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(54) Multiple sheet glass assembly for doors and windows including an inner wooden frame, and process to manufacture the same.

(5) A composite glass assembly is formed by two or more glass sheets (2, 3) superimposed to each other and spaced by an inner wooden frame as a decorative and reinforcing means for windows and doors.

The inner frame, of wood or wood derived material, is substantially flat and built up by listels (5) having a polygonal cross-section, and properly treated to withstand the action of the sunlight. The listels cross each other and are joined by means of regularly spaced apart matching grooves (7) so that the window appears as formed by many smaller panes. An aluminum outer frame or sash (4) constitutes a peripheral closure sealed by adhesive.

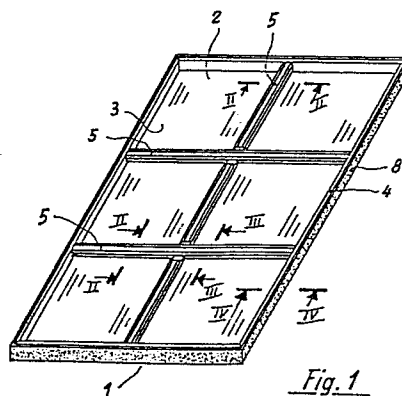


Fig. 1

EP 0 058 647 A1

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"MULTIPLE SHEET GLASS ASSEMBLY FOR DOORS AND WINDOWS
INCLUDING AN INNER WOODEN FRAME, AND PROCESS TO
MANUFACTURE THE SAME"

This invention relates to a multiple sheet glass assembly for windows and doors, also know as "vetrocamera" formed by two or more superimposed glass sheets that are spaced to form insulated inner spaces between them.

5 The invention also concerns a process to manufacture wooden listels forming the inner frame that is sandwiched between the glass sheets.

There are known and used multiple sheet glass assemblies that exhibit a high degree of insulation
10 thanks to the sealed interspace that prevents or reduces the thermal exchange and increases acoustic insulation of the doors and windows in which they are employed. A feature of such double (or triple as it is the case) sheet assemblies is to have a structure
15 and a shape quite simple that prevent their use for decorative purposes also. In the following reference will be made to window sashes but it is to be understood that the same applies to glass doors.

It is an object of the present invention to realize
20 a multiple sheet glass assembly incorporating a wooden

structure or inner frame forming a decorative (and reinforcing) frame.

It is another object of the invention to realize a process to suitably treat a wood material in form of listels or lists forming such inner frame so that the latter can last unaltered for the entire foreseen life of the assembly. Such process includes the milling of the listels that preferably have a polygonal cross-section.

10 The invention will now be disclosed with reference to a non limiting embodiment illustrated in the attached drawings in which:

FIGURE 1 shows an axonometric view of an assembly according to the invention;

15 FIGURES 2, 3 and 4 are cross-sections views along lines II-II, III-III and IV-IV of Fig. 1 respectively.

With reference to the figures, a window assembly 1 is formed by at least two glass sheets, respectively 2 and 3 that are superimposed and spaced apart thanks to a peripheral frame or sash 4, preferably an aluminum one. Between the two glass sheets there is interposed a wooden structure formed by listels 5 crossing to each other thanks to joints to form an inner frame resembling the windows known as "English" having a plurality of glass panes secured to a reticulated frame. Listels 5 are preferably of high quality woods, such as Douglas or Borneo wood, and are treated to withstand the degrading action of sunlight and of the high thermal gradient between the two glass surfaces.

25
30 It is known that multiple sheet assemblies are built so that the sealing of the inner spaces is ensured

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for rather long times, e.g. 10 years. Therefore the sandwiched frame must last unaltered for an equal period of time. As a matter of fact the action of the ultra-violet rays is particularly harmful to the wood elements tending to fade the colours, to evaporate the residual moisture of the wood and causing possible deformation of the inner frame. The unaltering of the colours and superficial aspect of the listels is very important for the present invention since the conditions of their outward surface is always subjected to comparison with the inward surface, substantially not exposed to direct sunlight. Furthermore it is well known that relatively high temperatures can develop within the two glass sheets of a double window exposed to sun-rays due to the greenhouse effect. As a consequence the wood would tend to release the residual moisture forming water vapour within the inner space that would condensate when the temperature decreases determining inadmissible aestherical effects. Finally it is to be considered that large differences between the temperatures of the glass surfaces, particularly in winter, will tend to deform the inner frame.

