April 5, 1966 M. C. BECHERER 3,243,931

PREFABRICATED THERMAL INSULATION PANEL

Filed Nov. 6, 1961 2 Sheets-Sheet 1

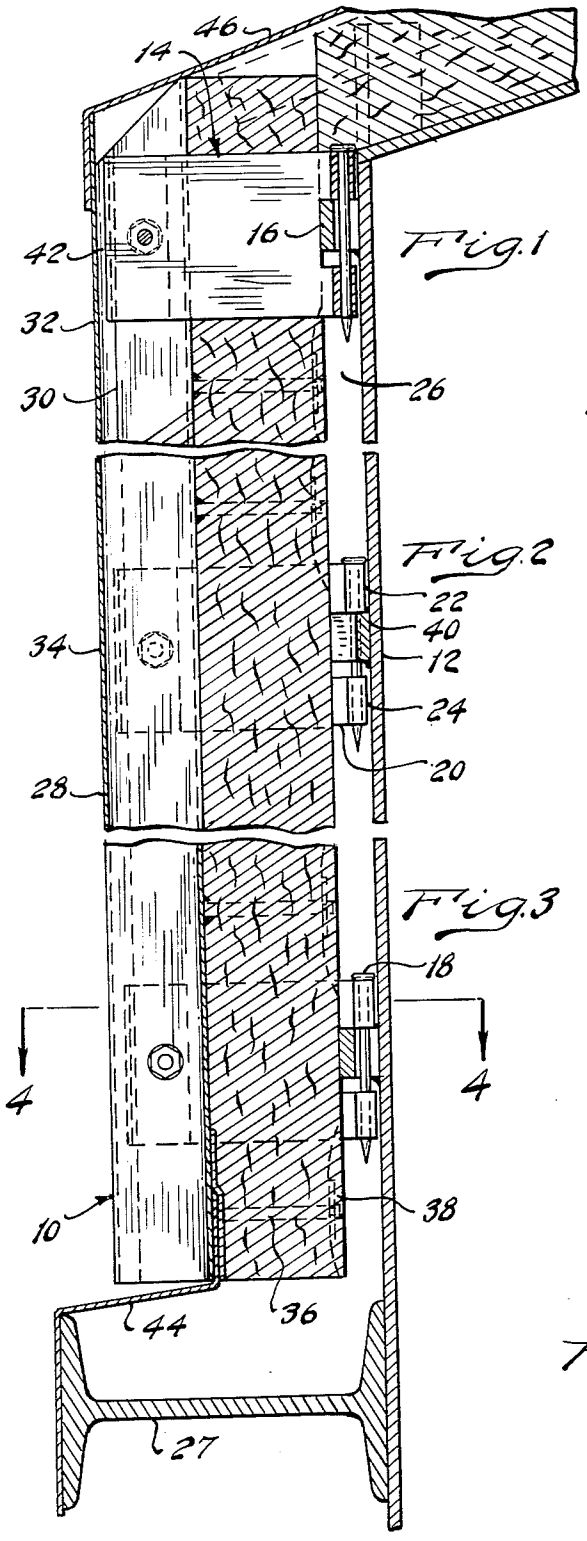


Fig. 1

Fig. 2

Fig. 3

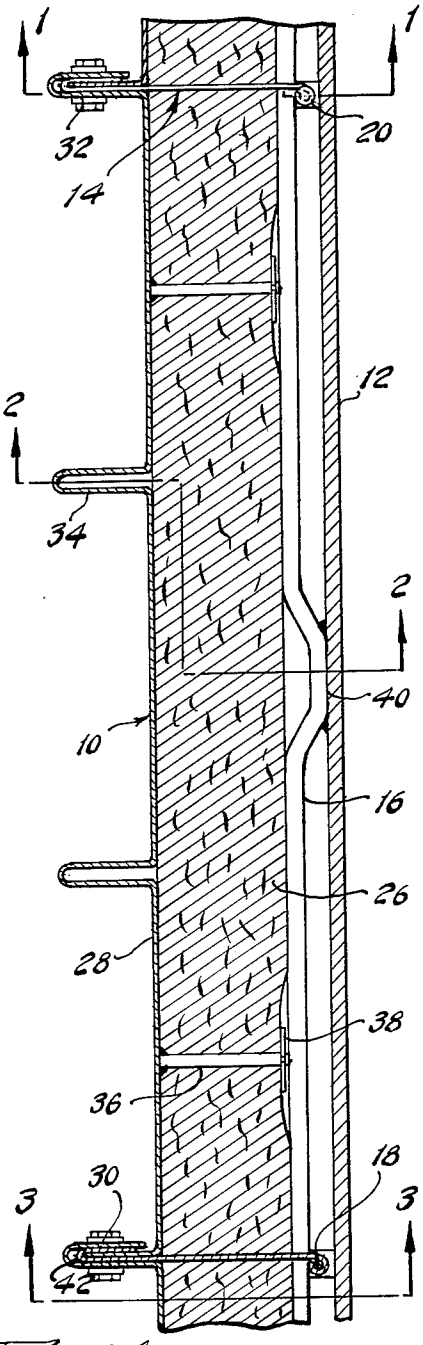


Fig. 4

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Fig. 5

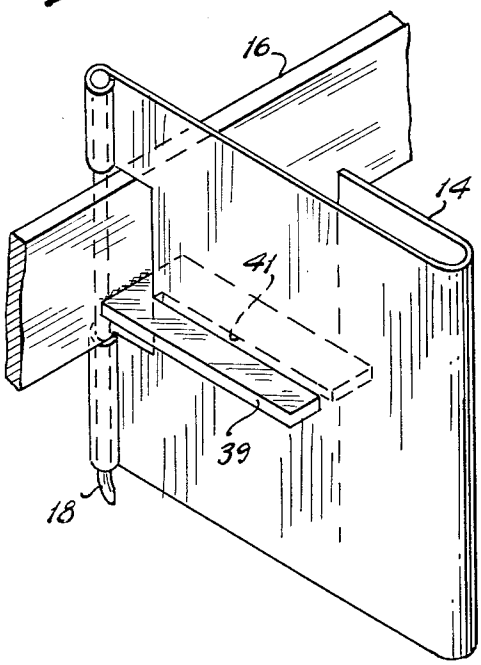
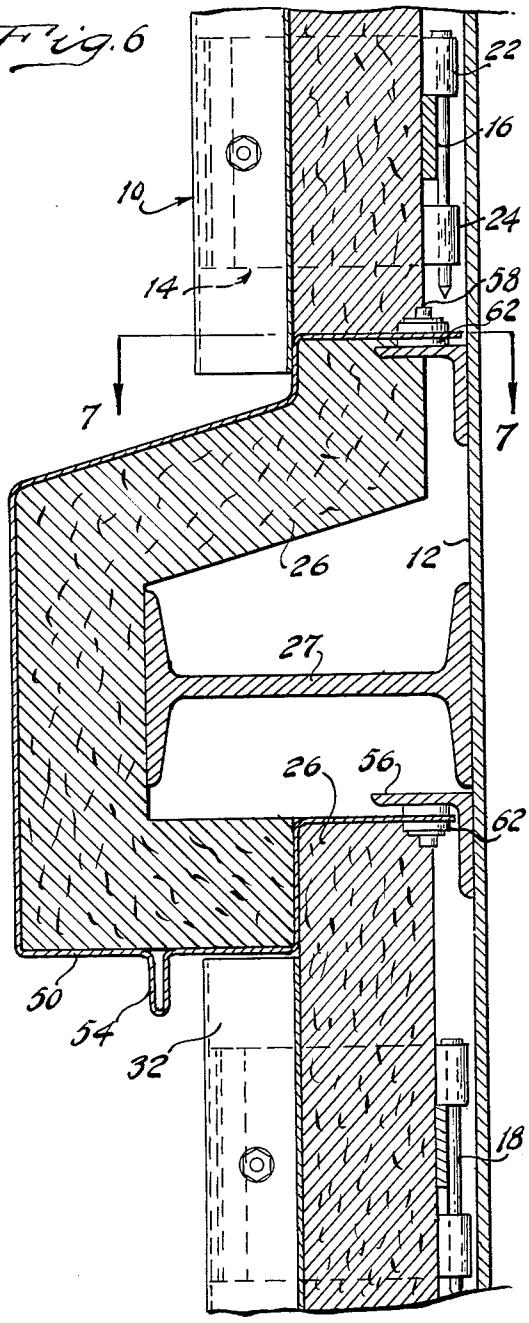


Fig. 6



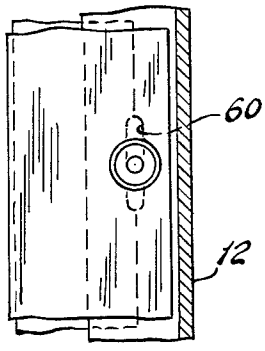


Fig. 7

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PREFABRICATED THERMAL INSULATION PANEL

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7 Claims. (Cl. 52—483)

The invention relates to a method of and means for insulating medium and high temperature heating ducts or the like and refers more specifically to pre-insulated building panels and a method of installing the preinsulated panels on medium and high temperature heating ducts permitting differential expansion of the heating ducts and preinsulated panels in a plurality of directions.

