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(54) Title of invention

A method for manufacturing a heat insulating sash bar

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(56) Documents cited
None

(58) Field of search
B3A

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FIG. 1a

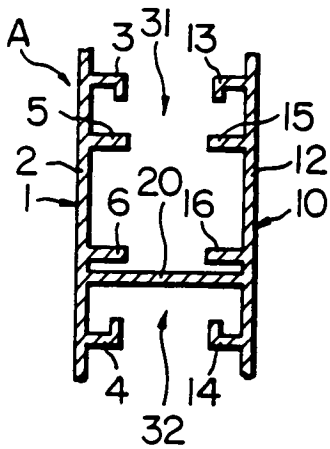

FIG. 1b

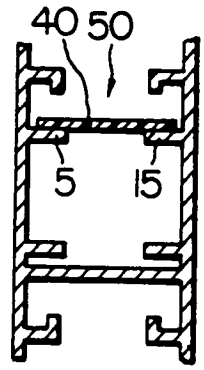

FIG. 1c

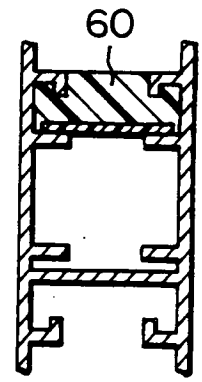

FIG. 1d

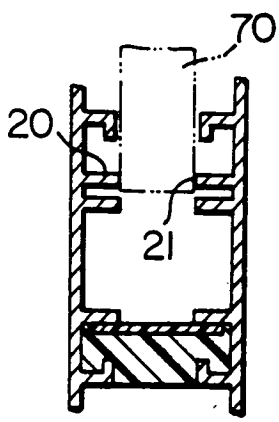

FIG. 1e

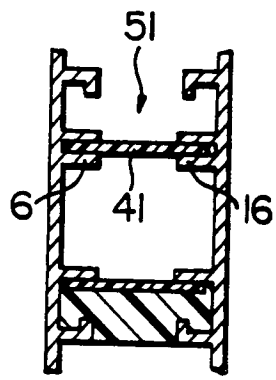

FIG. 1f

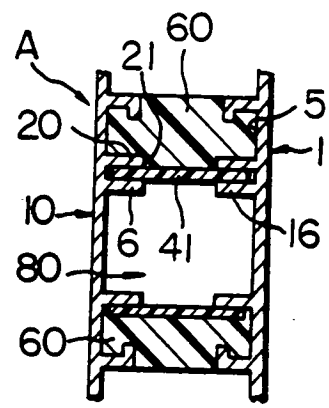

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FIG. 2

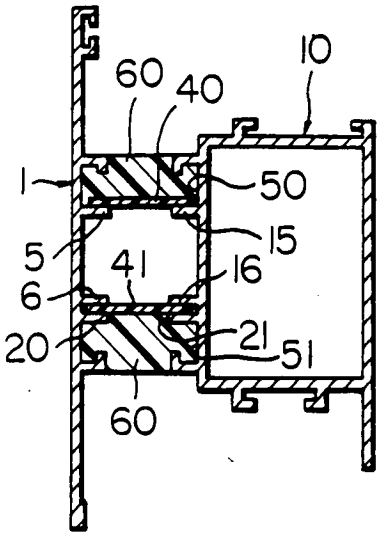


FIG. 3a

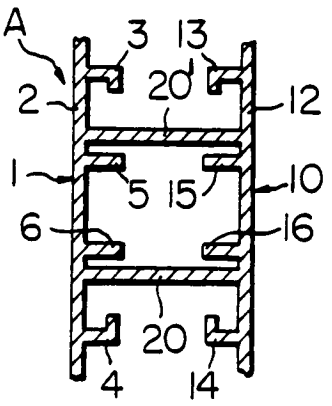


FIG. 3b

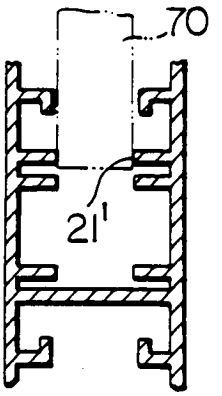


FIG. 3c

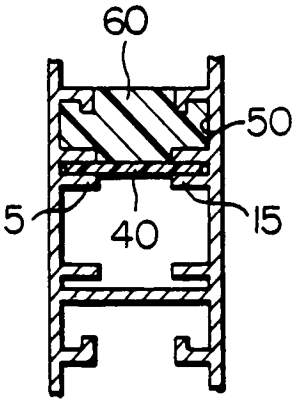


FIG. 3d

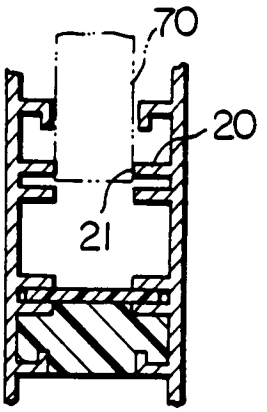


FIG. 3e

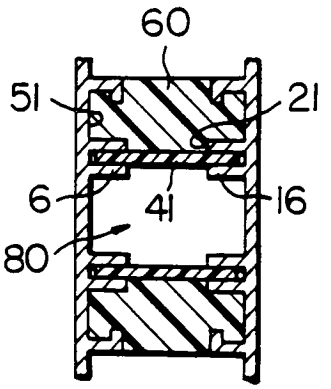


FIG. 4a

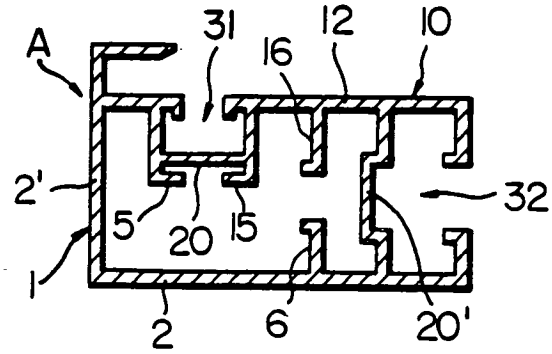


FIG. 4b

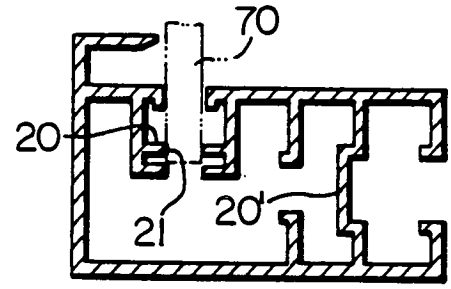


FIG. 4c

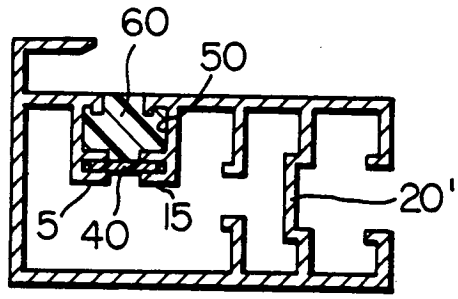
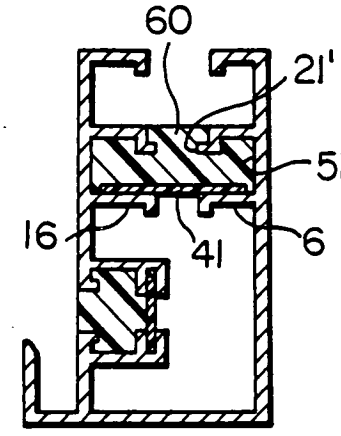


FIG. 4d



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A METHOD FOR MANUFACTURING A HEAT INSULATING SASH BAR

The present invention relates to a method for manufacturing a heat insulating sash bar for window sash or, more particularly, to a method for manufacturing a heat insulating sash bar of which remarkably improved heat insulation is obtained between the face plates of the sash bar, one facing the inside of the room and the other facing the outside of the room, as connected with connecting members of a heat insulating material in such a manner as to form a hollow space surrounded by the face plates and the heat insulating connecting members.

As is well known, many of the modern window sashes are framed with sash bars made of a metal such as aluminum and shaped by extruding in the form of bar materials. When such window sashes are to be used in severe climatic conditions, there may be a problem in the use of an integrally shaped metal-made sash bar in respect of the heat insulation between inside and outside of the room since the heat conduction through the integrally shaped sash bars is not negligibly small due to the high heat conductivity of aluminum or the like metal of which the sash bar is made.

In this connection, it is desirable that the two oppositely positioned face plates forming the sash bar, one

facing the inside of the room and the other facing the outside of the room, are not integral but isolated thermally from each other with connecting members made of a heat insulating material. In the prior art, various methods have been proposed for manufacturing such a heat insulating sash bar. For example, an integral bar material having an approximately H-wise cross section, composed of two oppositely facing face members connected with an inner connecting part to form at least one groove-like channel on one side of the connecting part, is shaped by extrusion and the groove-like channel is filled with a pourable heat insulating material to be cured in situ followed by longitudinally removing at least part of the connecting part by cutting off by use of a cutter or by tearing off at the reverse side of the heat insulating material to thermally isolate the two oppositely positioned face members.

