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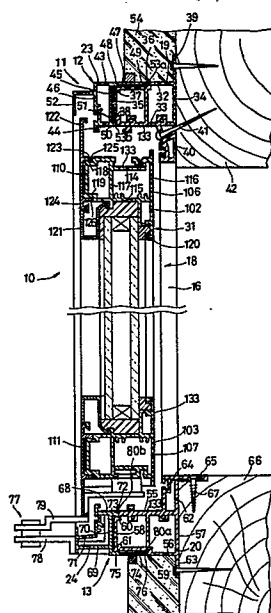
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⑤④ **Thermal insulating frame for sash window assemblies, or the like.**

⑤⑦ A thermal insulating frame (11) comprises two pairs of interconnected horizontal and vertical pieces (11,12 and 13) each of which consist of an interior member of thermal insulating material (19) and an exterior member of metal (23) joined directly with the interior member (19). The interior members (19) of at least three of the exterior member of metal (23) joined directly with the interior member (19). The interior members (19) of at least three of the frame pieces (11,13) have an identical cross-sectional shape. Surface areas of each interior member (19) which are exposed to the air are coated with a layer (133) of weather-proofing material.



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"THERMAL INSULATING FRAME FOR SASH WINDOW
ASSEMBLIES, OR THE LIKE"

The present invention relates to a thermal insulating frame for sash window assemblies, door assemblies, and the like.

5 There have been proposed a number of thermal insulating frames which comprise a pair of horizontal pieces and a pair of vertical pieces connected together and each consisting of a pair of spaced interior and exterior metallic members interconnected by thermal insulating connecting members interposed between the interior and
10 exterior metallic members. The prior art frame pieces have been proven insufficient to give a firm connection between the interior and exterior members. The interior and exterior members connected indirectly are liable to be displaced slightly with respect to one another, rendering
15 the respective frame pieces and, in turn, the frame as a whole unstable in construction. Yet, an increased number of components causes the assembling of the frame pieces of the frame to become complicated and tedious.

20 According to the invention, there is provided a thermal insulating frame comprising: a pair of horizontal

pieces and a pair of vertical pieces interconnecting said horizontal pieces, characterised in that each of said horizontal and vertical pieces consists of an interior member of thermal insulating material and an exterior member of metal joined directly with said interior member; and in that said interior members of at least three of said pieces have an identical cross-sectional shape.

The present invention seeks to provide a thermal insulating frame which can be assembled easily with an increased degree of firmness.

The invention further seeks to provide a thermal insulating frame having an excellent weather ability.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example. In the drawings:-

Figure 1 is a vertical cross-sectional view of a sash window assembly in which are used thermal insulating frames constructed in accordance with the present invention; and

Figure 2 is a horizontal cross-sectional view of the sash window assembly shown in Figure 1.

The principles of the present invention are particularly useful when embodied in thermal insulating frames for use in a sash window assembly such as shown in Figures 1 and 2, generally indicated by the numeral 10.

The sash window assembly 10 generally comprises

an outer frame 11 including a pair of horizontal pieces 12,13 (Figure 1) and a pair of vertical pieces 14,15 (Figure 2) connecting the horizontal pieces 12,13 to jointly define a rectangular window opening 16, a pair of fixed and pivoted window portions 17,18 formed within the frame 11 to close the opening 16. Each of the horizontal and vertical pieces 12,13 and 14,15 consists of an interior member of thermal insulating material 19,20,21,22 such as relatively rigid plastic material having excellent thermal insulating properties, and an exterior member 23,24,25,26 of metal such as extruded aluminum, steel or the like, the interior and exterior members 19 - 20, 23 - 26 being joined directly together.

A muntin 27 (Figure 2) extends vertically between the horizontal pieces 12,13 of the frame 11 to define together with the frame 11 a pair of first and second frame portions 28,29. A pair of spaced glasses 30,30 is mounted within the first frame portion 28 to form the fixed window portion 17. A double glazed sash 31 is pivotably mounted within the second frame portion 29 to form the pivoted window portion 18, the sash 31 being angularly movable in the counterclockwise direction to project outwardly of the window assembly for selectively opening and closing the window opening 16 in cooperation with the fixed window portion 17.

