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METHOD FOR MAKING AN INSULATED FRAME CONSTRUCTION

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Fig. 1

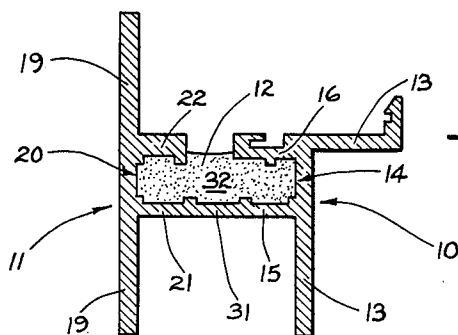
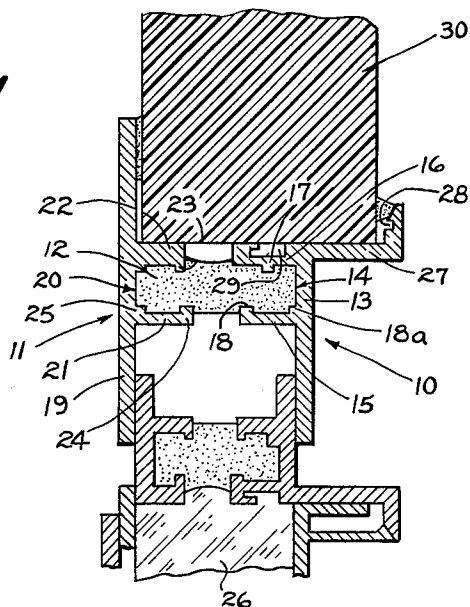


Fig. 2

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METHOD FOR MAKING AN INSULATED FRAME CONSTRUCTION

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This invention relates to a method for making an insulating construction. More particularly it relates to a method for making insulating frame constructions of the type used for supporting windows, wall panels, and the like during the fabrication of a structure from pre-formed component parts. For example, the present construction is adapted for the support of panels in "curtain wall systems."

In the accompanying drawings there is shown in FIG. 1 in top section, a window and panel supported by a frame construction made in accordance with the present invention.

FIG. 2 illustrates in top section the parts shown in FIG. 1 during the preferred method of manufacture thereof and prior to the step which thermally insulates the two sides of the frame.

Previously, metal window frames and curtain walls were constructed of heat conducting, all aluminum members for example, wherein the metal was capable of thermally conducting from the interior to the exterior surfaces of the walls in which they were used. Loss or gain of heat (where the building was heated or air-conditioned as the case may be) resulted in high operating costs in the buildings where they were employed in areas of extreme climatic conditions. Although the advantages of a fully insulated window and curtain wall structure have been recognized for a long time, and attempts to construct such window wall systems were made, the previous systems have proved to be too costly to manufacture and have been known to develop in-service failures.

For example, some prior systems have used a two-part frame wherein the exterior metal portion was separated from the interior metal portion so that thermal conduction was avoided. These systems employed a spacer between the interior and exterior portions which served as an insulator and was glued to the interior and exterior portions to achieve the necessary structural rigidity. Unfortunately, after the adhesive lost its initial elasticity, its capacity to adhere to the aluminum diminished and finally resulted in a dissociation of the component parts.

The present invention avoids all of the disadvantages of prior constructions. It includes the advantages of separating the metal on the exterior and interior of the walls by means of an insulating spacer. In addition, the novel construction employed is such that the spacer will remain in interlocked relationship with the two sides of the frame even after it may have lost any initial elasticity so that dissociation of the frame parts cannot occur.

Thus the present invention provides an insulating construction for use in window and curtain wall systems comprising a pair of structural members of relatively high thermal conductivity positioned in adjacent spaced apart relation. A mutually facing portion of each member defines a concavity. There is at least one projection extending from the surface defining each concavity. The construction includes a spacer of relatively low thermal conductivity inserted in and between the concavities of the pair of members. The spacer defines a plurality of recesses correspondingly shaped and positioned with respect to the projections and in cooperative engagement therewith. The projections and recesses are oriented relative to the remainder of the pair of members so as to mechanically interlock the members in said spaced apart relation.

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More specifically, and with reference to FIG. 1, the present construction includes a pair of structural members shown generally at 10 and 11 having an insulating spacer 12 therebetween. In the embodiment illustrated, members 10 and 11 are preferably made of metal such as aluminum. Member 10 comprises a metal strip 13 having a generally U-shaped channel 14 thereon formed with metal sides 15, 16 which are generally normal to strip 13. A plurality of projections 17, 18 and 18a protrude interiorly of channel 14 from sides 15 and 16.

In like manner member 11 includes a metal strip 19 generally parallel to metal strip 13 and in spaced apart relation therefrom. A channel 20 is formed on strip 19 by a pair of metal sides 21, 22 generally normal to strip 19. Again, a plurality of projections 23, 24 and 25 protrude interiorly of channel 20 and are supported by sides 21 and 22.

Strips 13 and 19, along with their channels 14 and 20, are maintained in the position illustrated by spacer 12 which substantially completely occupies both channels 14 and 20 and a suitable area therebetween depending upon the thickness of the windows or panels and the like which are to be used therewith.

Spacer 12 is in cooperative engagement with projections 17, 18 and 18a of channel 14 and with projections 23, 24 and 25 of channel 20, i.e., the projections are embedded in correspondingly spaced and positioned recesses in spacer 12. As a result, structural member 10 is mechanically interlocked with structural member 11 by spacer 12 and, for example, cannot be moved transversely away from member 11.

