This invention relates to curtain wall construction and more particularly to a prefabricated insulation unit for a metal window enclosure.

With the advent of metal construction used in curtain wall and other metal window enclosures, problems of heat conduction have arisen. The use of aluminum for the metal frames allows a greater transfer of heat between wall elements than heretofore took place in previous building wall construction. Accordingly, an insulation problem is presented, and although prior art attempts have been made to solve this insulation problem, none have been entirely successful. In one case, a laminated insulating strip has been attempted, but this strip was assembled on the job site with considerable difficulty and was found to lack in permanent installation due to deterioration.

It is an object of the present invention to provide an insulating construction in a metal window enclosure that can be prefabricated with the window assembly, is simply installed, inexpensive and efficient in insulating qualities. It is another object of the present invention to provide an insulating construction in a metal window enclosure that will prevent condensation forming on the metal walls before it forms on the glass enclosure.

It is further object of the present invention to provide an insulation construction for a metal wall enclosure that will prevent metal to metal contact between the inside and outside walls and provide a permanent insulation installation.

It is still another object of the present invention to provide an insulation barrier for a metal window enclosure that is formed from thermosetting plastic that is preassembled with the window frame and is not visible in the completed installation.

It is a further object of the present invention to provide an insulating construction in a metal window enclosure that upon installation retains the beauty and structural stability of conventional curtain wall construction.

In order that this invention may be fully understood, the following drawings are provided in which:

FIG. 1 is a view in elevation of a curtain wall on a building.

FIG. 2 is a sectional view taken on line II-II of FIG. 1.

FIG. 3 is an enlarged cross sectional view of that part of FIG. 2 where the window and insulated panel are joined.

FIG. 4 is a cross-sectional view showing the details of assembly of the insulating plastic barrier.

FIG. 5 is a view in perspective of the metal clip used to fasten the insulating plastic barrier in place.

FIG. 6 is a view similar to FIG. 4 showing a modification of the fastening means for the insulating plastic barrier.

Referring to the drawings a conventional curtain wall construction is shown in FIGS. 1 and 2. "Curtain wall" as referred to herein includes the complete sidewalk enclosure of a building excluding the building supporting elements, and as illustrated shows vertically alternating insulated panels 10 and glazing means or glass windows 11. Brickwork 12 may also be used on the surface, but it is to be understood that the invention is not to be limited to any specific building construction, but refers to any curtain wall having metal window enclosures.

In FIG. 2 a cross-section view of the curtain wall shows the junction 13 between insulated panel 10 and window 11, and this junction will be described in detail in connection with FIG. 3. The mullion or frame 14 surrounds the window, and the masonry wall is represented by the numeral 16. A closure wall 18 separates the curtain wall from heating units 19 having heating coils 21. Concrete flooring 23 has set thereon the base moulding 22, and below flooring 23 is a ceiling joist 24 with parts 26, 27, 28 and 29 representing a suspended ceiling.

The junction 13 connects window 11 and panel 10 through a plurality of aluminum parts and at least one insulating element. In the particular embodiment shown three insulating elements 36, 37 and 38 are shown with a variation in size, but it should be understood that more or less than three insulating elements may be used, and that they may all be of the same or different size. Window 11 is shown as a single pane, but it may also be a conventional double window construction having an insulating space therebetween. In the assembly illustrated parts 43 and 44 are made of extruded aluminum with part 43 being the outer part exposed to the area outside of the building and part 44 is the inner part exposed to the inside of the building. Since aluminum parts necessarily transfer heat readily, the invention is seen to be embodied in the assembly comprising a thermo-setting plastic barrier 36 placed between parts 43 and 44 to prevent metal to metal contact. A snap-on glazing bead 42 is made of extruded aluminum and fits in place on the top of part 43 and cooperates with an upwardly extending portion of part 44 to horizontally position window 11. Conventional supports not shown vertically position window 11 and conventional glazing materials 39 and 41 are used to fit and seal the window.

Plastic barrier 36 and its fastening means are more clearly shown in FIGS. 4 and 5. Plastic barrier 36 is formed from rigid thermo-setting plastic material having a low coefficient of heat transfer and is shown in the FIG. 4 embodiment with notches 45 formed adjacent its transverse ends. Although plastic barrier 36 is shown as having a particular cross-sectional configuration, it is understood that the plastic barrier 36 is not to be limited to any particular cross-sectional shape as long as notches 45 are formed adjacent the ends. However, as shown in the FIG. 6 embodiment, these notches are not essential if different fastening means are used.

