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Winans

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[54] **THERMAL BARRIER FOR FRAME STRUCTURES**

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[52] **U.S. Cl.** **52/403,** 52/204, 52/309

[51] **Int. Cl.** **E04b 1/64,** E06b 1/32

[58] **Field of Search** ..... 52/204, 212, 403, 731, 52/309; 49/DIG. 1, DIG. 2, 477, 417; 264/261

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[57] **ABSTRACT**

A thermal barrier joint between two metal extrusion strips comprising a vinyl or other plastic extrusion strip that forms a channel between the two metal strips and also locates the two metal strips with respect to each other, the channel then being filled with a thermal barrier material which rigidly fastens the two metal strips together; the plastic extrusion can either be left on or stripped off after the thermal barrier material has set.

2 Claims, 4 Drawing Figures

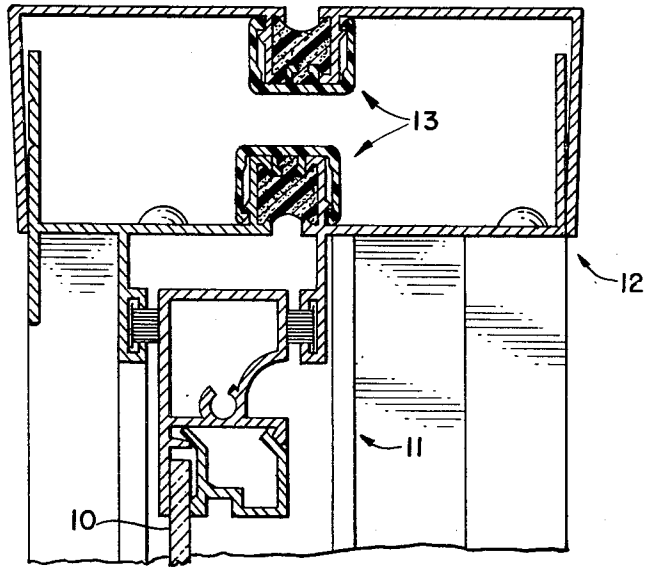


FIG. 1.

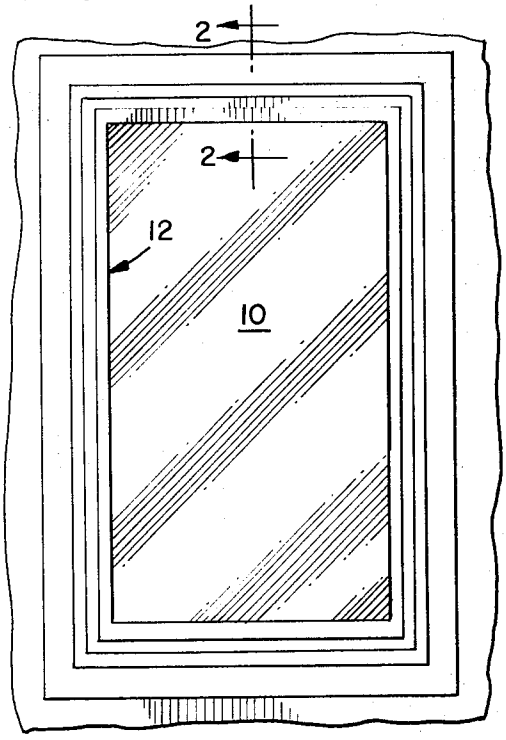


FIG. 3.

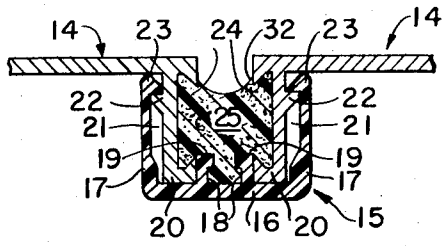


FIG. 4.

