Dec. 15, 1970 C. I. BRAGMAN 3,547,603

METHOD OF MAKING A THERMAL BARRIER

Original Filed Feb. 13, 1967

FIG. 1

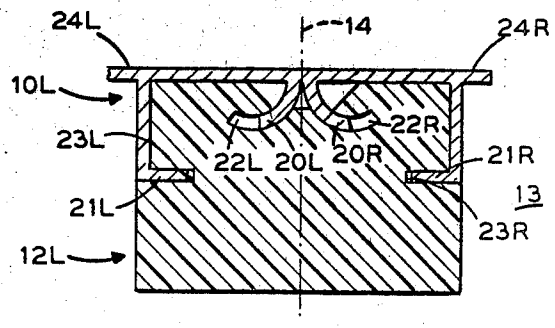


FIG. 2

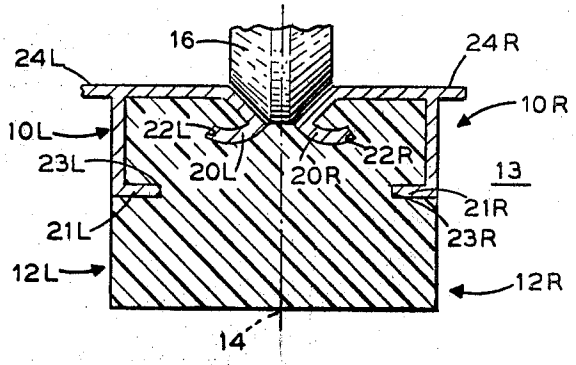


FIG. 3

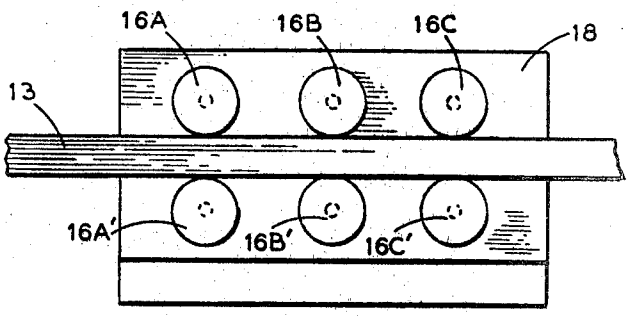
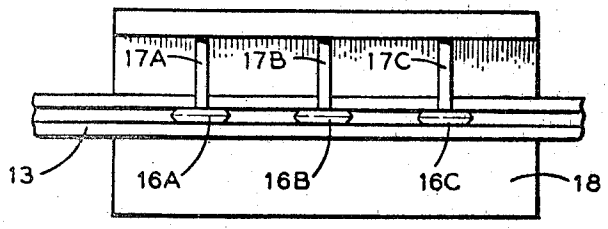


FIG. 4



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METHOD OF MAKING A THERMAL BARRIER

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Original application Feb. 13, 1967, Ser. No. 615,418, now Patent No. 3,445,974, dated May 27, 1969. Divided and this application Dec. 30, 1968, Ser. No. 803,510

Int. Cl. B23p 17/00

U.S. Cl. 29—418 8 Claims

ABSTRACT OF THE DISCLOSURE

Described is a method of making a thermal barrier, useful as stock material for an insulated frame, particularly in dual primary windows. The thermal barrier is made by telescoping (FIG. 1) metallis (preferably aluminum) frame (**10**) over insulating block (**12**). Frame and block have been prefabricated, for example, by extrusion process. The block is provided with receiving openings (**22L**, R; also **21L**, R) into which frame projections (**20L**, R; also **21L**, R) fit, initially with clearance. The frame is fractured at its center (**14**) by action of a die or roller (**16**; FIG 2) and the frame projections are forced into their receiving openings with complete sealing.

This is a division of my copending application, Ser. No. 615,418, filed Feb. 13, 1967, now Pat. No. 3,444,974, dated May 27, 1969.

This invention relates to insulated frame members, particularly frame members which may be integrated in frame structures in which the basic structural material is a metal, such as aluminum or steel. More particularly, the invention is directed to a method of making such frame members when used in conjunction with windows, curtain walls, store fronts or entrance doors.

In connection with uses mentioned in the preceding paragraph, conventional frame structures, owing to their good thermal conductivity, are subject to the undesirable effects of condensation and frosting, particularly if such structures are used in cold climates.

It is an object of the invention to provide a method of making an insulated frame member by the use of which the undesirable effects of condensation and frosting are substantially eliminated.

Another object of the invention is the provision of a method of making an insulated frame member, hereinafter also referred to as a "thermal barrier," which, when integrated in the frame structure, will provide a completely insulated window or the like.

Another object of the invention is to provide a relatively simple and inexpensive method of making the insulated frame members contemplated by the present invention, which method, insofar as is possible, draws on materials, equipment or techniques already in use in frame manufacturing, or on materials otherwise readily obtainable.