The ends of plastic barrier 36 are mounted in outer part 43 and inner part 44 with clamping means 46 which comprises a U-shaped metal clip. The legs of the U are angled slightly outward from the center and include a plurality of tabs 47 formed by bending small sections of the metal inwardly along the legs of the U. For receiving the plastic barrier 36 and clips 46 it will be seen from FIG. 4 that part 43 has recesses sections 34 and 35, and part 44 has recessed sections 32 and 33. It should be noticed in FIG. 4 that there is no direct contact between plastic barrier 36 and parts 43 and 44 when they are assembled, and spaces 30 and 31 are provided to prevent such contact between the shank of plastic barrier 36 and the ends of parts 43 and 44. This spacing aids assembly and fitting.

One of the important advantages of this invention is that the assembly of the entire insulating unit can be prefabricated at the factory instead of at the job installation area as done previously. The assembly can be done in a jig holding parts 43 and 44 while the clips 46, 47 and 36, which preferably are extruded, are preassembled in recesses 32, 33, 34 and 35. Next the plastic barrier 36, which extends continuously beneath the window, is
forced into the same recessed area. The rigid thermo-setting plastic material of barrier 36 forces the tabs 47 of clips 46 open until they slip into notches 45 whereupon the plastic barrier 36 is locked in place so that the aluminum parts 43 and 44, steel clips 46 and plastic barrier 36 become an integral permanently locked unit. This prefabricated unit can then be easily handled for final installation at the job site instead of having to do all such filing on the job. It will be seen that when glazing insert 42 is snapped in place that plastic barrier 36 is completely hidden so that the beauty of the curtain wall is maintained and the thermal efficiency improved since there is no metal to metal contact between the inside and outside walls. The insulated assembly will prevent condensation forming on the exterior of the aluminum frame to a point where condensation will form on the glass 11 before it forms on the exterior aluminum.

It will be seen from FIG. 3 that when the plastic barrier 36 is in place, it is spaced a substantial distance from the window 11 and the cross-sectional, longitudinal center line of window 11 passes generally through the inside end area of the plastic barrier. The junction 13 further includes the Mullion or outside frame parts 48 and 49 that are interlocked to support part 43 which in assembly is the window sash. Parts 52 and 54 form the inside frame, and parts 51 and 52 are against which the sash closes to give a water tight curtain wall. Weatherstrip 58 is provided of vinyl, and if desired, a second weatherstrip on the inside frame can be provided for double protection.

Between outside frame parts 48 and 49 and inside frame parts 52 and 54 are positioned additional thermo-setting plastic barriers 37 and 38. These plastic barriers are mounted in the same manner as described previously for plastic barrier 36 and as shown in FIG. 4. Similarly the frame unit 48, 49, 52 and 53 along with plastic barriers 37 and 38 can be preassembled at the factory as previously described in connection with plastic barrier 36, and this preassembly affords the same advantages mentioned hereinafore. Accordingly, it will not be necessary to describe again the details of the insulating unit and its assembly.

Outside part 56 is a downwardly projecting glazing bead similar to part 42, and part 56 cooperates with inside part 54 to contain insulating panel 10 therebetween, which is supported in a conventional manner, not shown. Glazing beads 57 and 57' are used on the sides of panel 10 for fitting. Panel 10 is seen to comprise an inside face 61 and an outside face 62 turned over at their top to overlap and be separated by a vinyl gasket 63. Fastening means such as steel screws, not shown, hold the faces together and the hollow central portion is filled with insulating material such as fiber glass 64. It will be seen from FIG. 3 that the cross-sectional longitudinal center line of panel 10 passes generally through the outside end area of the plastic barriers 36, 37 and 38.

A modification of the fastening means for the plastic barriers 36, 37 and 38 is shown in FIG. 6 in which the steel clips 46 are not required. The embodiment will be described for the parts 43 and 44 although it is understood this form of the fastening means can be used with all the plastic barriers placed in the curtain wall. In FIG. 6 the plastic barriers are illustrated by barrier 71 which has an unchanging cross-sectional dimension. A recess 72 is formed in part 43 and a recess 73 is formed in part 44 to receive the plastic barrier 71. It is seen that the transverse dimension of the recesses is larger than the transverse dimension of the barrier and the longitudinal walls of the recesses include serrations 74 and 75 in parts 43 and 44, respectively. Part 43, which is shown in this embodiment as the outside part holding the plastic barrier, includes a backing portion 76 so that a spacing 77 can be formed between the end of plastic barrier 71 and portion 76. In part 44 a spacing 78 is formed by recess 73. In the recesses 72 and 73 an adhesive is placed to coat the recesses, fill the serrations 74, 75, 77, 78 so that a locking bond is formed between the plastic barrier 71 and parts 43 and 44 and when plastic barrier 71 is placed within the adhesive. All the assembled parts are then positioned in a jig until the adhesive sets. It will be seen that the adhesive forms a complete layer around all confines of recesses 72 and 73 so that there is no direct contact between insulator 71 and parts 43 and 44, and the assembled unit can then be taken to the job site for installation as described in connection with FIGS. 3 and 4.