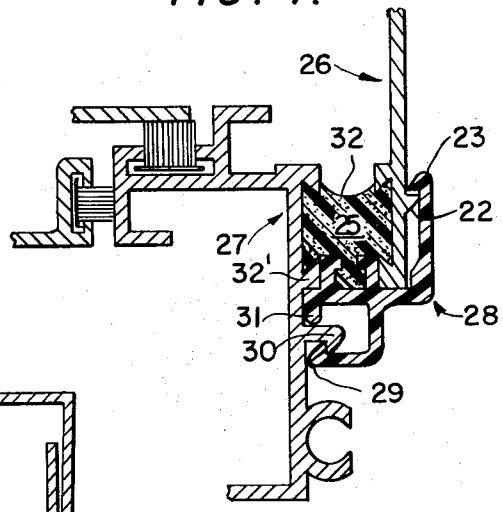
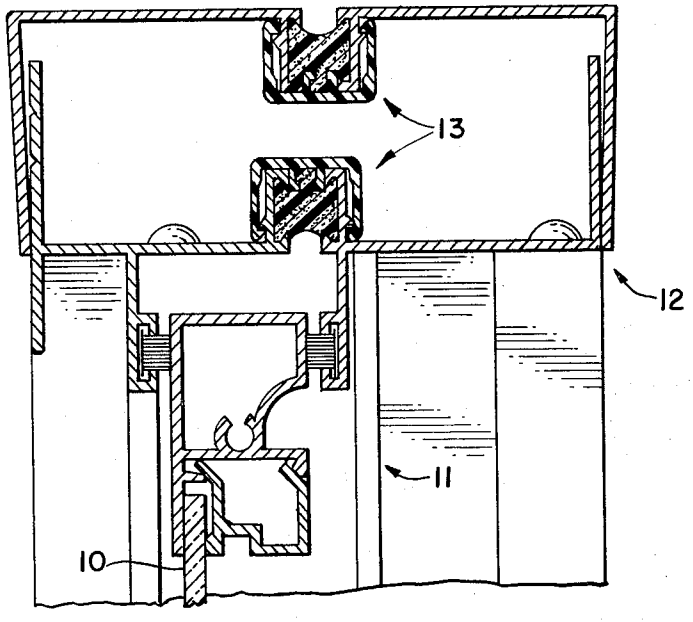


FIG. 2.



THERMAL BARRIER FOR FRAME STRUCTURES

BACKGROUND OF THE INVENTION

Aluminum window frames for permanent windows, as distinguished from storm windows, are becoming increasingly popular. The reasons for this increasing popularity are freedom from maintenance, pleasing appearance, and durability, among others. However, aluminum window frames suffer from one inherent drawback that does not exist with wooden frames. This drawback, a heat and cold conduction path from the inside of the room to the outside through the frame itself, stems from the fact that aluminum is a good conductor of heat and cold whereas wood is a poor conductor. Admittedly, this path is physically narrow and does not conduct much heat compared to the heat loss across the window itself. But in the interest of economy in heating a house or other building, all heat conduction paths must be eliminated or reduced as much as possible. The problem, then, is to produce an aluminum extrusion that will extend from the inside to the outside surfaces of an exterior wall without conducting heat from one side of the wall to the other.

The simple solution to this problem is to provide a break in the metal path from the inside to the outside of the wall. By inserting a material of lower thermal conductivity, or even just an air gap, somewhere in the metal frame, the heat conduction path is interrupted at that point and heat losses through the metal are markedly reduced.

The prior art has recognized this problem, notably in the U.S. Pat. No. to Revell et al, 3,441,995 and Nilsen, 3,204,324. While producing an acceptable thermal barrier, the methods disclosed in these patents require that machining steps be performed on the metal extrusions. In Revell et al., the extrusion must be slit and bent in two places along its entire length; in Nilsen a part of the original extrusion must be milled out after the thermal barrier material has set, again for the length of the extrusion. In both of these patents a large extrusion is cut along its length to give the appearance of a unit that is composed of two smaller extrusions that are held together by the thermal barrier material. Since the cost of an extrusion is a direct function of its cross-sectional area, it is cheaper to join two smaller extrusions with thermal barrier material than to start with a wide extrusion that is later cut in half.

SUMMARY

Briefly, the present invention comprises two aluminum extrusions that are placed side by side and then are joined together by means of a third extrusion, preferably of vinyl. The third extrusion joins the other two in such a manner as to create a U-shaped channel with no metal to metal contact between the two aluminum extrusions. This U-shaped channel is then filled with the thermal barrier material, creating a rigid assembly. This method requires no costly machining, since all extrusions are used as they are produced with no modifications. In addition, the present invention can be used for extremely small production runs (minimum of 1), since all operations can be performed by hand. For larger production, the method obviously can be mechanized to a large extent.

Accordingly, it is an object of the present invention to provide a thermal barrier in an aluminum window frame.

It is a further object to provide a thermal barrier in an aluminum window frame composed of two distinct extrusions held together by the thermal barrier material.

It is a further object to provide a method of constructing a thermal barrier that does not require any machining steps.

It is a further object to provide a method of constructing a thermal barrier that can be economically used for very small production runs.

It is a further object to provide a thermal barrier in an aluminum window frame wherein the thermal barrier material is polyester resin.

Other objects and inventions of the present invention will be apparent from the following specification and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a window whose frame incorporates a thermal barrier according to the present invention.

FIG. 2 is taken on line 2—2 of FIG. 1.

FIG. 3 is an enlargement of the circled area of FIG. 2.

