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Alabaster

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[54] **BUILDING CONSTRUCTION**

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[73] Assignee: **Conder International Limited,** Winchester, England

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[52] **U.S. Cl.** **52/97;** 52/204; 52/209
[51] **Int. Cl.**[2] **E06B 7/14;** E06B 3/62
[58] **Field of Search** 52/97, 204–214, 52/400, 402, 403, 624, 309; 49/DIG. 1, 504

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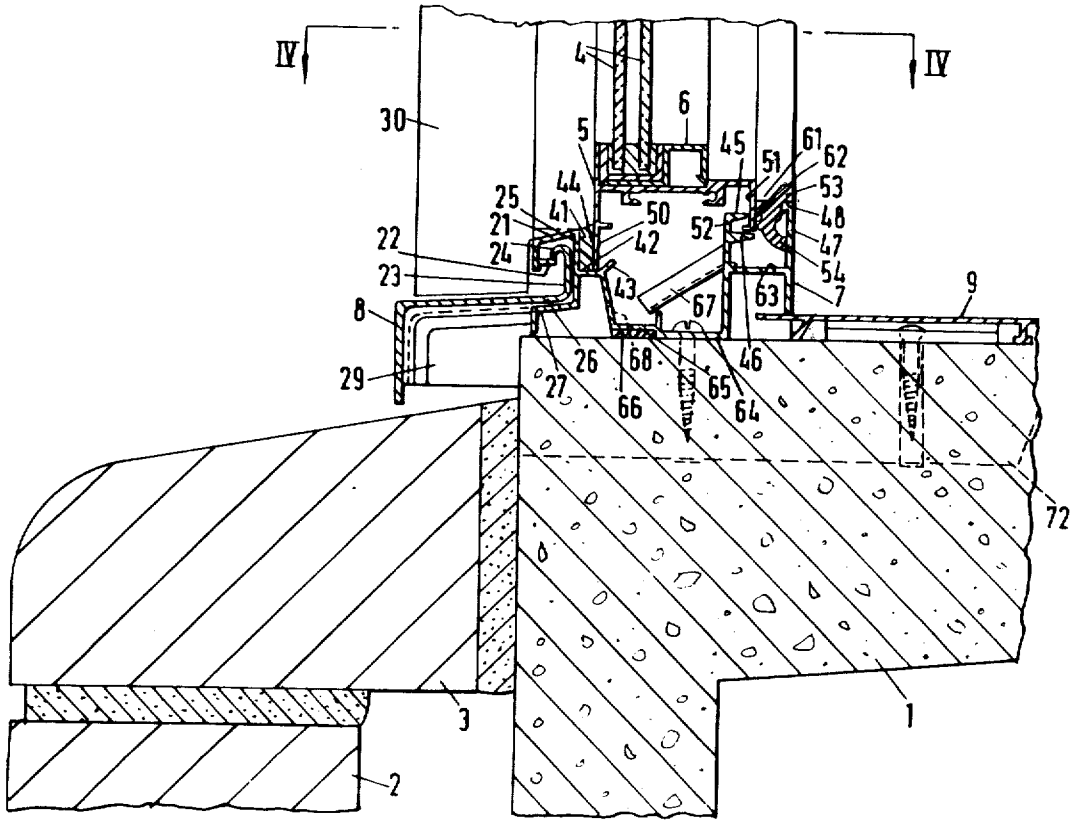
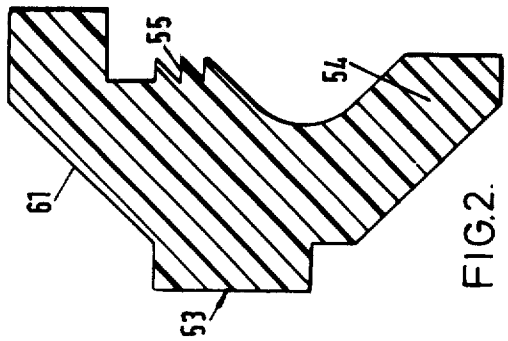
Primary Examiner—J. Karl Bell
Attorney, Agent, or Firm—Parmelee, Miller, Welsh & Kratz

[57] **ABSTRACT**

As standard practice, a window construction has a window surround and a window frame secured and sealed thereto. According to the invention, the window frame and window surround have facing sealing surfaces with a resilient seal therebetween and also facing jamming surfaces with a strip-like jamming member inserted therebetween to compress the seal to a desired extent and secure the window frame in position.