As shown in Figure 1, the interior member 19 of one of the horizontal pieces, the top rail 12, includes a hollow body of generally rectangular cross section having an upper wall 32, a lower wall 33 and a pair of inner and outer side-

walls 34,35 connecting the upper and lower walls 32,33. The upper wall 32 is stepped as at 36 intermediately thereof, the upper and lower walls 32,33 having recesses 37,38 adjacent to their respective outer ends or edges, respectively. The interior member 19 further includes a pair of upper and lower mounting flanges 39,40 integrally formed with the body and projecting outwardly from the upper and lower walls 32,33 at their respective inner ends or edges, respectively, the mounting flanges 39,40 having a plurality of holes through which nails 41 or other suitable fastening means extend respectively for attachment to a wooden header 42 of a building wall.

The exterior member 23 of the top rail 12 includes a hollow body of generally rectangular cross section having an upper wall 43, a lower wall 44 and a pair of inner and outer sidewalls 45,46 connecting the upper and lower walls 43,44, the inner sidewall 45 being held in abutting engagement with the outer sidewall 35 of the interior member 19. The upper wall 43 includes an integral extension 47 extending in overlying relation to a lower portion of the stepped upper wall 32 of the interior member 19 and having a pair of inwardly projecting locking protuberances 48,49 adjacent to its proximal and distal ends, respectively, the protuberances 48,49 engaging the recess 37 in and the stepped portion 36 of the upper wall 32 of the interior member 19, respectively. The lower wall 44 also includes an integral extension 50 having at its distal end a locking protuberance 51 projecting toward the protuberance 48 and engaging the recess 38 in the lower wall 33 of the interior member 19. The exterior

member 23 further has a fin 52 of generally L-shaped cross section projecting outwardly from the outer sidewall 46.

A connection or joint 53a is covered with an exterior siding 54 of the building wall and hence is made proof against rain, wind and other foreign materials. A layer of weatherproofing material 133 such as weatherable paint, acrylic resin, polyurethane resin or other weatherable plastics covers the lower wall 33 and mounting flange 40 of the interior member 19, a portion of the lower wall 44 of the exterior member 23 and another connection 53b between the lower walls 33,44.

The interior member 20 of the other horizontal piece, the sill 13 (Figure 1), includes a hollow body of generally rectangular cross section having an upper wall 55, a lower wall 56 and a pair of inner and outer sidewalls 57,58 connecting the upper and lower walls 55,56. The lower wall 56 is stepped as at 59 intermediately thereof, the upper and lower walls 55,56 having recesses 60,61 adjacent to their respective outer ends or edges, respectively. The interior member 20 further has a pair of upper and lower mounting flanges 62,63 formed integrally with the body and projecting outwardly from the upper and lower walls 55,56 at their respective inner ends or edges, respectively. The upper mounting flange 62 is of generally inverted L-shaped cross section having a vertical portion 64 and a horizontal portion 65 extending inwardly from the distal end of and perpendicular to the vertical portion 64 for abutting against the top surface of a wooden building sill 66. The mounting flanges 62,63 have a plurality of holes through which screws 67,

nails 41 or other suitable fastening means extend respectively for attachment to the building sill 66.

The exterior member 24 of the sill 13 includes a hollow body of generally reversed L-shaped cross section having an upper wall 68, a lower wall 69 and a pair of inner and outer sidewalls 70,71 connecting the upper and lower walls 68,69, the inner sidewall 70 being held in abutting engagement with the outer sidewall 58 of the interior member 20. The upper wall 68 includes an extension 72 formed integrally therewith and having at its distal end a locking protuberance 73 directed inwardly toward the recess 60 in the upper wall 55 of the interior member 20 for locking engagement therewith. The lower wall 69 also has an extension 74 formed integrally therewith and extending in overlying relation to the stepped lower wall 56 of the interior member 20. The extension 74 has a pair of inwardly directed locking protuberances 75,76 adjacent to its proximal and distal ends, respectively, for abutting engagement with the recess 61 in and the stepped portion 59 of the lower wall 56 of the interior member 20, respectively. A link 77 has a pair of relatively movable levers 78,79 secured to the outer sidewall 71 of the exterior sill member 24 and the sash 31 of the pivoted window portion 18, respectively. The exterior siding 54 covers a connection or joint 80a between the extension 74 and the stepped lower wall 56. A weatherproofing material layer 133 covers the upper wall 55 and mounting flange 62 of the interior member 20, a portion of the upper wall 68 of the exterior member 24 and another connection 80b between the upper walls 55,68.