FIG. 4 is a cross section of a thermal barrier joint between extrusions having different shapes from those shown in FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, there is shown a window in a house, office, etc. This can be of single or double pane construction, but will be described and shown as a single pane window.

FIG. 2 shows the window pane 10 held in a first frame assembly 11 which in turn is surrounded by second frame assembly 12. Second frame assembly 12 extends from the inside to the outside of the building and provides two heat conduction paths. Each path has a thermal barrier 13 in it, one such barrier being shown enlarged in FIG. 3.

Referring to FIG. 3, the aluminum extrusions are designated 14, 14; the vinyl extrusion is designated 15. Vinyl extrusion 15 is comprised of a horizontal member 16, vertical end members 17, and intermediate vertical members 18. Intermediate and end vertical members 17 and 18 form between them a pair of channels which receive the ends of downwardly extending members 20 of aluminum extrusions 14. The innermost ends of intermediate vertical members 18 have projections 19 thereon forming an enlarged cavity; the purpose of this cavity is to securely hold the vinyl extrusion to the thermal barrier material 32. Vertical end members 17 are cut away as at 21 to allow for the insertion therein of outstanding projections 22 on downwardly extending members 20 of extrusions 14. When vinyl extrusion 15 is put on metal extrusions 14, 14, the rounded ends 23 on members 17 ride outwardly on projections 22 and then snap over them, thereby being locked in place.

Downwardly extending members 20 can be seen to have dovetail slots 24 formed therein; when cavity 25 is filled with thermal barrier material a dovetail joint will be formed between this material and extrusions 14.

The method of assembling the extrusions of FIG. 1 is as follows: metal extrusions 14, 14 are placed in a jig which holds them in the proper spaced relationship. Vinyl extrusion 15 is then placed over downwardly ex-

tending members **20** until ends **23** are felt and heard to snap into place over projections **22.** When this occurs the three pieces are held together as a unit and could be removed from the jig and used; however, it is preferred that cavity **25** be filled with a material such as polyester resin for added mechanical strength.

The configuration shown in FIG. **4** differs from that in FIG. **3** primarily in the shape of the aluminum extrusions. As can be seen, aluminum extrusions **26** and **27** are held together by vinyl extrusion **28.** Aluminum extrusion **26** is held in vinyl extrusion **28** in the same manner as in the configuration of FIG. **3**; extrusion **27** is held by the interlocking of projections **29** and **30** and by the wedging of leg **31** of vinyl extrusion **28** between projections **30** and **32'** of aluminum extrusion **27.**

The final step is to fill cavity **25** with thermal barrier material **32**; the depth of filling is not critical, it is only necessary that the material fill all of dovetail slots **24.** The preferred material to be used to form the thermal barrier is polyester resin; however, any material that can be poured, which bonds to metal, is reasonably rigid, and has a low coefficient of thermal conductivity, can be used. Likewise, the preferred material for extrusion **15** is vinyl, although any other material that is extrudable, flexible, and has a low coefficient of thermal conductivity can be used.

The vinyl or other plastic extrusion **15** can be stripped off and then re-used if desired, since its contribution to the strength of the joint is minimal compared to the thermal barrier material. However, since its cost is quite low, it is preferably left on.

As stated earlier, this method can be used to make any number of thermal barrier assemblies; since there are no machining steps required, it can be used for very small production runs. If mass production is contemplated, several extrusion assemblies can be assembled in one master jig and then the filling of the cavity can be done by machine.

What is claimed is:

1. A composite structure which extends, transversely of its length, from a cold region to a warm region and has an integral heat conduction barrier therein; comprising two elongated structural members each extending from one temperature region to a point between said regions, each of said members having at said point an upstanding leg having two surfaces and extending in the same direction and spaced from each other whereby one surface of each leg faces the other, said surface of each of said leg facing each other having a dovetailed slot extending in the same plane as said structural member, said surface of each leg opposite to each of the facing surfaces having an elongated projection extending in the same plane as said structural member near substantially the junction of said structural member and said leg, a U-shaped member having two upstanding portions and a relatively flat apex portion, said upstanding portions adapted and constructed to embrace said surfaces of said legs opposite to each of the said facing surfaces, each of said upstanding portions having extending inwardly an elongated projection adapted and constructed to be positioned between the said projections of each of said legs and said structural members, said base portion of said U-shaped member adapted and constructed to connect the ends of said extending legs, said base portion having two inwardly extending upstanding spaced elongated elements substantially parallel with respect to said extending legs, said elements adapted and constructed to define a dovetailed slot therebetween, said facing surfaces of said legs and a portion of said base portion defining a U-shaped channel, said U-shaped channel being filled with a thermal barrier material.

2. The composite structural member as in claim **1** wherein said thermal barrier material is polyester resin.

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