8 Claims, 10 Drawing Figures

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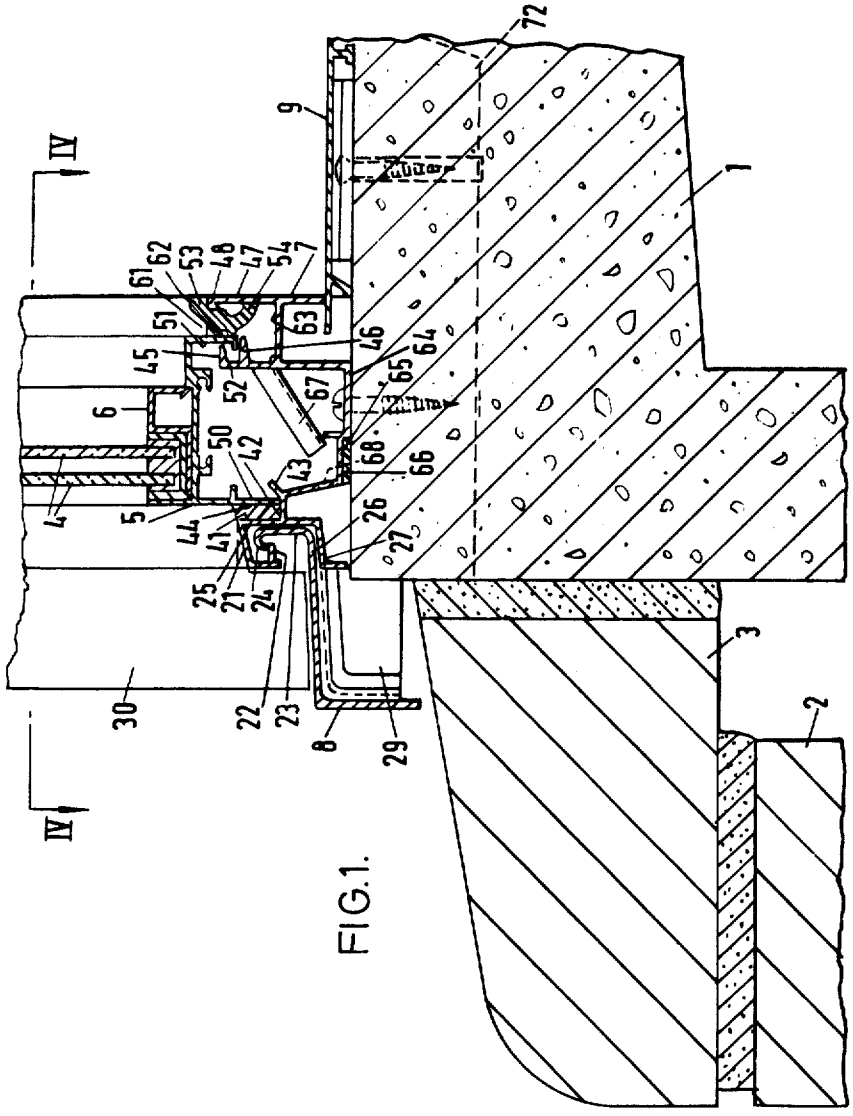
53

FIG.2.


72
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IV
1
61
62
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7
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68
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FIG.1.

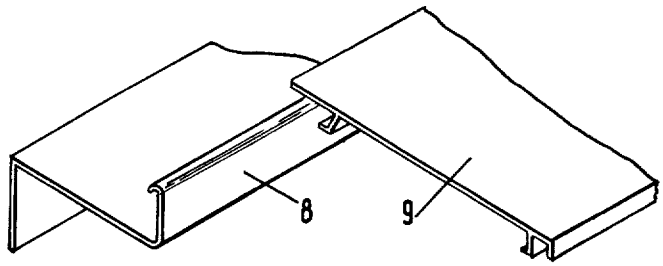
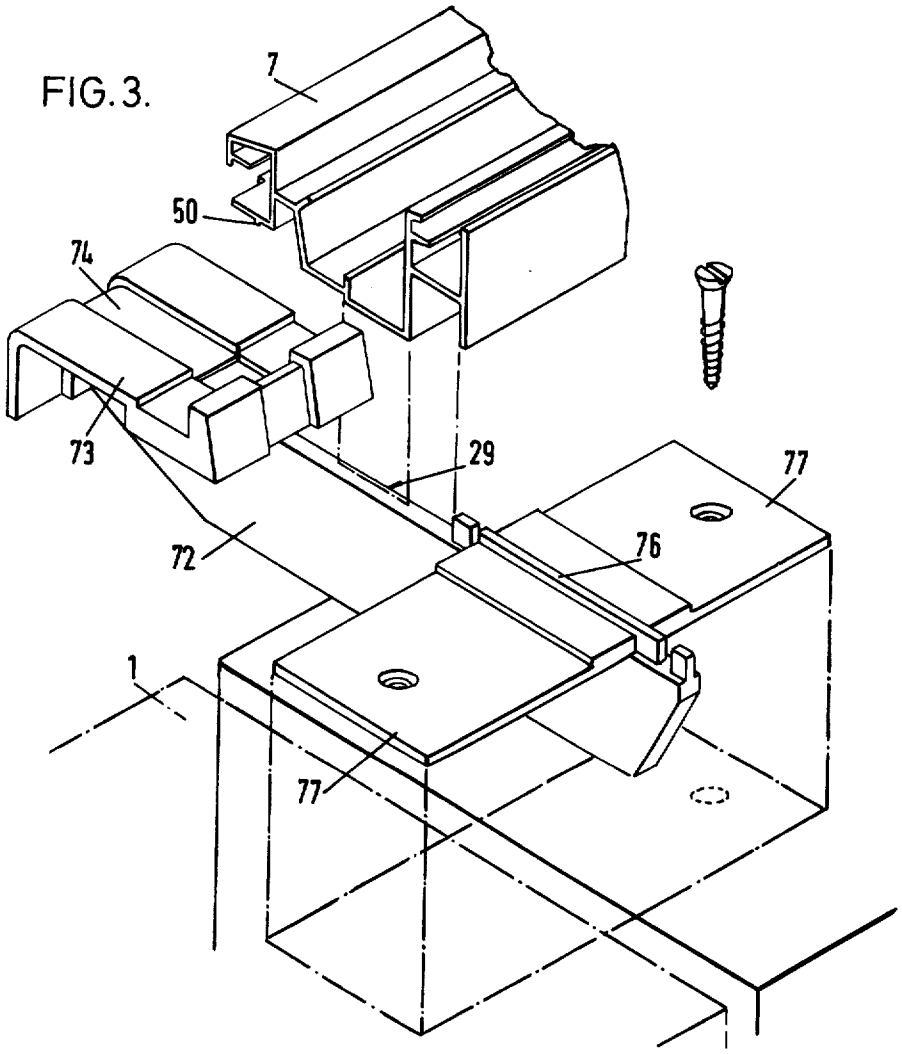
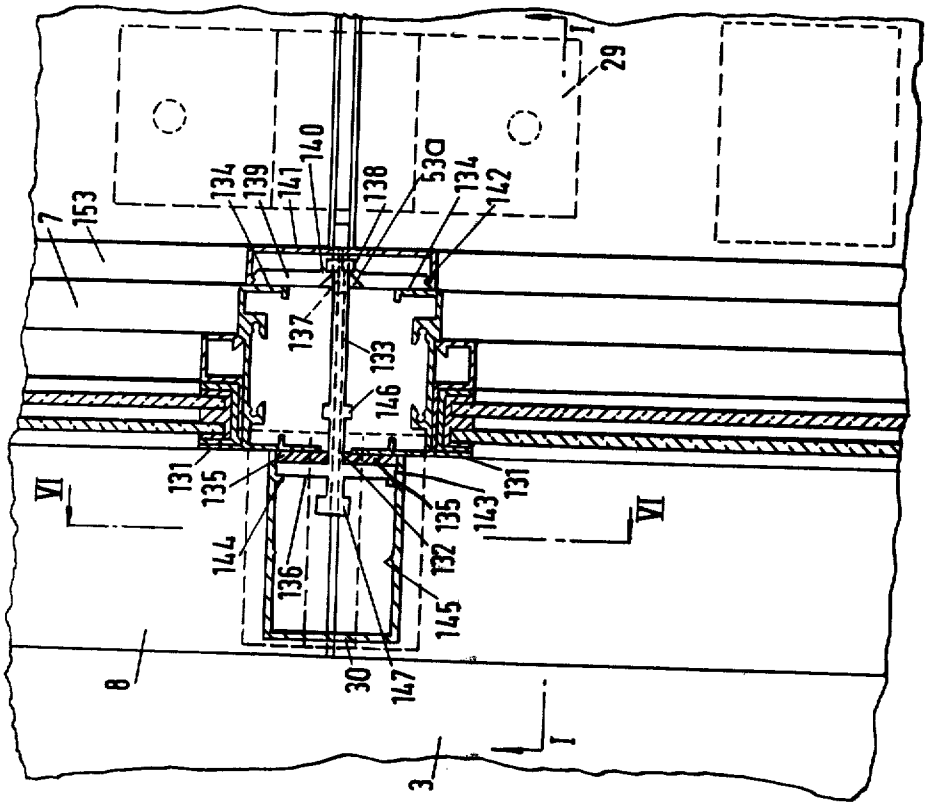


