sash bar 10 of the "Vienna sash bar" system is one subject of the present teachings.

In Fig. 2, a "Swiss sash bar" is shown. As already described above, Swiss sash bars are sash bars that are provided only in the interspace between the window panes 1, 2. The sash bar 10 of Fig. 2 is also one subject of the present teachings.

The sash bar 10 according to one embodiment of the present teachings is shown in Fig. 3 in a cross sectional view, which is an assembled sash bar comprising two profiles 20, 30. Considering the geometry of the insulating window unit into which the sash bar 10 will be
inserted, there is a first (outer) profile 20 and a second (inner) profile 30. Herein, the terms "outer" and "inner" are selected corresponding to the arrangement in the Y-direction, wherein the first window pane 1 is the outer window pane and the second window pane 2 is the inner window pane.

The cross sectional shapes of the first and second profiles 20, 30 of the representative embodiment shown in Fig. 3 are basically identical, except for details of the connecting portions 22 and 32, respectively, which will be described below. In particular, the widths in the x-direction are identical such that the edges 26, 36 of the two profiles 20, 30 can be and are aligned when the two profiles 20, 30 are connected. It is not necessary for the cross-sectional shapes of the two profiles 20, 30 to be identical, but such arrangement is preferred.

The first profile 20 comprises two legs (walls) 21 that protrude or project in the y-direction towards the inside of the assembled sash bar 10. Connecting portions 22 are respectively provided at the ends of the legs 21. In a similar manner, the second sash bar profile 30 comprises two legs (walls) 31 that protrude or project towards the inside of the assembled sash bar 10 and have matching or corresponding connecting portions 32 at their tip ends. The positions of the legs 21, 31, which are formed as longitudinally extending walls in the profile, are selected in the x-direction such that the legs 21, 31 oppose each other in the assembled state. As a result, the corresponding connecting portions 22, 32 can be engaged in the state where the edges 26, 36 are aligned.

While the solution shown in Fig. 3 provides clipping or snap-fitting connection portions, it is also possible to adhere the profiles 20, 30 using glue, an epoxy, etc.

Furthermore, it is additionally or alternatively possible to weld or fusion bond the two profiles 20, 30, e.g., preferably along the edges 26, 36.

The profiles 20, 30 are preferably manufactured as intermediate products. Further, the profiles 20, 30 can be made of colored materials or they can be laminated with foils, coatings, etc.

Preferably, as shown in Fig. 3, the separation plane of the two profiles 20, 30 extends in the x-z plane, i.e., in the plane of the interspace 3 of the insulating glass unit into which the sash bar will be mounted.
By manufacturing and subsequently attaching two profiles (partial profiles) to form the sash bar, sash bars can be advantageously produced that have different colors when viewed from the outside and the inside. In addition, laminated profiles can be produced that present a specific structure or appearance, such as a wood structure or appearance, only on one side.

Because the colors/appearances of the respective profiles 20, 30 can be freely combined, the separate partial profiles 20, 30 can be manufactured in advance and then combined according to the customer's desire.

Furthermore, although Fig. 3 shows an embodiment with a symmetrical separation of the two profiles 20, 30, a non-symmetrical separation and/or the use of connecting segments is possible in order to use the same partial profiles for assembled sash bars of different widths (x-direction) or different heights (y-direction). Consequently, the number of partial profiles or parts forming the assembled sash bar according to the present teachings is not limited to two.

Further, although the assembled sash bar shown in Fig. 3 is composed of two partial profiles, each made of one material, the present invention is not limited to such partial profiles.

For example, the sash bars may be made of composite profiles, such as metal plastic composite profiles, which are manufactured similar to composite profiles known, for example, from US 6,339,909. In this case, the composite profile comprises a profile body made of a first material. The first material is preferably a plastic material, more preferably a polyurethane, and more preferably a polypropylene, polyethylene terephthalate, polyamide or polycarbonate. One representative polypropylene example is Novolen 1040K.

In addition, the first material preferably has a heat conductivity value of less than 0.3 W/(mK), more preferably equal to or less than 0.2 W/(mK).

The composite profile may additionally comprise a reinforcement layer made of a second material, which may be a plastically deformable material, preferably metal, and more preferably steel having a corrosion protection or stainless steel. It is preferred that the second material has a heat conductivity value equal to or less that 50 W/(mK), more preferably less
than 15 W/(mK). The thickness of the reinforcement layer is preferably less than 0.5 mm, more preferably less than 0.2 mm, or equal or less than 0.1 mm.

