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(54) Multiple glazing.

(57) Multiple-glazing unit made from a coated spacer frame (10) sandwiched between two transparent panels (13), the coating of the spacer frame being a curing sealant composition (12) of sufficient thickness to form a moisture-resistant seal between the spacer and the transparent panels.

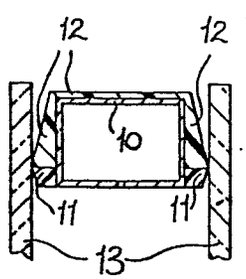

Fig-3

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MULTIPLE GLAZING

This invention is concerned with improvements in or relating to multiple glazing.

In the manufacture of multiple-, e.g. double-glazing units, it is a practice to insert a spacer frame between two glass panes somewhat inset from the edges thereof and to seal the unit by use of a sealant composition inserted between the spacer frame and the edges of the glass panes. Various methods have been proposed for manufacture of double-glazing units. For example, the sealant may be pumped into the U-shaped gap between the spacer frame and the panes, or it may be applied as a preformed tape. Also, using some varieties of sealant compositions which are to provide a tough impervious seal, it has been a practice to hold the sealed unit under pressure for a period of time during which the sealant composition becomes sufficiently cured so that handling and transport of the units may be effected without damaging the seal. It has also been a practice to bond the spacer frame to the glass panes using a pressure-sensitive adhesive in addition to the sealant composition. Various types of sealant compositions have been employed including, for example, two-part epoxy polysulphides which can be mixed and pumped into place at room temperature between the panes and allowed to cure at room temperature, thermoplastic tapes, for example, based on butyl rubber compositions which require heating to soften them and application of pressure to compress them after insertion of the tape between the panes, and cold curing polyurethane compositions which can be mixed and extruded between the panes at room temperature and allowed to cure at room temperature.

It has also been proposed to employ spacers having a preapplied layer of thermoplastic sealant. These

require heating after insertion between the panes to cause the sealant to soften, flow and adhere.

Spacer frames used in the manufacture of multiple-glazing units normally comprise lengths of hollow metal profile formed or joined to provide a closed figure.

The process of manufacturing a double-glazing unit normally involves, inter alia, preparing the glass panes and spacer, laying the spacer on one pane, laying the second pane onto the spacer and applying the sealing composition. In those cases where a thermoplastic sealant composition is used it is also necessary to heat the composition to soften it and to press the panes together to a desired extent, with consequent risk of irregular sealant flow. In those cases where a fluid sealant composition is extruded into place, it is necessary to hold the assembly of panes and spacer frame in required location whilst the composition is applied and until the composition has set or cured to an adequate extent. In order to ensure adequate sealing it is not unusual to employ significant quantities of the sealing composition to compensate for irregular extrusion or flow of the composition or for moisture vapour transmission properties of the sealant composition.

Thus, a number and variety of procedural steps, and significant handling of the assembly prior to and during the application and subsequent processing of the sealant are normal in manufacture of multiple-glazing units. To some extent, mechanisation of work handling and sealant application have been employed but in some respects such procedures reduce the ability of manufacturers to produce a wide variety of sizes of double-glazing units, and in any event render the economic manufacture of multiple-glazing units less attainable to manufacturers who wish to manufacture a wide range of units in smaller quantities.

We have now found that by use of a spacer frame coated with curable sealant composition prior to insertion

between the panes, one may provide a comparatively simple process for manufacture of multiple-glazing units especially appropriate to manufacture of units of various sizes in comparatively small quantities, which does not require a significant amount of special heating or work handling machinery.

According to the present invention a spacer frame for use in manufacture of a multiple glazing unit by a process in which a spacer frame comprising one or more spacer elements arranged to provide a closed figure of at least substantially uniform thickness is disposed between prepared transparent panels and the panels are pressed together, is characterised in that a coating of a curing sealant composition is disposed on outer surfaces of the closed-figure spacer frame, said coating being of sufficient thickness and distribution to form a moisture resistant seal between the spacer elements and glass panels.