FIG. 3.

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I
134
139
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53a
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142
7
153
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VI
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FIG.4.

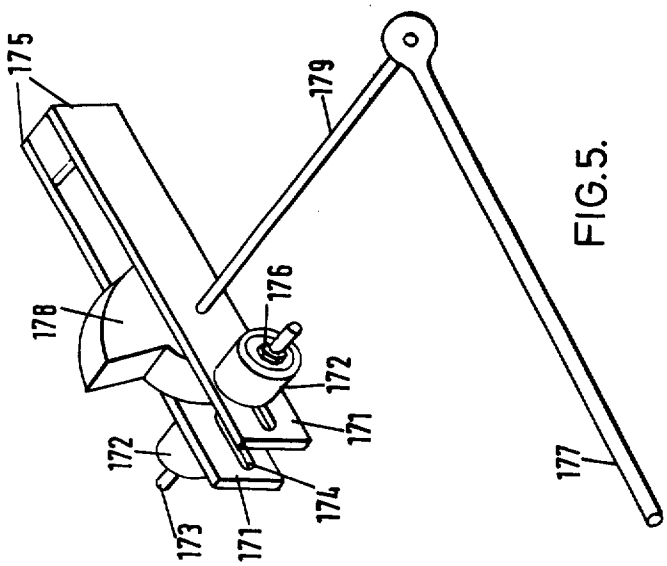
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FIG.5.