The listels, having the choosen cross-section, are dried in ovens at a temperature higher than 100°C for several days. Preferably the listels are kept at 120°C for ten days until their content of humidity is lower than 5% by weight. Then they are varnished with varnishes particularly resistant to ultra-violet rays and are stored in closed containers with hygroscopical salts. Usually before shipment and according to the type of sash to be built, matching grooves are made

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for the assembly of the window complete with the inner frame. Fig. 3 shows one of such grooves for the bottom listel of the window of Fig. 1 and for listels having an octagonal cross-section.

5 A similar groove is cut in the top listel overlying the former to obtain a simmetrical looking of the inner frame. The grooves are cut by means of an automatic milling machine provided with two cutterheads positioned on each side of the listel that advances by steps
10 of prefixed length for each cut so as to obtain a long listel having a plurality of matching grooves at predetermined distances (e.g. 20 or 25 cm). Each cutterhead can be advanced transversally to the length of the listel, by a distance that is shorter than its
15 width. After positioning the listel, one of the cutter is advanced for milling a groove that does not fully pass through the listel and then is returned to the inoperative position. The second head is then advanced to complete the groove from the other side and then
20 is brought back to the inoperative position. By this procedure it is avoided splintering the edge of the listel as it would happen in case of a single cutter "emerging" from the listel to cut the groove completely with one run.

25 Preferably each cutterhead comprises a first portion realizing the lower flat surface 10 of the groove, and two inclined cutters realizing the beveling of surfaces 11, thereby avoiding also the surface splintering of the listel. In case the ornamental inner frame were
30 built with a different cross-section of the listels, e.g. a romboidal cross-section, they will be matched

by suitably different grooves;

The width of the grooves is a little narrower to allow for a slightly forced fitting, so that the assembled structure forms a self-supporting reticulate. In a subsequent station a punching is applied over surface 10 of the groove, containing a trade mark, reference numbers, etc. The machine is fed by a magazine holding the listels one on the top of the other to get a continuous production.

10 In order to assembly the parts an aluminum sash or outer frame 4 is employed onto which a bottom glass sheet 3 is mounted. The sash is then placed on a level surface and the wooden structure is fitted therein.

The second or top glass sheet 2 is finally secured 15 to it sealing the sash with glazier putty or epoxy adhesive 8. The terms bottom and top are used here only with reference to the assembly operations.

Hygroscopical salts 6 are introduced into an inner space of the sash as shown in Fig. 4, before sealing 20 the assembly.

Listels 5 have been described as listels made by a high quality wood, but it is anyhow possible to build them from pasted wooden shavings or other wood derived materials provided that such materials have 25 a sufficient resistance to deformations when exposed to sun-rays. Employing such a type of material it will be possible to avoid bendings that might appear in the wood along its grain.

Furthermore the glass sheets forming the assembly 30 may be not completely transparent, but shaded or softly coloured. Also the embodiment illustrated of the composite assembly is not to be considered as limitative and

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the scope of the invention extends to the obvious modifications that will be apparent to the skilled of the art.

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CLAIMS

1. A composite glass assembly for windows and doors characterized in that it comprises at least a wooden structure (5) sandwiched between two or more flat glass sheets (2, 3), said glass sheets being superimposed to each other and spaced apart by means of a sash (4) so that inner space between the glass sheets is sealed.

2. A composite glass assembly as claimed in claim 1, characterized in that said structure comprises a reticulate of wooden listels (5) joined together by means of matching grooves (7) and forming an inner frame for decorative and reinforcing purposes.