A spacer frame according to the invention comprises one or more spacer elements arranged to provide a closed figure of uniform thickness. The shape of the closed figure is chosen in accordance with the shape of the panels with which the spacer frame is intended to be used. Conveniently, the closed figure is of the same shape as the panels, and its outer dimensions a few millimetres less than the outer dimensions of the panels or of the smaller of them, so that the spacer frame is employed at or near the perimeter of the panels thus to allow maximum visibility through a glazing unit. Conveniently the spacer frame is provided by a series of spacer elements at least one of which has a hollow profile and contains a dessicant effective to absorb moisture present in the air trapped between the spacer frame and the panels when a unit is assembled. For a square or rectangular unit it is convenient to employ four hollow profiles joined at their ends by corner pieces to provide the closed figure.

Preferably, the four profiles are of the same cross sectional area and have two parallel side portions intended to be located in juxtaposed relation and parallel with the panels, and a bridging portion extending between the side portions and located at the outer region of the spacer frame. By this arrangement, the spacer elements are of at least substantially uniform thickness, and facilitate assembly of the unit and effective sealing thereof with a minimum of uniform sealing layer between the spacer element and panels and without unsightly seepage of sealant during assembly of the unit. Preferably, the spacer frame has a uniform coating of sealant composition along the side portions of the spacer elements and this may entirely coat the side, or, more preferably, extends over the whole perimeter of the side portions and corner connectors to a depth of about two thirds of the height of the side portions. Preferably also, the coating extends entirely over the bridging portions and corner connectors. The thickness of the coating is chosen so that adequate sealing is achieved with a minimum amount of sealant composition. Preferably, the coating on the side surfaces of the spacer element is somewhat triangular in section so that during assembled with the panels, line contact is first established between the sealant composition and panels as they are brought together and before the composition is deformed by assembly pressure. If desired, an adhesion promoter or primer composition may be applied to the spacer element prior to application of sealant composition thereto. The sealant composition is mixed and applied to the spacer element in any suitable manner, for example by extrusion onto the spacer element through a nozzle of appropriate configuration. It is highly preferred that the sealant composition is applied to the spacer elements after they have been assembled to provide the closed figure in order to minimise clean-up and touch-up operations.

A spacer frame according to the invention has a coating of a curing sealant composition intended to provide a moisture-proof seal between the transparent panels (which are preferably of glass) and the spacer elements. A curing sealant composition is used with a view to providing a sealed glazing unit of performance comparable with other high quality units. Whilst double-glazing units made by use of thermoplastic sealant compositions have been proposed, we have found that curing sealant compositions yield seals which develop strength and tenacity to provide units which retain their beneficial properties for substantial periods of time. Suitable curing sealant compositions include those based on cold curing polyurethanes, cold curing polysulphides and moisture curing silicones. The sealant composition selected for use according to the invention has a suitable blend of properties, including appropriate flow characteristics at the time of application to the spacer element, ability to retain desired stability of configuration after application until assembly of the unit and appropriate curing speed as well as satisfactory adhesion, sealing and flexibility characteristics when cured.

Many curing compositions commence to cure as soon as the appropriate parts are mixed together, and continue to do so over a period from several seconds to many hours. The properties of viscosity and ability to be extruded and also the ability to form an adhesive bond by exertion of pressure alone generally decrease as curing proceeds. It is important, therefore, to select a curing sealant composition which cures at a rate compatible with the speed of production of spacer frames and multiple-glazing units using the spacer frame. It is envisaged that periods of from a few seconds to a matter of hours or even longer may elapse between extrusion of the composition onto the spacer element and assembly of the unit. It is also important to select a composition which can be extruded onto the spacer

element in the desired configuration and which will retain the configuration to a required extent whilst the composition remains in a somewhat flowable bond forming condition prior to assembly of the unit. Desirably, the composition has a degree of thixotropy greater than is normally demonstrated by double-glazing sealants. This may be achieved by incorporation of thixotropic fillers e.g. carbon black, calcium carbonate, fused silica into the composition. It is important to select a sealing composition having adequate adhesion to the spacer element and transparent panel, if necessary in conjunction with an adhesion promoter or primer, and adequate sealing properties. Sealing properties are frequently assessed in terms of Moisture Vapour Transmission Rate and other tests for flexibility and cohesion standard in the insulating glazing industry.