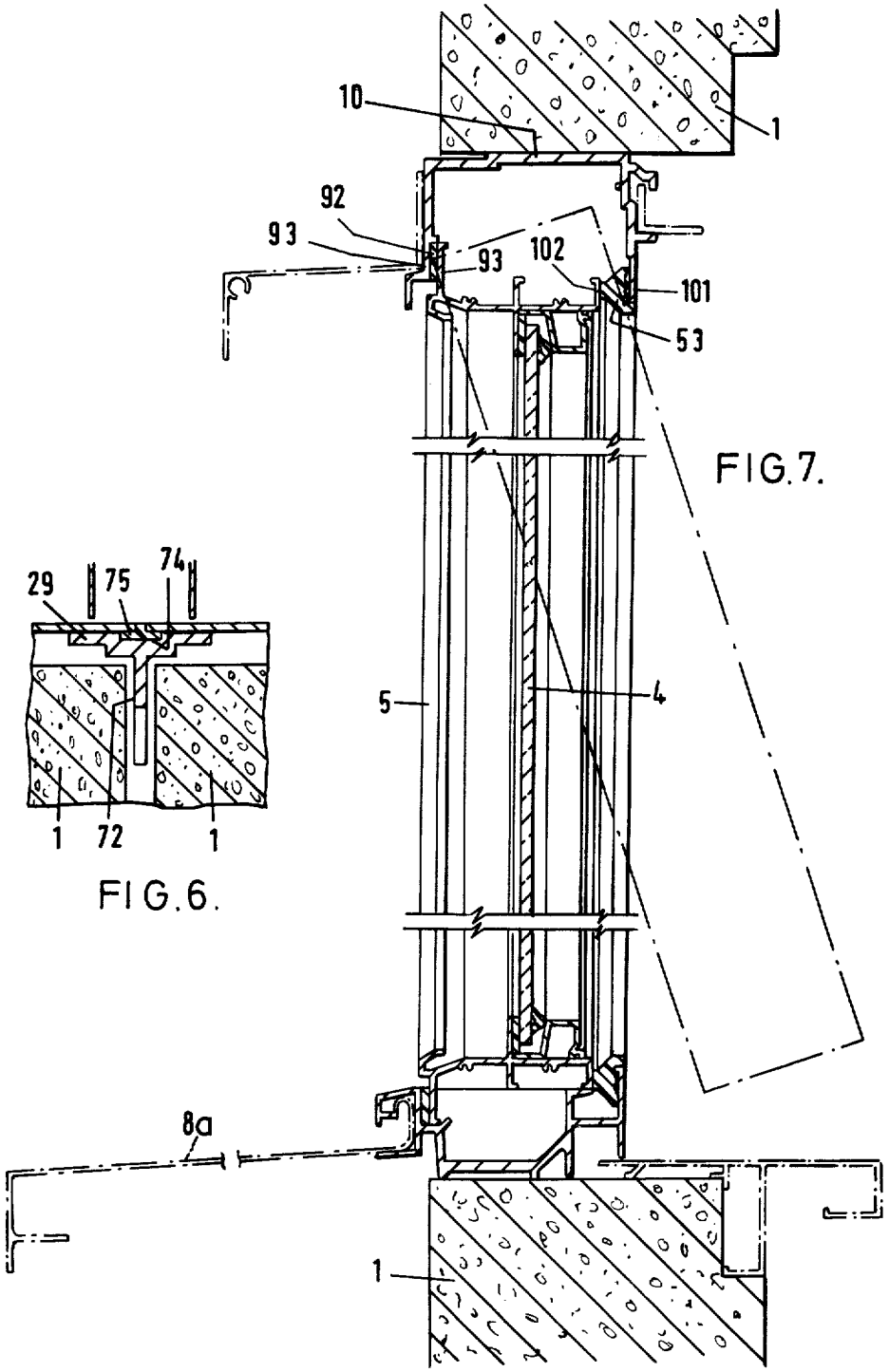

FIG.7.

FIG.6.

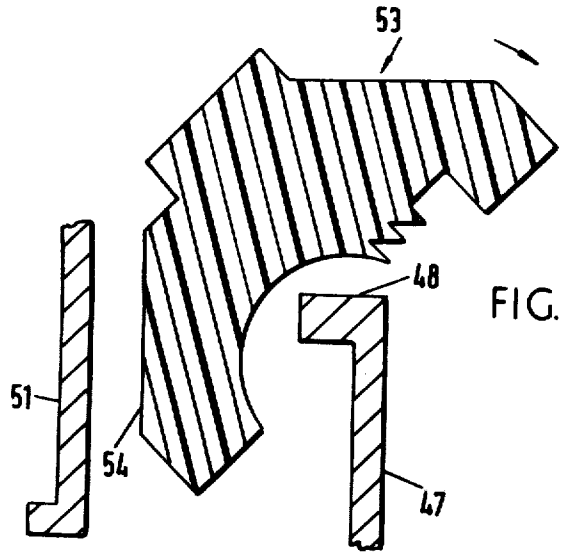

FIG. 8a.

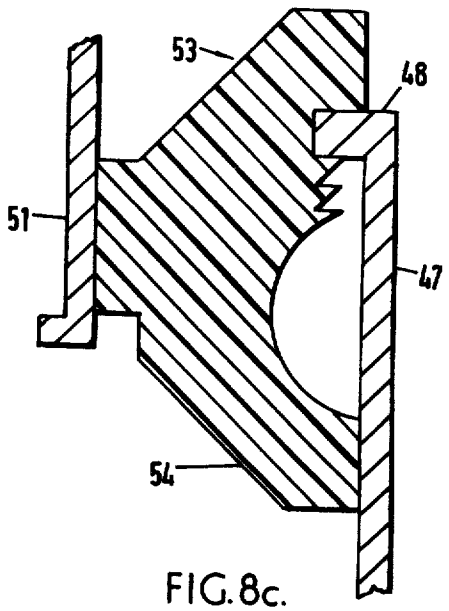

FIG. 8c.

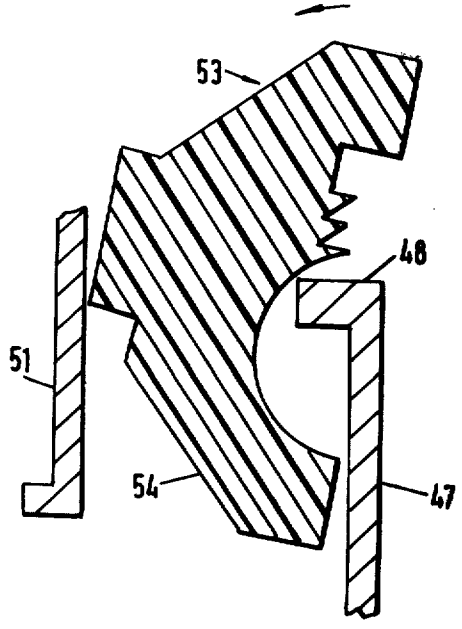

FIG. 8b.

BUILDING CONSTRUCTION

BACKGROUND OF THE INVENTION

This invention relates to a window construction having a window surround and a window frame secured therein and sealed thereto.

It is an object of the invention to provide a screwless but watertight assembly which enables the window frame to be fitted into position on site whilst allowing normal manufacturing tolerances in the components, and also to provide an assembly in which resilient seals are used but are neither over-compressed nor under-compressed.