The interior member 21 or 22 of each of the vertical pieces or stiles 14,15 (Figure 2) includes a hollow body of generally rectangular cross section having an inner wall 81, an outer wall 82 and a pair of inner and outer sidewalls 83,84 connecting the inner and outer walls 81,82. The outer wall 82 is stepped as at 85 intermediately thereof, the inner and outer walls 81,82 having recesses 86,87 adjacent to their respective outer ends or edges, respectively. The interior member 21(22) further has a pair of integral mounting flanges 88,89 projecting from the inner ends of the inner and outer walls 81,82, respectively in opposite directions away from each other for abutting against the outer surface of a wooden stile 90 of the building wall. The mounting flanges 88,89 have a plurality of holes through which nails 41 or other suitable fastening means extend for attachment to the building stile 90.

As understood from the foregoing description and the drawings, the interior members 21,22 of the stiles 14,15 have a cross-sectional shape which is identical with that of the interior member 19 of the top rail 12.

The exterior member 25 or 26 of each of the stiles 14,15 includes a hollow body of generally square cross section having an inner wall 91, an outer wall 92 and a pair of inner and outer sidewalls 93,94 connecting the inner and outer walls 91,92, the inner sidewall 93 being held in abutting engagement with the outer sidewall 84 of the interior member 21(22). The inner wall 91 includes an integral extension 95 having at its distal end a locking protuberance 96 snugly

received in the recess 86 in the inner wall 81 of the interior member 21(22). The outer wall 92 also has an extension 97 formed integrally therewith and extending in overlying relation to the stepped outer wall 82 of the interior member 21(22). The extension 97 has a pair of inwardly directed locking protuberances 98,99 adjacent to its proximal and distal ends, respectively for abutting engagement with the recess 87 in and the stepped portion 85 of the outer wall 82 of the interior member 21(22). A connection 100a or joint between the outer extension 97 and the stepped outer wall 82 is covered with the exterior siding 54. The weatherproofing material layer 133 covers the inner wall 81 of the respective inner member 21(22), a portion of the inner wall 91 of the respective exterior member 25(26) and another connection 100b between the inner walls 81,91.

The double glazed sash 31 is pivotably mounted on one of the stiles 14 of the frame 11 by means of hinges 101 (only one being shown in Figure 2) and comprises a pair of horizontal pieces 102,103 (Figure 1) and a pair of vertical pieces 104, 105 (Figure 2) connecting the horizontal pieces 102,103. Each of the pieces 102 - 105 consists of an interior member of thermal insulating plastic material 106,107,108,109 and an exterior member 110,111,112,113 of metal such as extruded aluminum, the interior and exterior members 106 - 109 and 110 - 113 being joined directly together.

Each interior member 106,107 of the horizontal pieces or top and bottom rails 102,103 includes a hollow body of generally rectangular cross section having an upper

wall 114, a lower wall 115 and a pair of inner and outer sidewalls 116,117 connecting the upper and lower walls 114, 115, the upper and lower walls 115,116 having recesses 118, 119 adjacent to their respective outer ends or edges, respectively. The interior member 106 further includes an integral mounting flange 120 depending from the inner end or edge of the lower wall 115 for supporting glasses together with a cooperating support 121 which is attached to the exterior member 110 of the top rail 102. The exterior member 110 includes a sidewall 122 and a pair of spaced upper and lower walls 123,124 extending inwardly from the sidewall 122. The upper and lower walls 123,124 have at their respective distal ends a pair of locking protuberances 125,126 directed toward each other and snugly received in the recesses 118,119 in the interior upper and lower walls 114,115, respectively. The upper wall 114, outer sidewall 117 and mounting flange 120 of the interior member 106 and a portion of the upper wall 123 of the exterior member 110 are coated with the weatherproofing material layer 133. For clarification, only the top rail 102 has been explained in structural details thereof by affixing reference numerals thereto.

As will become apparent from Figures 1 and 2, the interior members 108,109 of the vertical pieces or stiles 104,105 have a cross-sectional shape which is identical with that of the interior top and bottom rail members 106,107 and therefore no description on structural details thereof is needed. The exterior members 111,112,113 of the bottom rail and stiles 103,104,105 each have a structure generally similar

to that of the exterior top rail member 110 described above, and structural details thereof can therefore be omitted.