In order to manufacture a double-glazing unit using a spacer frame according to the invention, two transparent panels of required size are prepared for example by washing, and if necessary coated at their periphery with a primer. The panels may be single panels or double-or multiple-glazing panels and are preferably of glass. The spacer frame, prepared as aforesaid, is placed on one of the panels with its periphery adjacent to and slightly within the perimeter of the first panel. The second panel is then placed onto the exposed surface of the spacer frame in appropriate location. Pressure is then exerted on the assembly to a controlled extent sufficient to ensure both panels and sealant composition are in adhesive engagement throughout the length of the spacer elements on both sides thereof i.e. the sealant composition is subjected to squashing sufficient to cause it to assume conformity with the surfaces of the panels. The units thus assembled are stored in their bonded configuration for a time sufficient to ensure that adhesion between spacer frame and panels is sufficient to permit handling of the

unit. This storing may conveniently be done by stacking units one on top of the other and storing them for a time appropriate to the degree of cure of the sealant composition. Alternatively the individual units may be clamped for an appropriate period.

We prefer to employ a spacer frame according to the invention which incorporates on its side portions a coating of pressure-sensitive adhesive composition. Conveniently this may be provided by a stripe of a butyl-rubber based hot-melt applied to the spacer element before or after extrusion of the coating of sealant composition. The adhesive composition is selected and used in a quantity with a view to providing sufficient adhesion to permit handling of the unit whilst the sealant composition continues to cure.

The invention also provides a method of making a multiple-glazing unit using two prepared transparent panels and a spacer frame according to the invention described above, wherein the spacer frame is positioned between said two transparent panels, and the panels are then pressed together with the spacer frame between them to ensure conformity of the coating of curing sealant composition with the panels, thereby forming a moisture-proof seal.

The present invention thus provides, through the use of a spacer frame bearing a curing sealant, a method of making double-glazing units which is flexible as to the size of units which may be made, and inexpensive in that a limited amount of sophisticated equipment is required

A preferred embodiment of the present invention will now be described by way of example with reference to the accompanying drawings, in which:-

Figure 1 is a view of the illustrative spacer frame,

Figure 2 is a view of two transparent panels and the illustrative spacer frame ready for assembly, and

Figure 3 is a view in section on an enlarged scale of a portion of the spacer frame taken on the line 3-3 of Figure 1

Figure 1 shows a spacer frame (9) made from four hollow profiles (10) joined at their ends by corner pieces (14), as is common practice in the double-glazing industry. As described above, the frame is coated with a curing sealant (12) and contains in addition a pressure-sensitive adhesive (11) which is often used in the manufacture of double-glazing units to facilitate mounting and to serve as a water barrier.

Figure 2 shows schematically the construction of a double-glazing unit from a coated spacer frame (9) and two glass panes (13).

As shown in Figure 3, the curing sealant (12) is coated on three sides of hollow profile (10). Following assembly of the two glass panes (13) and the coated spacer frame (9), the double-glazing unit is made by pressing the two glass panes (13) onto the curing sealant to form a tight seal. The use of the pressure-sensitive adhesive may be avoided if a curing sealant with low moisture vapour transmission rate (MVTR) is used, such, for example, as certain polyurethane sealants based on hydroxyl-group-bearing polybutadienes. Its use is, however, indispensible if curing sealants with high MVTR are used, as e.g. one-part, cold-curing silicone sealants.