BRIEF DESCRIPTION OF THE INVENTION

According to the invention, at least one of the sides, sill and head of the window surround has a generally rearwards-facing sealing surface, a generally forwards-facing jamming surface being spaced to the rear of the sealing surface, and the corresponding side, bottom or top of the window frame correspondingly having a generally forwards-facing sealing surface cooperating with the sealing surface of the window surround with a resilient seal between the two sealing surfaces, and a generally rearwards-facing jamming surface spaced to the rear of the sealing surface of the frame, spaced in front of the jamming surface of the window surround, a strip-like jamming member being inserted between the two jamming surfaces and thrusting the sealing surface of the frame forwards against the sealing surface of the window surround.

The jamming arrangement provides a screwless but watertight assembly which nonetheless permits relatively large tolerances and speedy fitting of the window frame on site. The window construction can provide efficient weather-tight glazing in preformed window apertures in a wall construction which is subject to normal constructional tolerances.

If as is preferred, a jamming member is used which is designed to be driven right home to provide a predetermined spacing between the two respective jamming surfaces, the construction can be designed to apply a controlled compression to the resilient seal.

The jamming arrangement is preferably applied to just the sill and the head, but may also or alternatively be applied to one or both of the sides, provided the frame can be placed in position without undue difficulty.

The jamming surfaces need not be even approximately vertical, and the jamming surface on the window surround is preferably inclined at an angle of approximately 45° to give a wedge action when the jamming member is inserted.

The jamming member can be made of a plastics material such as polyvinyl chloride. The jamming member is preferably a long strip for extending along the whole of the edge of the respective frame, giving a neat finish. If, as is preferred, the strip is flexible, it can be fed into position without difficulty, e.g. from a coil.

The jamming member preferably has a rebate, along its top front edge, for forming a condensation drainage channel; there may be vertical channels along the front surface of the wedge for draining condensation down out of the channel or holes drilled down through the strip, or the strip ends may be mitred for this purpose.

A building construction normally has vertical gaps between adjacent building members such as window

frames, and the gaps are sealed by suitable intermediate members. It is an object of the invention to provide a sealing arrangement which is simple to fit on site, neither over-compressed nor under-compressed resilient seales used, permits normal manufacturing tolerances and can have a good appearance. According to an important aspect of the invention, the intermediate member is a coupling member of, or having a part of, T shape as seen in horizontal section, the stem of the T projecting into the gap (preferably from the outside) so as to extend through to the other side of the building members, and the two end portions of the cross-bar of the T overlapping the edge portions of the respective building members, resilient seals being positioned between the respective end portions of the T cross-bar and said edge portions of the building members and being compressed by drawing on the stem of the T, the coupling member being retained by retaining devices in a position compressing the seals, which retaining devices cooperate with the building members.

The stem of the T can be drawn by means of a tool and the coupling member can give a good seal while avoiding the use of screws and nonetheless permitting variations in the width of the vertical gap, due to manufacturing tolerances. In addition, there can be controlled compression of the seals in that by suitable dimensioning, the seal will be neither too much compressed nor too little compressed.

The cross-bar portion of the coupling member can be designed to have a good appearance, particularly where it is acting as a mullion between two window frames, and the retaining means can be arranged to be concealed by a cap, to improve the appearance.

The retaining devices preferably comprise a number of vertically-spaced, horizontal cross-members engaging the surfaces of the building members on the other side thereof to said edge portions, each cross-member bridging said gap and engaging the end portion of the stem of the T, preferably by passing through a cross-aperture in the stem end portion. The cross members preferably have locating detents on their ends for engagement by small projections on the inside of a snap-on vertical channel-section cap, for concealing the retaining devices.

The cross-bar of the T can have locating detents, e.g. on its ends for engagement by small projections on the inside of a snap-on vertical channel-section cap for covering the cross-bar and giving a bolder appearance to this side of the coupling member, particularly where the coupling member is sealing the vertical gap between window frames and the cap acts as a mullion. The mullion cap so formed can give stronger architectural effect to the windows.

In a building construction there are often joints formed between aligned thin section building members, such as extruded aluminum sill sections, whose edges are separated by a narrow gap sealed by the interposition of a seal. It is an object of the invention to provide a method of forming the seal which formed an effective seal with components of normal manufacturing tolerances and a seal which has a good appearance if it is to be visible, but which method however can be performed by unskilled labour.

According to an important aspect of the invention, the sea seal is inserted by placing an easily deformable sealing material, e.g. a substantially non-elastic but extrudable material such as mastic, in a channel in a sub or backing member, which channel will be behind and

run the length of the gap and will be substantially wider than the width of the gap, and the cross-sectional area of the sealing material being substantially greater than the cross-sectional area of the channel, and drawing the edge portions of the buildiing members against the sub or backing member to squeeze some of the sealing material up into the gap between the edges of the building members.

This construction gives a good seal in a gap which is difficult to seal, and the sealing material need not spread sideways beyond the channel to a substantial extent beneath or behind the building members and need not project beyond the exposed faces of the building members because a controlled thickness of sealing material can be provided in a controlled channel depth, particularly when using a strip of sealing material; nonetheless, the sealing material is firmly fixed in position. The construction can however accommodate variations in the width of the gap due to manufacturing tolerances.

The seal is particularly useful for sealing the external parts of window sills, or external window sills, together; the sub or backing member can be a pre-formed member which is placed on the building wall before placing the sills in position, and the sill end portions can be drawn against the sub or backing member by fixing the sills for instance to the wall.