The muntin 27 (Figure 2) consists of an inner member of thermal insulating material 127 such as thermal insulating rigid plastics and an exterior member of metal 128 such as
5 extruded aluminum joined together by interlocking engagement of recesses 129,130 in the former 127 with locking protuberances 131,132 on the latter 128, respectively. A substantial part of the interior member 127 and a portion of the exterior
10 member 128 are coated with the weatherproofing material layer 133.

As described hereinabove, the respective interior members of thermal insulating plastic material 19 - 22; 106 - 109 and the respective exterior members of metal
15 23 - 26; 110 - 113 are joined directly together without connecting members interposed therebetween, with the result that the respective horizontal and vertical pieces 12 - 15; 102 - 105 and hence the frame 11 and the sash 31 have
excellent thermal insulating properties and can be
20 assembled easily with an increased degree of positional stability and firmness.

Furthermore, at least three interior members 18,21,22; 106,108,109 have an identical cross-sectional shape so that only two distinct interior members need to be manufactured
25 for the respective pieces 12 - 15; 1-2 - 105 of the frame 11 or sash 31, reducing a number of components to a minimum and increasing a rate of production.

In this regard, it is noticed that a rate of extrusion

molding of the plastic interior members is substantially smaller than a rate of extrusion of the metallic exterior members. If the frame or sash were assembled with pairs of horizontal and vertical pieces having four distinct cross-sectional shapes, such an imbalance in productivity would cause a over-production of the exterior members or a shortage of the inter members, resulting in reduction of the productivity of the frame or sash as a whole. The interior members so constructed in accordance with the invention as to have an identical cross-sectional shape can accommodate the imbalance in productivity between the interior and exterior members and hence avoid the foregoing problems.

The interior members 19 - 22; 106 - 109 have their respective surface areas coated with the layer of weatherproofing material 133 such as weatherable paint, weatherable plastics or the like, which the surface areas are exposed to the air as the window assembly 10 is mounted on the building wall.

The layer 133 makes the plastic interior members 19 - 22; 106 - 109 weatherproof against sun light irradiated thereto, and polluted liquid or gases which are liable to cause deterioration or change of properties of the plastic interior members 19 - 22; 106 - 109. The weatherproofing material layer 133 further extends over a part of the exterior members 23 - 26; 110 - 113 beyond the connections or joints 53b, 80b, 100b between the respective interior and exterior members 19 - 22; 106 - 109 and 23 - 26; 110 - 113, making the connections proof against rain, wind and other foreign material.

The connections or joints 53b, 80b, 100b between the respective extensions 47, 74, 97 and the respective stepped walls 32, 56, 82 are located closer to the building wall such an extent that they are covered with the exterior siding 54
5 and hence made proof against rain, wind and other foreign material.

Each of the horizontal and vertical members 12 - 15 is assembled by first spreading the extensions 47, 50; 72, 74; 95, 97 of the respective exterior member 23 - 26 outwardly.
10 The interior member 19 - 22 is then inserted between the extensions 47, 50; 72, 74; 95, 97 until its outer sidewall 35; 58; 84 is brought into abutting engagement with the inner sidewall 45; 70; 93 of the exterior member 23 - 26. With this condition, the extensions 47, 50; 72, 74; 95, 97 are pressed
15 toward each other, bringing the locking protuberances 48, 49, 51; 37, 75, 76; 96, 98, 99 thereon into locking engagement with the recesses 37, 38; 60, 61; 86, 87 and the stepped portion 36; 56; 85 of the interior member 19 - 22.

Although various minor modifications may be suggested
20 by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted thereon, all such embodiment as reasonably and properly come within the scope of this contribution to the art.

CLAIMS:

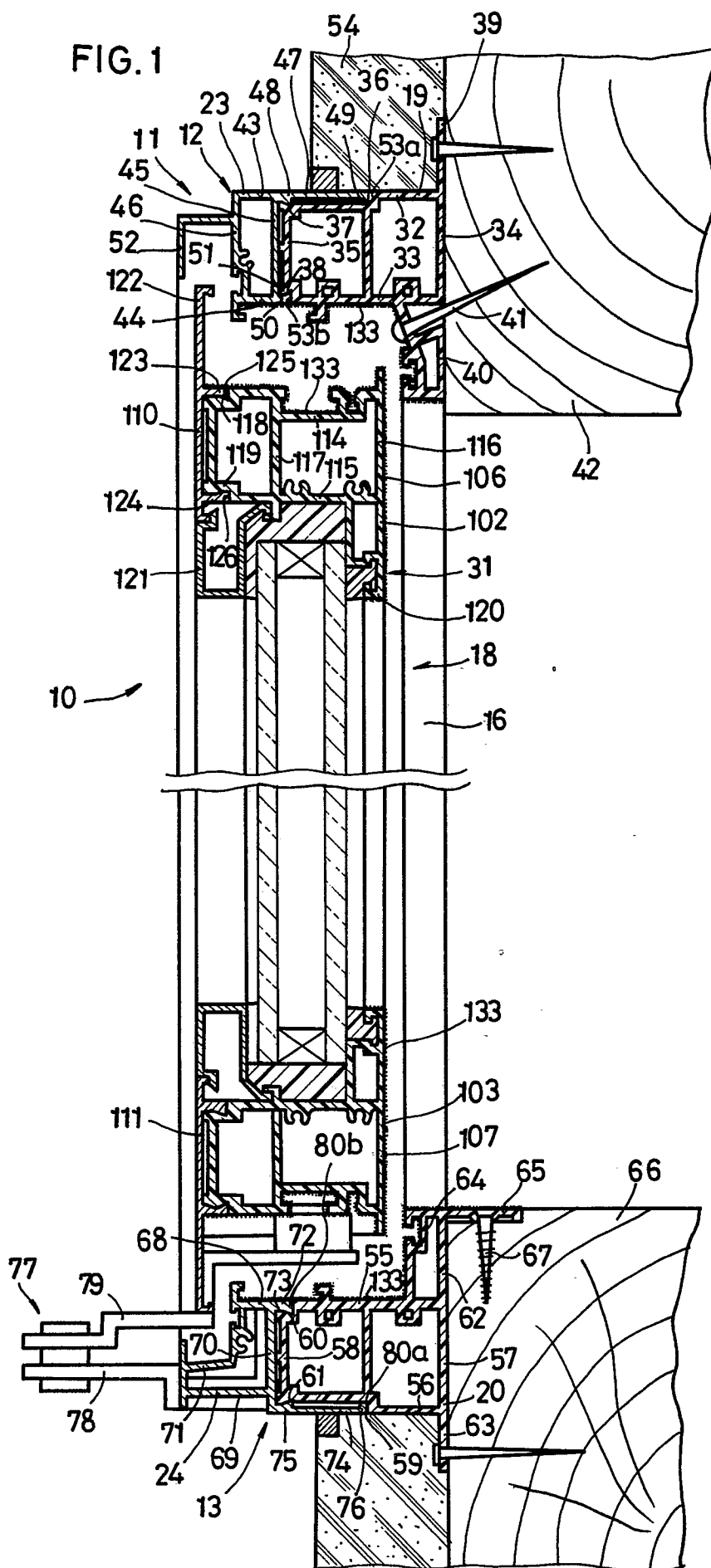
1. A thermal insulating frame (11) (31) comprising a pair of horizontal pieces (12, 13) (102, 103) and a pair of vertical pieces (14, 15) (104, 105) interconnecting said horizontal pieces, characterised in that each of said horizontal and vertical pieces (11-15) (102-105) consists of an interior member (19-22) (106-109) of thermal insulating material and an exterior member (23-26) (110-113) of metal joined directly with said interior member; and in that said interior members (19, 21, 22) (106-109) of at least three of said pieces have an identical cross-sectional shape.