Claims

1. A spacer frame for use in manufacture of a multiple glazing unit by a process in which a spacer frame comprising one or more spacer elements arranged to provide a closed figure of at least substantially uniform thickness is disposed between prepared transparent panels and the panels are pressed together, characterised in that a coating of a curing sealant composition is disposed on outer surfaces of the closed-figure spacer frame, said coating being of sufficient thickness and distribution to form a moisture-resistant seal between the spacer elements and said transparent panels.

2. A spacer frame according to claim 1, wherein the spacer element(s) comprise at least one hollow profile containing dessicant.

3. A spacer frame according to claim 1 or 2, comprising bent corners or four hollow profiles joined at their ends by corner pieces or welding, the hollow profiles each having two parallel portions intended to be located in juxtaposed relation to and parallel with the transparent panels, and a bridging portion extending between the parallel portions and located at the outer region of the spacer frame.

4. A spacer frame according to claim 3, wherein the coating of sealant composition extends along of the parallel portions of the profiles and over the bridging portions of the profiles.

5. A spacer frame according to any one of the preceding claims, wherein the sealant composition comprises a cold-curing polyurethane composition, a cold-curing

polysulphide composition, or a cold-curing silicone composition.

6. A spacer frame according to any one of Claims 1 to 4, wherein the sealant composition comprises a polyurethane compound of polyisocyanate and hydroxy-bearing polybutadiene.

7. A spacer frame according to any one of the preceding claims comprising a coating of pressure sensitive adhesive composition disposed on surfaces of the spacer element(s) intended to be located in juxtaposed relation to the transparent panels.

8. A spacer frame according to claim 7, wherein the coating of pressure sensitive composition is provided by use of a butyl-rubber-based hot-melt.

9. A spacer frame for use in the manufacture of a multiple-glazing unit substantially as hereinbefore described with reference to and as illustrated by the accompanying drawings.

10. A method of making a multiple glazing unit using two prepared transparent panels and a spacer frame according to any one of the preceding claims, wherein the spacer frame is positioned between said two transparent panels, and the panels are then pressed together with the spacer frame between them to ensure conformity of the coating of curing sealant composition with the panels, thereby forming a moisture-proof seal.