The corresponding profile can be manufactured, for example, by coextruding the profile body and the reinforcement layer. One example for a stainless steel foil is a steel foil 1.4301 or 1.4016 according to DIN EN 10 088 12 with a thickness of 0.05 mm. Further teachings concerning the selection of appropriate materials can be obtained from US 6,339,909 or US provisional application No. 60/608,221.

The reinforcement layer may be provided within the profile body, such that the color can be selected by coloring or dyeing the first material. In addition or in the alternative, the reinforcement layer may be provided on the visible surface of the composite profile and can be colored or dyed, for example by coating or varnishing the same. Furthermore, the reinforcement layer also may be laminated with one or more foils, etc. in the same way as was described above.

Testing of insulating glass units is rather time consuming and expensive, because the test window units have to be tested for several months or even years. Therefore, the use of the composite sash bars is very advantageous, because it is already known that they do not change the characteristics of the insulating window units due to the fact that the corresponding materials and production techniques have already been used for spacer profiles.

Therefore, no separate testing of the materials for UV resistivity, fogging, etc. is necessary. In addition, the expansion coefficient of these composite sash bars corresponds to the (low) expansion coefficient of the spacer profiles, such that visible bending of the sash bars can be avoided. Moreover, the mechanical strength is far superior to the mechanical strength of sash bars produced from plastic materials only. Furthermore, although it is usually not necessary, the sash bars could be used to accommodate (contain) hygroscopic material (desiccant) in the same way as spacer profiles.

It is also possible to produce the sash bars as one profile (without the separation in partial profiles) when using the metal plastic composite profiles. In this case, the different colors can be provided, for example, by providing the reinforcement layer (metal layer) on one side only, which is coated or laminated with a different color or structure than the profile body.
Each of the above-described features and teachings may be utilized separately or in conjunction with other features and teachings to provide improved insulating window units and methods for designing and using the same. Representative examples of the present invention, which examples utilize many of these additional features and teachings both separately and in combination, were described in further detail with reference to the attached drawings. This detailed description is merely intended to teach a person of skill in the art further details for practicing preferred aspects of the present teachings and is not intended to limit the scope of the invention. Therefore, combinations of features and steps disclosed in the detailed description may not be necessary to practice the invention in the broadest sense, and are instead taught merely to particularly describe representative examples of the present teachings.

Moreover, the various features of the representative examples and the dependent claims may be combined in ways that are not specifically and explicitly enumerated in order to provide additional useful embodiments of the present teachings. In addition, it is expressly noted that all features disclosed in the description and/or the claims are intended to be disclosed separately and independently from each other for the purpose of original disclosure, as well as for the purpose of restricting the claimed subject matter independent of the compositions of the features in the embodiments and/or the claims. It is also expressly noted that all value ranges or indications of groups of entities disclose every possible intermediate value or intermediate entity for the purpose of original disclosure, as well as for the purpose of restricting the claimed subject matter.
CLAIMS:

1. A sash bar suitable for provision in the interspace of an insulating glass unit comprising:
   at least a first profile body (20) and a second profile body (30), which are configured to be connected before being mounted in the interspace.

2. A sash bar according to claim 1, wherein at least one of the profile bodies is colored.

3. A sash bar according to claim 1 or 2, wherein at least one of the profile bodies is laminated with a foil.

4. A sash bar according to claim 1, 2 or 3, wherein at least one of the profile bodies is a metal plastic composite profile.

5. A sash bar suitable for provision in the interspace of an insulating glass unit comprising:
   at least one plastic metal composite profile.

6. A sash bar according to claim 5, comprising at least a first profile body and a second profile body, wherein at least one of the first and second profile bodies is a metal plastic composite profile.

7. A sash bar according to claim 6, wherein the metal plastic composite profile comprises a profile body made of a first material and a reinforcement layer made of a second material.

8. A sash bar according to claim 7, wherein the first material is a polyolefin, preferably a thermoplastic material, more preferably at least one of polyurethane, polypropylene, polyethylene terephthalate, polyamide or polycarbonate, and the second material is metal, preferably stainless steel or steel having corrosion protection.

9. A sash bar according to one of claims 6 to 8, wherein the sash bar is laminated and/or varnished and/or coated and/or colored.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

E06B3/66

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

E06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of Box C.

**Date of the actual completion of the international search**

16 February 2006

**Date of mailing of the international search report**

06/03/2006

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