In the above described conventional method for manufacturing a heat insulating sash bar, it is sometimes unavoidable that the heat insulating material which has been cured in contact with the inner connecting part, is more or less shaved off by the blade of the cutter when the cutter blade is thrusted into the connecting part and the thus formed shaving dusts electrostatically charged during the cutting work adhere to the outer surface of the bar material. Therefore, such adhering dusts of the heat insulating material must be removed with great consumption of time and labor. In addition, shaving

of the heat insulating material with the cutter blade may cause cracking or fissures in the heat insulating material resulting in decrease of the connecting strength between the face members through the heat insulating material as the connecting member.

In order to avoid thrusting of the cutter blade into the heat insulating material, two parallel incision lines are formed on the connecting part and the portion between the incision lines is removd by tearing off. This method of tearing off is also not free from the problem caused by the adhesive bonding between the heat insulating material and the connecting part to be removed.

A further problem in the above described conventional method is that, since the surface of the section formed by the removal of part of the connecting part by cutting or tearing off is exposed bare to the outer atmosphere, corrosion of the metal sash bar readily starts at this surface of section by the influence of the atmospheric moisture because the surface of section is not provided with any surface protective layer different from the other surfaces of the bar material provided in advance with a protective coating layer formed, for example, by anodic oxidation.

A remedy for the above problem of the exposed surface of section is disclosed in Japanese Patent Publication 56-1434 in which a second impregnation with the heat insulating material

is undertaken to cover the surface of section after a part of the connecting part has been removed by cutting off. This method is indeed effective in protecting the surface of section from corrosion but the other problems described above are left unsolved. Furthermore, the second impregnation with the pourable heat insulating material in this method is performed at the side of the connecting part reverse to the first impregnation with the heat insulating material so that no hollow space can be retained with the bar material. Therefore, an extremely large volume of the heat insulating material is used to fill up the space within the bar material resulting in disadvantages not only due to the economical problem by the large

costs for the heat insulating material but also due to the difficulty in manufacturing and handling by the excessively heavy weight of the sash bar, especially, when the sash bar has a large cross-section.

According to the present invention there is provided a method for manufacturing a heat insulating sash bar comprising two face members connected together with two connecting members formed of a heat insulating material therebetween which comprises the steps of

(a) placing a first belt-like strip of sheet made of a heat insulating material on and bridging a first pair of oppositely positioned intermediate flanges each on a respective one of the face members while said face

members are integrally connected together by an inner connecting part, each of the face members being provided with two respective intermediate flanges to form said first pair of the intermediate flanges remoter from the inner connecting part and a second pair of the intermediate flanges closer to but not in direct contact with the inner connecting part with the respective oppositely positioned intermediate flanges on the other face member, to form a first groove-like channel opening at a side of the inner connecting part provided with the first belt-like strip of sheet as the bottom and with the two face members as the side walls,

(b) filling the first groove-like channel with a heat insulating material to form a first connecting member which connects the face members with each other,

(c) partly removing the inner connecting part over whole length thereof,

(d) placing a second belt-like strip of sheet made of a heat insulating material on and bridging the second intermediate flanges to form a second groove-like channel including the sections of the inner connecting part remaining after the latter has been partly removed and opening at the other side of the inner connecting part provided with the second belt-like strip of sheet as the bottom and with the face members as the side walls, and

(e) filling the second groove-like channel with a heat insulating material to form a second connecting member which connects the face members with each other and covers the sections of the inner connecting part remaining after the latter has been at least partly removed.

The invention will be described by way of example with reference to the accompanying drawings wherein:-

Figures 1a to 1f each illustrate a step of a first preferred form of the inventive method starting with a bar material having an approximately H-wise cross section by the cross section of the sash bar;

Figure 2 is a cross sectional view of a sash bar manufactured by a preferred form of the inventive method starting with a bar material of which one of the face members has a box-like configuration;

Figures 3a and 3e each illustrate a step of a second preferred form of the inventive method starting with a bar material having two inner connecting parts; and

Figures 4a and 4d each illustrate a step of a third preferred form of the inventive method for manufacturing a sash bar used for a meeting stile.