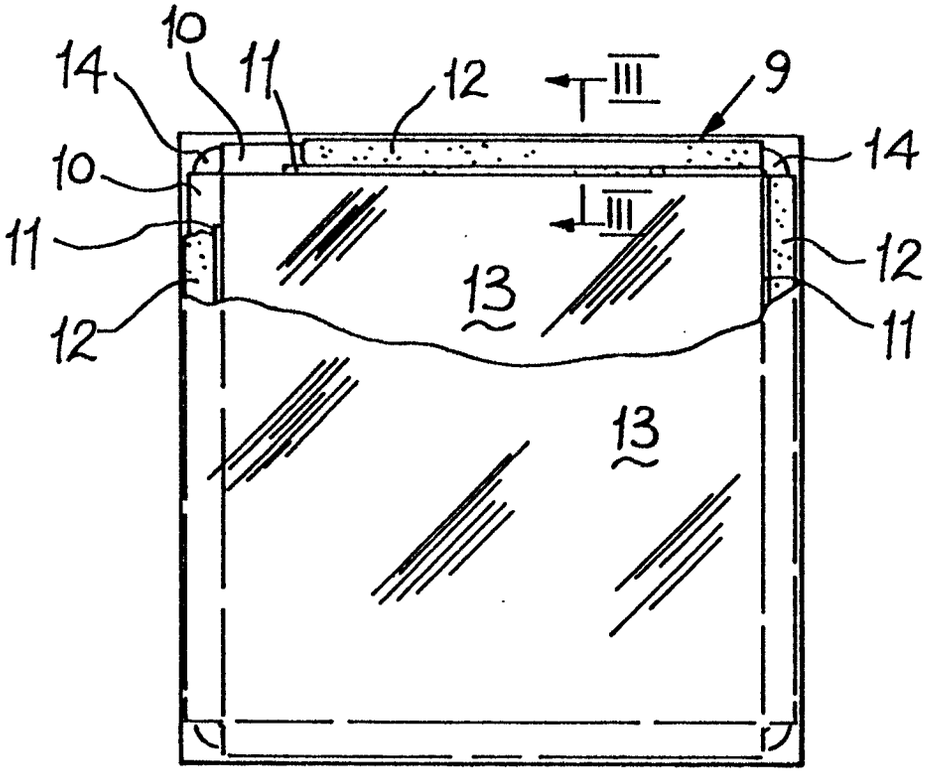

Fig_1

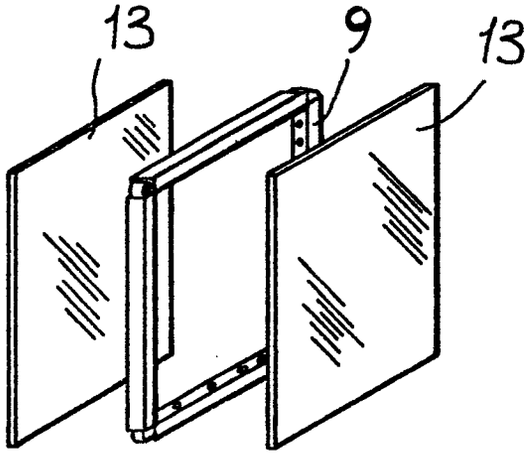

Fig_2

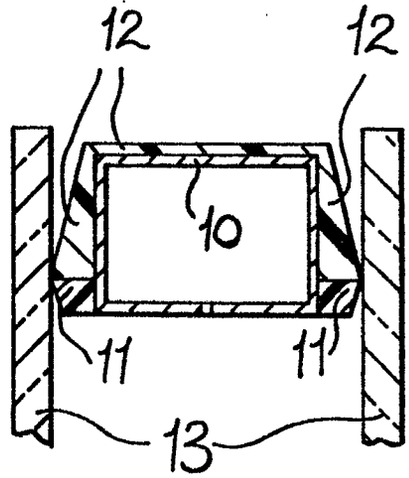

Fig_3

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EUROPEAN SEARCH REPORT

0192363
Application number

EP 86 30 0621

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.4)
X	DE-A-3 011 893 (F.A.S.) * Page 3, line 1 - page 5, line 32; figures 1-4 *	1-3,5, 7-10	E 06 B 3/66
Y		4,6	
X	US-A-3 280 523 (STROUD) * Column 2, line 55 - column 3, line 4; column 3, line 58 - column 4, line 6; column 5, line 33 - column 6, line 38; figures 1,2,6 *	1-3,5, 9,10	
Y	GB-A-2 023 209 (BOSTIK) * Page 1, lines 1-42; page 1, line 94 - page 2, line 46; page 2, lines 108-126; page 6, line 17 - page 7, line 86; figures 1-12 *	4	TECHNICAL FIELDS SEARCHED (Int. Cl.4) E 06 B
A		1-3,5, 10	
Y	US-A-4 153 594 (WILSON) * Column 1, lines 13-34; column 4, line 50 - column 6, line 26; column 13, lines 19-26 *	6	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12-05-1986	DEPOORTER F.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

0192363
Application number

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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.4)
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A	US-A-4 193 236 (MAZZONI) * Column 4, lines 13-59; column 6, lines 8-15; column 6, line 53 - column 7, line 20; figures 1-5 *	1-3,5, 7,8	
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A	DE-A-3 131 677 (PERENNATORWERK) * Page 6, line 4 - page 9, line 25; page 11, line 17 - page 13, line 20; figures 1-3 *	5,7,8	
A	EP-A-0 083 797 (BAYER) * Page 1, line 7 - page 5, line 1 *	5,6	

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THE HAGUE	12-05-1986	DEPOORTER F.

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