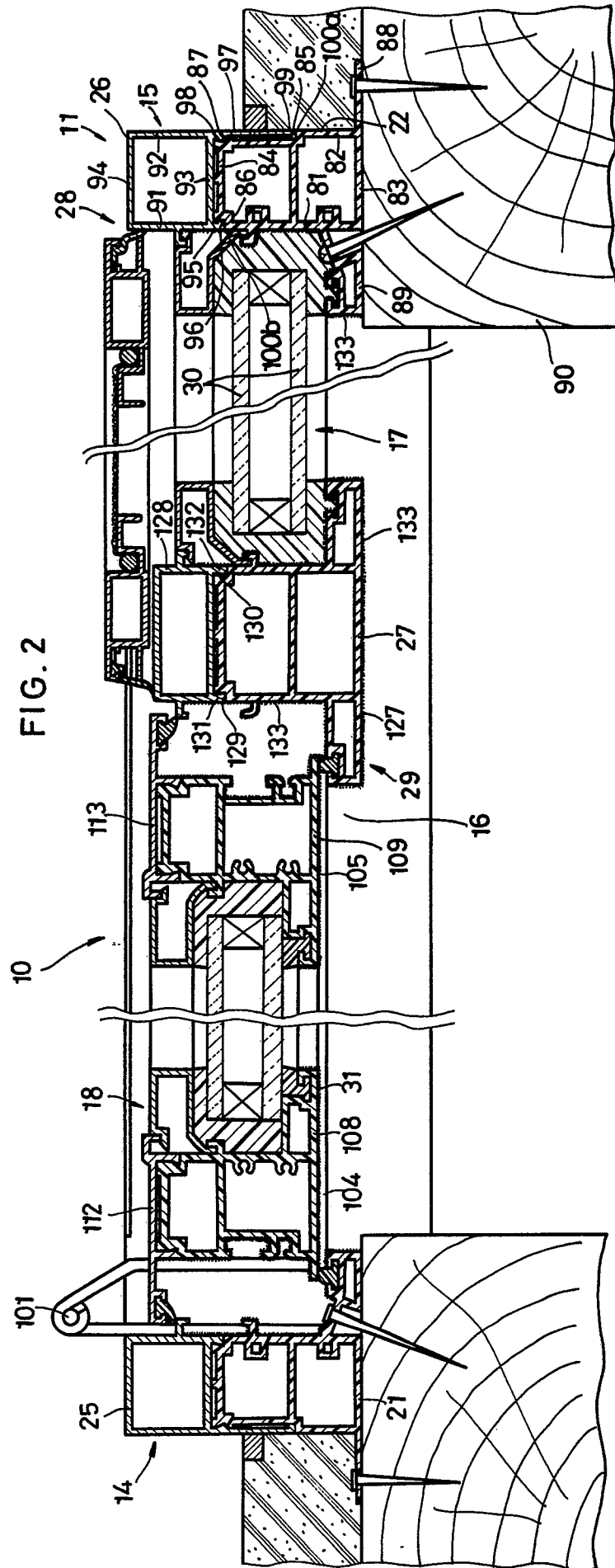
2. A thermal insulating frame (11) (31) according to claim 1, each of said interior member (19-22) (106-109) being made of thermal insulating rigid plastics.

3. A thermal insulating frame according to claim 1, each said interior member having surface areas exposed to air, said surface areas being coated with a layer (133) of weatherproofing material.

4. A thermal insulating frame according to claim 1, said interior and exterior members (19-26) (106-113) having connections therebetween (53b, 80b, 100b) coated with layers of weatherproofing material (133) respectively.

FIG. 1







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EUROPEAN SEARCH REPORT

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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
P	<u>GB - A - 2 055 937</u> (FULGURITWERKE SEELZE UND EICHRIEDE et al.) * complete document * --- <u>EP - A1 - 0 003 042</u> (GRETSCH-UNITAS GMBH) * claims 1, 2, 10, 11; fig. * --- <u>WO-A1-80/01820</u> (WEATHERSEAL WINDOWS LTD.) * claims 1 to 8; fig. * --- <u>DE - A - 1 923 599</u> (RITTER ALUMINIUM GMBH) * claims; fig. * --- <u>DE - A - 2 045 156</u> (VAW LEICHTMETALL - WERKE GMBH) * claims; fig. * --- <u>DE - A1 - 2 806 025</u> (GEBR. UHL GMBH & CO. KG) * claims 1, 9; fig. * ---	1,2 1,2 1,2 1,2 1,2 1,2 1,2	E 06 B 3/26 E 06 B 3/30
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			E 06 B 3/00
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
A	<u>EP - A1 - 0 009 652</u> (DYNAMIT NOBEL AG) * claim 1 * --- ./..	1,2	
X The present search report has been drawn up for all claims			&: member of the same patent family, corresponding document
Place of search		Date of completion of the search	Examiner
Berlin		26-11-1981	WUNDERLICH



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DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	BAU- UND MÖBELSCHREINER Vol. 9, No. 3, 1977 Leinfelden-Echterdingen "Kunststoff-Fensterprofil zweifarbig-coextrudiert" * page 78, right-hand column *	3,4	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)