FIGURES 1a to 1f each illustrate a step of a typical embodiment of the inventive method by the cross section of the sash bar. FIGURE 1a is a cross sectional view of the starting bar material A made of, for example, aluminum shaped integrally by the technique of extrusion. The cross sectional configuration of the bar material A is approximately H-wise as a whole as composed of two oppositely positioned face members 1, 10 connected together with an inner connecting part 20 forming two groove-like channels 31, 32 on each side therof opening to the different sides. Each of the face members 1, 10 is formed of a face plate 2 or 12 provided with two peripheral flanges 3, 4 or 13, 14 at or near the peripheries thereof and two intermediate shelf-like flanges 5, 6 or 15, 16. It is noted that these intermediate flanges 5, 6 and 15, 16 are positioned at the same side of the connecting part 20, the flanges 5, 15 being remoter from the connecting part 20 and the flanges 6, 16 being closer to the connecting part but not in direct contact therewith.

The first step is, as is illustrated in FIGURE 1b, placing a belt-like strip of sheet 40 made of a heat insulating material on and bridging the intermediate flanges 5, 15, remoter ones from the connecting part 20, to form a somewhat narrowed groove-like channel 50 opening outwardly.

The second step is, as is illustrated in FIGURE 1c, the impregnation of this groove-like channel 50 with a pourable heat insulating material 60 which may be a prepolymer of a thermo-setting resin or a melt of a thermoplastic resin and cured or solidified in situ in the groove-like channel 50.

The third step is, as is shown in FIGURE 1d, removal of part of the inner connecting part 20 over whole length thereof. This is performed, if convenient, by turning the bar material A filled in the first groove-like channel 50 with the pourable heat insulating material 60 upside down and thrusting a cutter 70 into the other groove-like channel 32 formed between the inner connecting part 20 and a pair of the peripheral flanges 4, 14 to form a gap between the sections 21, 21 of the connecting part 20 whereby the two oppositely positioned face members 1, 10 are thermally isolated from each other by being joined together only with the heat insulating material 60 in the first groove-like channel 50. It is of course optional that, instead of cutting off the inner connecting part 20 with a cutter 70, a pair of parallel incision lines are formed in advance on the inner connecting part 20 over whole length thereof and the portion between the incision lines is removed by tearing off.

The fourth step is, as is shown in FIGURE 1e, placing a second belt-like strip of sheet 41 made of a heat insulating

material, which may be the same as or similar to that of the first strip of sheet 40, on and bridging the second pair of the intermediate flanges 6, 16 but below the sections 21, 21 of the inner connecting part 20 to form a second groove-like channel 51 having the second strip of sheet 41 as the bottom and the oppositely positioned face plates 2, 12 as the side walls.

The last step is, as is shown in FIGURE 1f, the impregnation of the thus formed second groove-like channel 51 with a pourable heat insulating material 60 which may be the same material as used for filling the first groove-like channel 50 and is cured and solidified in situ in the second groove-like channel 51. As is readily understood, the sections 21, 21 of the inner connecting part 20 are completely covered by this heat insulating material 60 filling the second groove-like channel 51 so that the surface of the sections 21, 21 is shielded and protected from the atmosphere not to cause corrosion even when the surface of the sections 21, 21 is not provided with surface protection such as the oxide film of aluminum formed by anodization.

The thus finished heat insulating sash bar is composed of the two oppositely positioned face members 1, 10 thermally isolated from each other but connected together with the heat insulating material 60 filling the two groove-like channels 50,

51 comprising a hollow space 80 therebetween. The volume of this hollow space 80 can be as large as desired contributing to the reduction of the overall weight of the sash bar and to the saving of the heat insulating material 60 with great economical advantages in the costs. Therefore, even a heat insulating sash bar of a large size in the face measure can be manufactured easily and inexpensively.

FIGURE 2 illustrates a cross section of another heat insulating sash bar which is a modification of the sash bar illustrated in FIGURES 1a to 1f and can be manufactured in just the same manner. Different from the face members 1, 10 in FIGURES 1a to 1f, one of the face members 10 in FIGURE 2 has a tubular configuration of rectangular cross section as a whole comprising a hollow space therein. Otherwise, the relative positions of the flanges and the inner connecting part are much the same as in the sash bar illustrated in FIGURES 1a to 1f so that it may be useless to describe the manufacturing steps in detail.

FIGURES 3a to 3e each illustrate one of the successive steps for manufacturing a heat insulating sash bar by the cross section which is a further modification of the sash bar illustrated in FIGURES 1a to 1f. In this case, the starting bar material has two inner connecting parts 20, 20' each at a

position between the pair of the intermediate flanges 6, 16 and the pair of the peripheral flanges 4, 14 or between the intermediate flanges 5, 15 and the peripheral flanges 3, 13, respectively.