Since member 10 is not continuous with or joined to member 11, thermal conductivity between the two members is destroyed. By selecting a spacer made from material of suitably low thermal conductivity, the construction substantially prevents any gain or loss of heat through the construction.

As illustrated in FIG. 1, metal strips 13 and 19 may generally be of a configuration in accordance with prior art constructions for engaging and supporting component parts of curtain wall systems. Thus a window 26 may be inserted between strips 13 and 19 for the support thereof. On the other side opposite from window 26, strip 13 may be suitably bent as at 27 and notched as at 28 and 29, for engagement (in cooperation with strip 19) with a panel 30 (of conventional curtain wall design) that may be positioned adjacent to window 26.

Insulating spacer 12 may be made from any of the insulating materials used for such purposes in the art. In the preferred embodiment the insulating spacer is suitably made from a resinous material and may also include inorganic fillers and/or fibers that are selected for the strength as well as the insulating properties they impart. In any event, the insulating spacer composition is compounded to have the tensile strength, dimensional stability, resistance to impact, moisture, and sub-freezing temperatures as required by the particular installation. Preferably, the insulating material should exhibit good adhesion to the metal employed such as aluminum. However, this quality is not necessarily essential to the operability of the construction because of the mechanical interlocking aspects noted above.

It is noted that although the construction is illustrated with reference to the supporting of windows and panels, the structural members may be similarly used in the formation of ventilators, mullions, and the like as will be obvious to those skilled in the art.

The present invention also provides a method of making the above construction. The method of the preferred embodiment has the advantage of insuring that the completed construction will be in perfect alignment so that the windows, panels and the like supported thereby will

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fit snugly and evenly without gaps or spaces. Thus it is advantageous to have the outer surfaces of opposed channel sides lie in substantially common planes. This feature is of particular importance when it is considered that the frame is comprised of two separated parts and alignment therebetween could pose a significant problem. In the method of the present invention alignment is assured as illustrated in FIG. 2.

In accordance with the present method, section 31 (preferably metal) is employed to rigidly join at least one opposed metal side 15, 21 of each channel 14 and 20 respectively. The spacer 12 is formed by filling the interior of channels 14 and 20 and the area 32 bounded by metal section 31 and channels 14 and 20. Preferably, spacer 12 is formed from a resinous mixture in a condition of being flowed into channels 14, 20, and area 32. When the resinous insulating composition has been flowed therein, it is suitably cured and hardened by techniques well known to those skilled in the art. After the spacer 12 has been cured, section 31 is removed and severed from sides 15 and 21 by any suitable method such as sawing, milling, shearing, etc.

The insulating spacer forming material may be introduced into the appropriate areas by any suitable type of device. Conventional grouting or caulking equipment can be used for this purposes. The flowing and filling of the channels and the area therebetween is facilitated by the use of vibration. Vibration aids the flow of the material inside the channels while also reducing the amount of air bubbles which may have been entrapped in the material during mixing and handling.

In the preferred embodiment, the construction such as that illustrated in FIG. 2 is made from aluminum and is extruded directly as a unitary combination. The unit may include only one metal joining section 31 as in FIG. 2, or may also have a metal section joining sides 16 and 22. There is no particular advantage in employing the second joining section and, if used, would simply require that an additional cutting and severing operation be performed after the insulating spacer has been inserted in place.

In the configuration such as that shown in FIG. 2, the unit may be alternatively be considered as comprising a hollow metal core defined by the channels 14, 20 and metal section 31. The unit would then also include a plurality of fins formed by both ends of metal strips 13 and 19. The fins would of course engage the curtain wall component parts such as windows 26 and panel 30.

It will be appreciated that the drawings illustrate merely a portion of the construction which may be employed during use. The construction is usually contemplated as being used in the configuration of a frame for surrounding the edges of the window or panel to be supported thereby.

Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be practiced within the spirit of the invention as limited only by the scope of the appended claims.

What is claimed is:

1. A method for forming an insulating construction for use in window and curtain wall systems comprising:

(a) providing first and second metal strips disposed in generally parallel spaced relation having spaced

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apart first and second generally U-shaped channels on said respective strips formed with metal sides generally normal to said strips, at least one projection inside each channel on a side thereof, and wherein at least one metal side of each channel is positioned in opposed relation and joined together with a metal section therebetween;

(b) filling the interior of said channels and the area therebetween bounded by said metal section with an insulating spacer by flowing a resinous insulating composition therein;

(c) curing said resinous insulating composition to harden the same;

(d) and then removing said metal section joining said channels.

2. A method in accordance with claim 1 wherein said filling is executed by vibrating said metal strips and channels while flowing said resinous material therein.

3. A method in accordance with claim 1 wherein said metal strips and channels and channel joining section is a unitary extruded aluminum combination.

4. A method for making an insulating construction for use in window and curtain wall systems comprising:

(a) providing a pair of elongated structural members of relatively high thermal conductivity positioned in adjacent spaced-apart relation, wherein a mutually facing portion of each member defines a concavity, and the concavities together define a channel therebetween, wherein at least one projection extends from the surface interiorly of each concavity, and wherein the structural members include a portion spanning the space therebetween for rigidly joining the two structural members, said spanning portion defining part of the boundary of said channel in cooperation with the surfaces of said concavities;

(b) filling said channel with a solidifiable spacer forming material of relatively low thermal conductivity, and thereafter solidifying said spacer forming material, and thereby embedding said projections in the spacer material;

(c) and then removing said spanning portion joining the two structural members to destroy thermal conductivity between the two members.

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