The invention will be further described, by way of example, with reference to the accompanying drawings, in which:

FIG. 1 is a vertical section through the lower part of a window construction in accordance with the invention, along the line I—I of FIG. 4;

FIG. 2 is a vertical section, on a larger scale, through the jamming member shown in FIG. 1, with a small modification;

FIG. 3 is an isometric, exploded view, showing the lower part of the window construction at the joint between two sills;

FIG. 4 is a horizontal section along the line IV—IV of FIG. 1, showing the centre mullion and the sealing between two windows;

FIG. 5 is an isometric view of a special tool for drawing back the coupling member;

FIG. 6 is a vertical section along the line VI—VI of FIG. 4; and

FIG. 7 is a vertical section, taken higher up the building than the section of FIG. 1 but generally corresponding thereto though showing a modified sill arrangement.

FIGS. 8*a* to 8*c* illustrate the manner in which the jamming member is inserted between the window surround jamming surface and the window frame jamming surface.

The building shown in the drawings has its main wall structure made of large concrete units **1**, these units **1** being suitably supported; an outer cladding **2** may be provided, and the outer cladding **2** may have a suitable coping **3** below the level of the window sills. The building has a number of side-by-side double-glazed windows, each window being formed as a standard unit of any suitable number of panes **4** secured in e.g. an extruded aluminium frame **5** by means of e.g. snap-in sections **6**. The frames **5** rest on a main sill **7** which is screwed to the top of the lower wall unit **1**, the main sill **7** having an external sill **8** and an internal sill **9**. A head section **10** (FIG. 7) is mounted above the window frames **5** and is screwed to the bottom of an upper wall unit **1**.

POST APPLIED EXTERNAL SILL

As shown in FIG. **1**, the main sill **7** has an external overhang with a sloping top piece **21** and a rearwardly-projecting lower piece or flange **22**, a gap being left inwards of the inner edge of the lower piece **22**. The external sill **8** has an upstand **23** which passes up through the gap and has a forwardly-projecting part in the form of a curled-over upper end **24** which rests on the overhang lower piece **22**. The rear surface of the upstand **23** either lies flush against, or lies parallel to and close to, a vertical wall **25** on the main sill **7**. The base of the rear portion **26** of the external sill **8** does not quite touch the adjacent surface **27** of the main sill **7**.

In order to place the external sill **8** in position, the curled-over upper end **24** is passed up through the gap referred to above with the front of the external sill **8** raised, and the front of the external sill is then lowered into its proper position. The external sill **8** can then be secured in position, for instance by being bolted or riveted to splice plates **29** (as shown in FIG. **1**) or to brackets (not shown); the splice plates **29** are described in more detail below with reference to FIG. **3**. The heads of the screws or rivets can be concealed by mullion capping **30**, described in more detail below with reference to FIG. **4**, provided the screws or rivets are only used at the join between adjacent window frames **5**.

In the arrangement shown in FIG. **1**, the front edge of the external sill **8** just projects over the rear edge of the coping **3**. However, a different arrangement is indicated in FIG. **7**, where there is no coping on the outer cladding (not shown); the external sill **8***a* is wider and projects right out beyond the forward edge of the outer cladding.

BOTTOM LOCATION AND RETENTION OF WINDOW FRAME

The main sill **7** has a step in its front portion providing a vertical, rearward facing sealing surface **41** and a horizontal support surface **42**, the support surface **42** terminating in an inclined guide lip **43**. Prior to inserting the window frame **5**, a sealing strip **44** having one adhesive surface is stuck to the sealing surface **41** by means of the adhesive surface.

The main sill **7** may also have a rearwardly-projecting retaining lip **45** spaced above a rear support lip **46** and facing a retaining flange **47** having a forwardly-projecting detent lip **48** along its top edge. The retaining lip **45** is however omitted in FIG. **7**.

To insert the window frame **5**, the frame **5** is tilted forwards somewhat and its top is inserted up into the head section **10** (see the dashed outline in FIG. **7**); the frame bottom is then swung forwards and the frame **5** dropped down until the front support flange **50** engages the guide lip **43** and slides down onto the sill support surface **42**. The top of the frame **5** is then fixed in position as described below. The bottom of the frame **5** can be pushed forward by hand so that the front of the support flange **50** is firmly against the sealing strip **44**.

A jamming member in the form of a wedge strip **53** (see FIG. **2**), made of hard but flexible and somewhat resilient material such as polyvinyl chloride, is now inserted from a roll into the gap between the rear surface (the jamming surface) of the frame flange **51** and the sill retaining flange **47**. This is done by tilting the wedge

strip **53** slightly backwards and then inserting its lower portion or leg **54** through the gap before the jamming action commences and before tilting the strip **53** into the correct position and tapping it home. As shown in FIGS. **8a** to **8c** wedge strip **53** can be tilted backwards through an angle of about 45° until the inclined front surface of the lower portion or leg **54** is parallel to the rear or jamming surface of the frame flange **51**, thus permitting simple insertion of the relatively thin leg **54**, even though the window frame **5** will be slightly to the rear of its final position, making the gap between the rear or jamming surface of the frame flange **51** and the detent lip **48** rather small. As the strip **53** is tapped right home, it initially has a wedging action as the inclined upper side of the horizontal channel in the rear of the strip **53** rides over the inclined generally forwards-facing jamming surface of the detent lip **48**; then the detent lip **48** engages in successive detent grooves **55** on the rear of the strip **53** and prevents easy removal of the strip. The strip **53** thus has a wedging and jamming action and presses the support flange **50** firmly against the sealing strip **44**, the strip both sealing and locating the bottom of the window frame.