As is illustrated in FIGURE 3b, the first step is the removal of part of the inner connecting part 20' over whole length thereof, leaving sections 21', by thrusting a cutter 70 from the opening between the peripheral flanges 3, 13 and then, as is illustrated in FIGURE 3c, a strip of sheet 40 made of a heat insulating material is placed on and bridging the intermediate flanges 5, 15 but below the sections 21' of the inner connecting part 20' to form a groove-like channel 50 which is then filled with a pourable heat insulating material 60 to cover the surface of the sections of the inner connecting part 20'. Subsequent steps illustrated in FIGURES 3d and 3e are just the same as the steps illustrated in FIGURES 1d and 1f so that detailed description of the steps need not be repeated here.

FIGURES 4a and 4d each illustrate one of the steps for manufacturing a heat insulating sash bar used, for example, in the meeting stile of a sliding door. FIGURE 4a illustrates a cross section of the starting bar material A. Although the general cross sectional configuration of the bar material

appears to be quite different from those illustrated in the previously referenced figures, the principle of the manufacturing steps in this case is not different from that in FIGURES 3a to 3e.

As is shown in FIGURE 4a, one of the face members 1 of the bar material A has an L-shaped cross section instead of a single plate with only one of the branches 2 facing the other face member 10 and the other branch 2' being perpendicular to the face member 10. These face members 1, 10 are connected together with two inner connecting parts 20, 20' to form two groove-like channels 31, 32, respectively, one opening toward the interior side of the door and the other in the sliding direction of the door, with the respective inner connecting parts 20, 20' as the bottoms thereof.

The first step is, as is illustrated in FIGURE 4b, the removal of part of the inner connecting part 20 by thrusting a cutter 70 into the groove-like channel 31 over whole length of the connecting part 20 to form the sections 21 of the connecting part 20. The next step is, as is shown in FIGURE 4c which corresponds to FIGURE 3c in the previous embodiment, placing a belt-like strip of sheet 40 made of a heat insulating material on and bridging the flanges 5, 15 but below

the sections 21 of the partly removed inner connecting part 20 followed by the impregnation of the thus formed first groove-like channel 50 with a pourable heat insulating material 60.

Thereafter, the other inner connecting part 20' is at least partly removed over the whole length thereof by thrusting a cutter into the groove-like channel 32 whereby the face members 1, 10 are thermally isolated from each other but joined together with the heat insulating material 60 filling the first groove-like channel 50. Further, the bar material A is turned by 90° so as to have the groove-like channel 32 opening upwardly and a second strip of heat insulating sheet 41 is placed on and bridging the intermediate flanges 6, 16 but below the sections 21' of the partly removed connecting part 20' to form a second groove-like channel 51 which is subsequently filled with the pourable heat insulating material 60 as is shown in FIGURE 4d.

Reference is directed to copending patent application no. 8417791 (Serial no. 2141646) - reference 230P48171.

CLAIMS:

1. A method for manufacturing a heat insulating sash bar comprising two face members connected together with two connecting members formed of a heat insulating material therebetween which comprises the steps of

(a) placing a first belt-like strip of sheet made of a heat insulating material on and bridging a first pair of oppositely positioned intermediate flanges each on a respective one of the face members while said face members are integrally connected together by an inner connecting part, each of the face members being provided with two respective intermediate flanges to form said first pair of the intermediate flanges remoter from the inner connecting part and a second pair of the intermediate flanges closer to but not in direct contact with the inner connecting part with the respective oppositely positioned intermediate flanges on the other face member, to form a first groove-like channel opening at a side of the inner connecting part provided with the first belt-like strip of sheet as the bottom and with the two face members as the side walls,

(b) filling the first groove-like channel with a heat insulating material to form a first connecting member which connects the face members with each other,

partly removing the inner connecting part over whole length thereof,

(d) placing a second belt-like strip of sheet made of a heat insulating material on and bridging the second pair of the intermediate flanges to form a second groove-like channel including the sections of the inner connecting part remaining after the latter has been partly removed and opening at the other side of the inner connecting part provided with the second belt-like strip of sheet as the bottom and with the face members as the side walls, and

(e) filling the second groove-like channel with a heat insulating material to form a second connecting member which connects the face members with each other and covers the sections of the inner connecting part remaining after the latter has been at least partly removed.

2. A method substantially as described with reference to Figures 1a to 1f of the accompanying drawings.

3. A method substantially as described with reference to Figure 2 of the accompanying drawings.

4. A method as described with reference to Figures 3a to 3e of the accompanying drawings.

5. A method substantially as described with reference to Figures 4a to 4d of the accompanying drawings.

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