The particular embodiments of the invention illustrated and described are to be considered illustrative only. The present invention includes such other modifications and equivalents as may readily occur to one skilled in the art, within the scope of the appended claims.

It is claimed and desired to secure by Letters Patent: 1. A metal curtain wall on a building having an inner metal part forming part of the inside wall of the building, an outer metal part spaced from said inner part and forming part of the outer wall of the building, a plastic barrier portion held in said inner element receiving area and the other end positioned within said outer element receiving area, all parts of the outside surface of said insulating element being spaced a predetermined distance from the edge surfaces of said element receiving areas so that an insulating space is formed therebetween, fastening means located in said space for attaching said insulating element to said surfaces of said receiving areas, the cross-sectional center line of said window passing through the inner element receiving area and the cross-sectional center line of said insulated panel passing through said outer element receiving area, said insulating element being positioned between and spaced from the adjacent ends of said window and insulating panel.

2. A pre-fabricated aluminum curtain wall on a building having an inner aluminum part forming a part of the inside wall of the building, an outer aluminum part spaced from said inner part and forming part of the outer wall of the building, a window being positioned between said walls in fixed relation relative thereto, an insulated panel spaced from said window and forming part of said outer wall, said inner and outer parts each having an element receiving area formed therein in facing relation to each other, a rigid plastic insulating element longitudinally positioned with one end within said inner element receiving area and the other end positioned within said outer element receiving area, all parts of the outside surface of said insulating element being spaced a predetermined distance from the edge surfaces of said element receiving areas so that an insulating space is formed therebetween, fastening means located in said space for attaching said insulating element to said surfaces of said receiving areas, the cross-sectional center line of said window passing through the inner element receiving area and the cross-sectional center line of said insulated panel passing through said outer element receiving area, said insulating element being positioned between and spaced from the adjacent ends of said window and insulating panel.

3. A pre-fabricated aluminum curtain wall on a building having an inner aluminum part forming a part of the
inside wall of the building, an outer aluminum part spaced from said inner part and forming part of the outer wall of the building, a window being positioned between said walls in fixed relation relative thereto, an insulated aluminum panel spaced from said window and forming part of said outer wall, said inner and outer parts each having an element receiving area formed therein in facing relation to each other, a rigid thermo-setting plastic insulating element longitudinally positioned with one end within said inner element receiving area and the other end positioned within said outer element receiving area, all parts of the outside surface of said insulating element being spaced a predetermined distance from the edge surfaces of said element receiving areas so that an insulating space is formed therebetween, an adhesive bonding layer being deposited in each element receiving area and extending around the ends of said insulating element to fill said insulating space between the outer surface of the insulating element and the edge surfaces of said element receiving areas, the cross-sectional center line of said window passing through the inner element receiving area and the cross-sectional center line of said insulated panel passing through said outer element receiving area, said insulating element being positioned between and spaced from the adjacent ends of said window and insulating panel.

4. A pre-fabricated aluminum curtain wall on a building having an inner aluminum part forming a part of the inside wall of the building, an outer aluminum part spaced from said inner part and forming part of the outer wall of the building, a window being positioned between said walls in fixed relation relative thereto, an insulated aluminum panel spaced from said window and forming part of said outer wall, said inner and outer parts each having an element receiving area formed therein in facing relation to each other, a rigid thermo-setting plastic insulating element longitudinally positioned with one end within said inner element receiving area and the other end positioned within said outer element receiving area, all parts of the outside surface of said insulating element being spaced a predetermined distance from the edge surfaces of said element receiving areas so that an insulating space is formed therebetween, fastening means located in said first and second spaces for attaching said first and second insulating elements to said surfaces of said first and second receiving areas, respectively, the cross-sectional center line of said window passing through the first and second inner element receiving areas and the cross-sectional center line of said insulated panel passing through said first and second outer element receiving areas, said first and second insulating elements positioned between and spaced from the adjacent ends of said window and insulated panel.

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