To facilitate understanding thereof and not by way of limitation, the manner in which the stated objectives are attained, and a brief statement of the invention ,are given more conveniently with reference to the accompanying drawings in which:

FIGS. 1 and 2 are cross-sectional views, drawn essentially to scale, of a thermal barrier in accordance with a preferred embodiment of the invention, these figures respectively illustrating the thermal barrier before and after completion of its manufacture; and,

FIGS. 3 and 4 are respectively front elevational and

top plan views illustrative of an embodiment of the method of the invention.

The objectives of the invention are realized, referring also primarily to FIG. 2, by provision of a method of making a thermal barrier **13** which comprises an elongated member of thermally insulating material **12**, and an elongated, relatively thin metallic frame-like member **10** which overfits the insulating member to substantial length of the latter and forms with it a unitary elongated body **13**, said metallic member being split apart along the longitudinal direction of said unitary body, the arrangement being such, that considered in cross-section through said body, the frame member at least partially envelopes the periphery of the insulating member with each free end **20L**, **20R** of the frame member projecting into a groove-like receiving opening **22L**, **22R** of said insulating member such that a tight seal is formed between the frame member and the insulating member, to the extent the frame member **10** envelopes the insulating member **12** and inclusive of the edges defining said openings.

More specifically, the thermal barrier, considered in cross-section through the unitary body, is arranged so that the frame member **10** overlies only part of the insulating member's **12** outer periphery and is composed of two split-apart half-members **20L**, **10R**, each having two free ends **20L**, **21L**; **20R**, **21R** projecting into receiving openings **22L**, **22R**, **23L**, **23R** of the insulating member and in sealing relation therewith.

The thermal barrier **13** is essentially rectangular in cross-section, but the frame member **10** is preferably provided with flangelike projections **24L**, **24R**, which project beyond the rectangle, essentially parallel to that rectangular side which is formed solely by the insulating member **12**. The projections facilitate attachment of the thermal barrier **13**, for example, to the main metallic structure of a window frame.

Further objects of the invention, and the manner of realization of the objects of the invention, particularly the preferred method of making the thermal barrier and also additional novel features of the invention, are set forth in the following, more detailed description, of which the appended claims form a part.

In FIGS. 1 and 2, which will be described first, the basic structural frame member is generally designated by **10**, and the block of insulating material with which the frame **10** is united (see FIG. 2), generally by **12**. Since the members **10** and **12** are symmetrical with respect to the central axis **14**, it is convenient in the description to refer to left parts by the suffix letter L, and to the right parts by suffix letter R. Only one of the parts (L or R) is explicitly described, and the description of its symmetrical part is by implication. Upon occasion, reference is made without suffix letter, and such description is intended to apply generically to the left and the right part. In this manner, needless repetition of identical verbiage is avoided.

The frame member **10** is made of a relatively thin metal (.062 inch typical), and has been prefabricated to the illustrated configuration by extrusion process. Especially for usage in window frames, the member **10** is made of aluminum; for other, related uses it may be made of steel.

The block **12** also has been prefabricated to the illustrated geometric configuration by extrusion process; materials suitable for forming the block **12** may be known rigid materials of low heat conductivity, which lend themselves well to extrusion process, such as polyvinyl chloride, polyethylene or polystyrene. The block **12** and the frame member **10** are generally prefabricated so as to be coextensive in depth (into and out of paper), and will usu-

ally be made of uniform cross-section, namely that illustrated, even in the front and rear end surfaces (viewed into the paper). Alternatively, depending upon the particular contemplated use, the cross-section may be varied, or the end terminations may differ from cross-sections taken elsewhere, or one of the two members, **10** or **12**, may be made longer than the other. Such modifications need not be described in detail.

The frame **10** and block **12** are so prefabricated as to be readily joined to be coextensive in depth by hand operation, if desired, to a moderately snug fit which may be achieved by sliding one over the other. Such preassembled form is illustrated in FIG. 1. As illustrated in FIG. 2, the members **10** and **12** have been joined together so as to form a unitary structure by the action of a retractably depressible forming member **16**, which for relatively long-depth frame structures may be a roller, for example, a pinch roller as will be apparent from a consideration of the subsequent drawing figures. Where the united structure, herein also referred to as the insulated frame member or the thermal barrier **13**, has relatively short-depth, the forming member **16** may alternatively be a suitably shaped die or punch.