DRAINAGE OF CONDENSATION FROM INSIDE OF WINDOW PANE

As can be seen in FIGS. **1** and **2**, the wedge strip **53** has a rebate **61** in its top front edge, forming a channel with the frame flange **51** for receiving condensation running off the window pane and over the sections **6** and back of the frame **5**. If desired, a groove **62** can be formed along the front face of the wedge strip **53**, as shown in FIG. **1** but not in FIG. **2**, in order to maintain a nearly constant thickness of section for extrusion, though this is not considered essential. Vertical channels may be spaced along the front of the wedge strip **53** or spaced holes may be drilled down through the wedge strip **53** so that the condensation can drain down into a channel **63** formed in the main sill **7**; however, it is preferred that each wedge strip only extends for the width of one window, and its ends are mitred for this purpose, as visible at **53***a* in FIG. **4**. In front of the channel **63**, there is a fixing channel **64** in the base of the main sill **7** and then a shallow drainage channel **65** lying above a rebate containing a bottom sealing strip **66**. The condensation is taken over the fixing channel **64** by means of ducts in the form of U-section aluminium channels **67** which are for instance welded into position. From the channel **65**, the condensation passes out through front openings **68** on to the top of the wall unit **1** and then pools and flows out beneath the front lip **69** of the main sill **7**.

SPLICE PLATE COUPLING BETWEEN SILLS

The main, external and internal, sills **7**, **8**, **9** are in sections, butt joints being made between the sections in the vertical plane of the joints between the window frames **5**; there will also be a joint between adjacent wall units **1**, lying in the same plane. Prior to placing the main sills **7** in position, a splice plate **29** (see FIG. **3**) has its spine **72** inserted into the joint between the lower wall units **1** (this joint being a gap of for instance **10** mm. width) and the splice plate **29** is screwed down. The splice plate **29** has a profiled front portion **73** which acts as a sub or backing member and is shaped so that its front and upper surfaces mate with respective surfaces on the underside of the external and main sills **8**, **7** (see FIG. **1**), the end of the support flange **51** being cut away (see FIG. **3**).

As can be seen in FIG. **4**, the front portion **73** has a wide, shallow channel or groove **74** which runs along the whole of its front, top and rear surfaces. Prior to placing the main and external sills **7**, **8** in position, a mastic sealing strip **75** (see FIG. **6**) of flat, rectangular section is placed in the groove **74**, the top of the mastic strip **75** protruding out of the groove **74**; thus the groove **74** can be 2 mm. deep while the mastic strip **75** is 3 mm. thick. When the main sills **7** and subsequently the external sills **8** are fixed in position, some of the mastic squezzes up into the gap or joint between the ends of the sills so that the strip assumes the inverted T shape shown in FIG. **6**.

The internal sills **9** can be placed in position after fixing the main sills **7** and are located against longitudinal movement by a low, notched rib **76** running along the top of the splice plate **29** between wings **77** which are used to support the internal sills **9** and screw the splice plate **29** to the top of the wall units **1**.

TOP RETENTION OF WINDOW FRAME

The top of the window frame **5** is inserted up into the head section **10** (see FIG. **7**) and its top front flange **91** is adjacent a sealing strip **92** which is stuck to a depending flange **93** on the head section **10**. The frame **5** is then dropped until it is supported by the main sill **7**. A wedge strip **53** is then tapped home between a rear flange **101** of the head section **10** and the rear flange **102** of the frame **5** in exactly the same way as the bottom wedge strip **53** is inserted, compressing the sealing strip **92**.

The building is constructed so that the tops of the units are accurately aligned, all tolerances being taken out of the bottoms of the units; thus the bottom of one unit **1** may be up to for instance **6** mm above or below the bottom of the adjacent unit **1**. The joints between the head sections **10** are in the same vertical planes as the joints between the units **1** and thus adjacent head sections can be mis-aligned in a vertical direction.

COUPLING AND SEALING BETWEEN WINDOW FRAMES

As can be seen in FIG. **4**, there is a vertical gap between the front flanges of the window frames **5**. When one window frame **5** has been fixed in position, a coupling member **132** has its stem **133** rested against one side of the fixed frame **5** with its rear end projecting out behind the rear surface **134** of the fixed frame **5**, resilient sealing strips **135** having been stuck to the rear surfaces of the "cross-bar" **136**. The bottom of the coupling member **132** is located by being inserted in notches (not shown) cut in the retaining lip **45** and sloping top piece **21** of the sill. The top of the coupling member **132** is notched so that it projects up into the channel of the head section **10** or **10***a*, locating it against forwards and backwards movement. The other window frame **5** is then inserted and fixed in position. The inside end of the stem **133** has a number of cross-slots **137** spaced along its length and a spine **138** running the length of its rear edge. The spine **138** is gripped by a special tool (see the description of FIG. **5** below) which draws the stem **133** back and presses against the rear surfaces **134** of the frames, squeezing the sealing strips **135**. When the stem **133** has been drawn back far enough, a horizontal cross-piece **139** is inserted in the respective cross-slot **137**, the cross-

piece **139** then bearing against the rear surfaces **134** on the frames **5**. The cross-piece **139** is shown as having two small nibs **140** which engage on either side of the spine **138** and prevent accidental removal of the cross-piece **139**. However, it is preferred to have only one such nib **140** and to insert adjacent cross-pieces **139** alternately from the left and from the right until the respective nib **140** abuts the side of the spine **138**.

Each end of the cross-piece **139** has a locating detent; a channel-section cap **141** is now snapped on over the cross-pieces **139**, the cap having nibs **142** which snap into the locating detents on the ends of the cross-pieces **139**. The cap **141** conceals the rear ends of the stems **133** and cross-pieces **139**, and also prevents the cross-pieces **139** slipping sideways, should there be any tendency for this to occur.