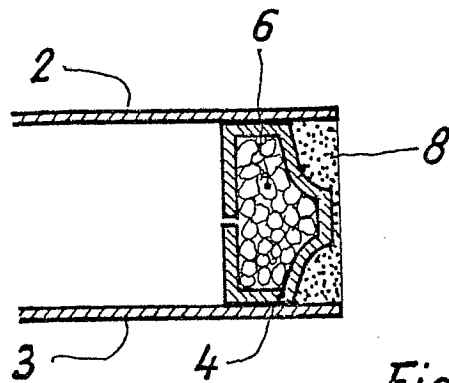
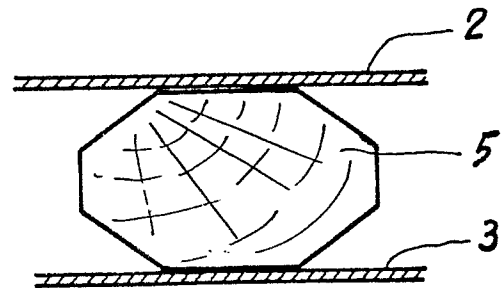
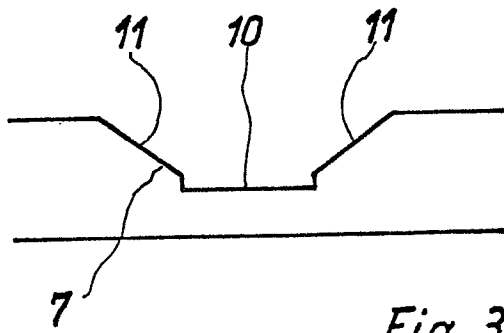
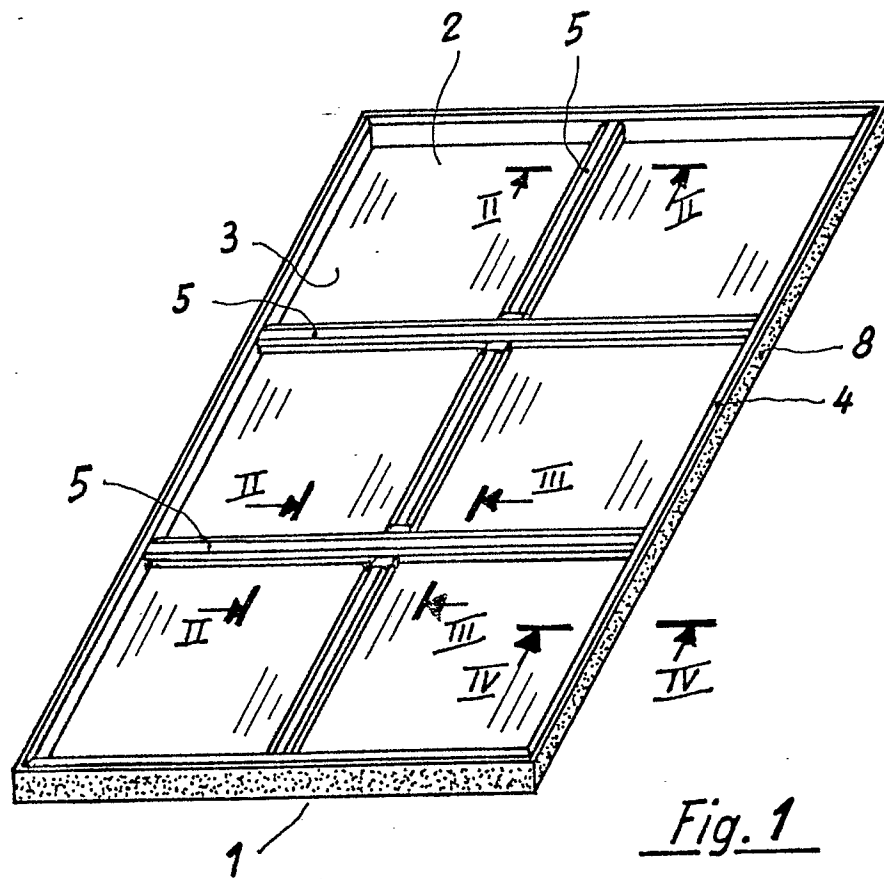
3. A composite glass assembly as claimed in claim 2, characterized in that said wooden listels (5) have a polygonal cross-section and that the assembly is closed along its periphery by a sealed aluminum sash or outer frame (4).

4. A process for manufacturing a composite glass assembly for windows and doors incorporating a wooden structure sandwiched between two glass sheets, characterized in that it comprises the following steps:

- cutting a wood material to obtain listels having a chosen cross-section;
- drying the listels in an oven at a temperature higher than 100°C for at least eight days to reduce the content of moisture under 5% by weight and coating the listels with protecting varnishes resistant to the action of ultra-violet rays;
- milling grooves at predetermined distances along the listels in order to joint the listels to form

- a substantially flat inner frame, said grooves being cut by a couple of cutterheads, each placed on one side of the listel, each of them subsequently advancing to mill the groove for a length shorter
- 5 than the width of the listel;
- storing the listels in sealed containers with moisture adsorbing salts;
 - placing on a level surface a glass sheet secured to a metal peripheral sash, applying the wooden
 - 10 inner frame by superimposing it to the glass sheet; and
 - introducing a small amount of hygroscopical salts into longitudinal slots of the sash and closing the assembly with a second glass sheet sealing the
 - 15 latter to the metal sash.

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	FR-A-2 313 539 (MAILLE) *Page 1, lines 20-26; page 2, lines 13-33; figures 1 and 2*	1-4	E 06 B 3/66
X	--- US-A-3 946 531 (ARMSTRONG) *Column 2, lines 55-68; column 3, lines 1-68; column 4, lines 1-50; figures 1-5* -----	1-4	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			E 06 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 10-05-1982	Examiner DEPOORTER F.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	