In FIGS. 3 and 4 is shown apparatus suitable for forming the thermal barrier on a continuous basis. The forming members **16** are shown as three pairs of powered rollers **16***a*, **16***a'*; **16***b*, **16***b'*; **16***c*, **16***c'*. The roller pairs may be arranged approximately four to six inches from one pair to the next pair. The rollers are affixed to suitable driving shafts **17***a*, **17***b*, **17***c*, which are supported for rotation by a suitable support **18**, and are driven by motor drive (not shown) contained within the unit **18**. Positive drive may also be imparted to the rollers **16***a'*, **16***b'*, **16***c'*, or these may be simply idler rollers. The separating distance between the two rollers of a particular pair is made progressively smaller, so that separation between rollers **16***a* and **16***a'* is the greatest and that between the rollers **16***c* and **16***c'* the smallest. In this manner, the fracturing of the metallic extrusion member **10** and its union with the thermoplastic member **12** is gradually, but continuously accomplished.

The completed thermal barrier **13** may now be used as stock material for an insulated frame for dual primary windows. As is known in the art, such a dual primary window comprises two sash pairs, one pair of which is disposed towards the "street" side, and the other pair towards the "room" side. In each pair, at least one sash is slidable; the other may be fixed light or may also be slidable. It is in connection with such a dual primary window that the need for a thermal barrier between the two sash pairs exists; owing to the good conductivity of the metallic framework, usually aluminum framework, frosting of the "room" side sash pair may occur. Such frosting is avoided by provision of a thermal barrier, which is formed as a rectangular frame, co-extensive with and integrated into the overall framework for the dual primary window. Such an assembly is per se well-known in the art.

For the purposes mentioned in the preceding paragraph, the thermal barrier stock material **13** is out to four lengths per primary window structure; they may be suitably mitered if desired. The four lengths may be united with the overall frame structure and with each other by suitable sheet metal screws as is well-known in the art.

The completed thermal barrier stock material **13**, which may be typically .75 in. x .50 in., has decided advantages over thermal barriers heretofore known, among which are the following:

(1) In the construction of dual primary window, one may prepare the basic framework separately and independently of the thermal barrier, then integrate the thermal barrier to complete the frame structure. According to prior approaches, it has not been possible to dissociate the forming of the basic frame structure and that of the thermal barrier; a series of complicated steps had been required to introduce the thermoplastic insulating material into the surrounding metallic structure, which metallic structure invariably had been part of the basic framework.

(2) The completed thermal barrier stock material **13** locks the insulating material **12** rigidly in place so that the material **13** can still be handled as if it were a single piece of aluminum. In contrast, by the prior approaches, it had been necessary to provide two separate aluminum frames and then unite them with an insulating separator, which invariably was rather loose fitting, and for this reason structurally not the best nor very efficient as an insulator. Such prior assemblies require additional sealant; that of the present invention does not.

(3) Fewer parts are needed to complete the thermal barrier frame for a dual primary window. By use of the herein disclosed techniques, the completed stock material **13** (insulating material **12** included), merely four pieces need be cut as has been stated. According to prior techniques it had been necessary to cut eight pieces of metal and four pieces of insulating material before attempting union of these into twelve pieces with each other and with the basic overall frame structure.

From the aforegoing, it is apparent that by the present invention there has been provided, a particularly advantageous thermal barrier structure and method of making the same. The invention has been described with reference to presently preferred embodiments thereof. However, it is intended to embrace within the invention such modifications as fall within its true spirit and scope.

What is claimed is:

1. A method of making a thermal barrier comprising the steps of providing an elongated member of thermally insulating material having a plurality of longitudinally extending grooves, two of which grooves diverge from each other, and an elongated, relatively thin metallic frame member which is adapted to overfit said insulating member for a substantial length of the latter so that, when considered in cross-section through both members in overfitted relation, the frame member at least partially envelopes the periphery of the insulating member, said frame member being provided with a plurality of elongated extensions, two of which diverge from each other with reference to a longitudinally extending separating line, which is essentially the line of intersection of those two extensions, each in said plurality of extensions adapted to fit into a respective one of said grooves to at least part depth of the respective groove when the frame member overfits the insulating member; fitting the frame member with said extensions engaging said grooves over said insulating member; and applying pressure along said separating line thereby to deform said extensions into said grooves and fracture along the separating line, the frame member and to cause it to engage in tight sealing relation the insulating member, to the extent the former overlies the latter and inclusive of the surface defining the extension-receiving grooves.

2. The method according to claim **1**, wherein the insulating member is prefabricated by extrusion process.

3. The method according to claim **1**, wherein the frame member is prefabricated by extrusion process.

4. The method according to claim **1**, wherein fracturing of the frame member is accomplished by means of at least one pinch roller.

5. The method according to claim **1**, wherein fracturing of the frame member is accomplished in gradual manner by successive application of a plurality of pinch rollers to one and the same point located on the aforesaid separating line, and to a succession of such points.

6. The method according to claim **1** wherein the frame member is made of aluminum.

7. The method according to claim **1** wherein the frame member is made of steel.

8. The method according to claim **1** wherein the insulating member is made of rigid insulating material selected

from the group consisting of polyvinyl chloride, polyethylene, polystyrene.

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