On the outside, the coupling member **132** can be designed to be a mullion and give a good appearance to the window. However, the capping mullion **30** can be snapped on over the cross-bar **136**, the cross-bar **136** having small detent grooves running down its edges and the capping mullion **30** having nibs **143** which snap into these grooves. The capping mullion **30** also has a small lip **144** within each side to prevent the mullion **30** being pushed on too far and has a further pair of nibs **145** which are referred to below.

The coupling member has projecting nibs **146** which prevent any water infiltration travelling to the inside of the building, and may have a front spine **147** to give it sufficient strength, the size of the front spine **147** being chosen to suit the wind loading expected.

SPECIAL TOOL FOR DRAWING BACK THE COUPLING MEMBER

The tool is shown in FIG. **5**, which is on a larger scale than FIG. **4**.

The tool has jaws **171** which are passed over the rear spine **138** of the coupling member **132** until rubber wheels **172** bear on the rear surfaces **134** of the window frames **5**. The wheels **172** are carried on a threaded spindle **173** which passes through longitudinal slots **174** in side plates **175** whose front ends form the jaws **171**; nuts **176** on the spindle **173** are tightened to clamp and grip the spine **138** between the jaws **171**. A lever **177** is pulled in a clockwise direction (as seen in FIG. **5**) and a cam **178**, fixed to the lever **177** via a spindle **179**, abuts the spindle **173** and forces it forwards, thus drawing back the spine **138** of the coupling member **132**.

SEALING STRIPS

The sealing strips **44**, **92** and **135** may be made of Neoprene or polyethylene foam.

I claim:

1. A window construction for a building, comprising:

a window surround having two sides, a sill and a head, at least one of said sides, sill and head having a generally rearward-facing sealing surface and a generally forward-facing jamming surface spaced to the rear of said sealing surface;

a window frame in said window surround, said window frame having two sides, a bottom and a top and at least one of said sides, bottom and top having a generally forward-facing sealing surface adjacent and to the rear of said window surround sealing surface and a generally rearward-facing jamming surface spaced to the rear of said window frame sealing surface and adjacent and in front of said window surround jamming surface;

a resilient seal between said window surround sealing surface and said window frame sealing surface; and

a strip-like jamming member inserted between said window surround jamming surface and said window frame jamming surface and thrusting said window frame sealing surface against said window surround sealing surface by way of said resilient seal, said jamming member, as seen in vertical cross-section in position at the bottom of and securing said frame, having a front surface for engagement with said window frame jamming surface, an upper rear portion and a lower rear portion, said upper and lower rear portions having upper and lower rear surfaces for engagement with said window surround jamming surface, the upper and lower rear portions defining a recess therebetween, said recess having a generally concave surface the depth of said recess being such as to define a substantial space between the window surround jamming surface and said concave surface to facilitate insertion of the lower rear portion of the jamming member between the window frame jamming surface and the window surround jamming surface.

2. The window construction of claim **1**, wherein said jamming surfaces are on said window surround sill and on said window frame bottom, and wherein said jamming member has a rebate along its top front edge, forming a condensation drainage channel, said window construction further comprising drainage duct means extending from said rebate to the outside of said building.

3. A window construction for a building, comprising:

a window surround having two sides, a main sill, and external sill and a head, said main sill defining an external overhang which comprises a top portion and a rearwardly-projecting lower portion spaced below said top portion, a gap being defined inwards of the inner edge of said lower portion, and said external sill having an upstand which passes up through said gap and defines a forwardly-projecting portion which is at least adjacent to said rearwardly-projecting lower portion of said main sill overhang, whereby said forwardly-projecting portion of said external sill upstand can be passed up through said gap with the front of said external sill raised and said external sill front then lowered into position to provide said external sill;

a window frame in said window surround, said window frame having two sides, a bottom and a top;

sealing means sealing said window frame in said window surround; and

securing means securing said window frame in said window surround.

4. The window construction of claim **3**, wherein said upstand of said external sill is substantially vertical and defines a forwardly-curled-over upper end forming said projecting portion, and wherein said main sill has a portion against whose front surface the rear surface of said upstand abuts.

5. A window construction comprising:

at least two window frames, said window frames being substantially co-planar and defining a vertical gap therebetween;

a coupling member having at least a part of T shape in horizontal section, said T comprising a stem and a cross-bar, said stem projecting into said gap and extending through to the inside of said window frame, and said cross-bar overlapping outside edge

portions of said window frames adjacent said gaps;

resilient seals between respective end portions of said cross-bar and said window frame outside edge portions; and

retaining means inserted after placing said coupling member in position and retaining said coupling member in a position compressing said resilient seals, said retaining means cooperating with the inside edge portions of said window frames adjacent said gap, said retaining means comprising a plurality of vertically spaced, horizontal cross members engaging said inside edge portions of said window frames, each said cross member bridging said gap and engaging in an aperture in the end portion of said stem of said T.

6. The window construction of claim **5,** wherein a snap-on vertical channel-section cap is engaged over and conceals said cross-members, said cross-members defining locating detents on their ends, and said channel-section cap defining small projections on the inside thereof, said small projections engaging said detents.

7. The window construction of claim **5,** wherein a snap-on vertical channel-section cap engages over and covers said cross-bar of said T, said cross-bar of said T defining locating detents and said channel-section cap defining small projections on the inside thereof, said small projections engaging said detents.

8. A window construction comprising:

two aligned, thin gauge sill sections defining a narrow gap therebetween;

a backing member beneath end portions of said sill sections and beneath said gap, said backing member defining a channel which is substantially wider than the width of said gap and extends beneath said gap;

securing means drawing said end portions against said backing member; and

an easily deformable sealing material in said channel and extruded up into said gap, said sealing material having a cross-sectional area which is substantially greater than the cross-sectional area of said channel, whereby part of said sealing material was squeezed up into said gap upon drawing said end portions against said backing member.

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