In the past insulation of boilers, heating ducts, and similar apparatus has been accomplished by a plurality of separate operations. The insulation was first applied to the structure to be insulated and the insulated structure was later covered by preformed panels or similar lagging supported independently of the insulation and insulated structure. Differential movement due to different expansion and contraction of the lagging and member insulated caused by different materials and different temperatures thereof has therefore been possible.

Such insulating procedures are both time consuming and expensive in that they require separate individual handling of the lagging and insulating material usually by separate contractors requiring separate scaffolding for performing their work at different times. In addition when the lagging supports have been secured to the structure to be insulated the supports have hindered the work of the insulation installing contractor, thus increasing the cost of installation of the insulation. Conversely if separate supports for the lagging are provided they must be provided at additional expense.

It is therefore one of the objects of the present invention to provide a preinsulated panel for installation on medium and high temperature heating ducts or similar structures.

Another object is to provide means for attaching a preinsulated panel to a medium or high temperature heating duct or similar structure which permits differential expansion between the panel and structure to which it is attached in a plurality of directions.

Another object is to provide a method of installing preinsulated building panels on medium or high temperature heating ducts or similar structures so that differential expansion between the building panels and structure is permitted.

Another object is to provide means for securing a preinsulated building panel having male and female mating longitudinal edges to a heating duct or similar structure comprising a clip having an open returned end fitting over the male edge of one panel, sandwiched between the female edge of the adjacent panel and secured between said panels, the other end of the clip being bifurcated and provided with cylindrical edge portions, a bar secured to said structure in spaced relation thereto positioned between the cylindrical edge portions of the bifurcated end of the clip and fastening means extending through the cylindrical edge portions of the bifurcated end of the clip on each side of the bar and between the bar and structure.

Another object is to provide means for securing a preinsulated building panel to a heating duct or similar structure as set forth above wherein the space between the cylindrical edge portions of the bifurcated end of the clips is substantially greater than the similar dimension of the bar whereby differential longitudinal movement of the building panel relative to the structure is permitted.

Another object is to provide means for securing a preinsulated panel to a heating duct or similar structure as set forth above including means for limiting the movement of panels longitudinally of said bar in installations wherein the panels and bar are inclined or wherein vibration tends to cause the panels to slide in one direction on the bar.

Another object is to provide means for securing a preinsulated building panel to a heating duct or similar structure as set forth above and preinsulated flashing means for closing the ends of the panels and insulating structural members used in conjunction with the duct which preinsulated flashing members include means for permitting expansion thereof relative to the heating duct in a plurality of different directions.

Another object is to provide a preinsulated building panel for use in structure as set forth above wherein the outer surface of the building panel has a plurality of inwardly open ribs therein and insulation is secured to the inner surface of the building panels.

Another object is to provide a preinsulated panel as set forth above wherein the insulation is secured to the inner surface thereof by means of members secured to the inner surface of the panels extending through the insulation and clips provided on the ends thereof to engage the insulating material directly or in the case of soft blanket insulation to engage the reinforced backing material.

Another object is to provide a method of and means for installing preinsulated building panels on medium or high temperature heating ducts or similar structure which is simple, economical and efficient.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating a preferred embodiment of the invention, wherein:

FIGURE 1 is a vertical section of a portion of a heating duct having preinsulated building panels secured thereto by the means and method of the invention which section is taken substantially on the line 1—1 of FIGURE 4.

FIGURE 2 is a vertical section of the insulated heat duct illustrated in FIGURE 4 taken substantially along the line 2—2 in FIGURE 4.

FIGURE 3 is another vertical section of the insulated heat duct shown in FIGURE 4 and taken substantially on the line 3—3 of FIGURE 4.

FIGURE 4 is a horizontal section of the insulated heat duct shown in FIGURE 3 taken substantially on the line 4—4 in FIGURE 3.

FIGURE 5 is a perspective view of a clip constructed in accordance with the invention secured to a panel hanger bar illustrating means for limiting movement of the clip longitudinally of the bar.

FIGURE 6 is a vertical section of a portion of a heating duct having preinsulated building panels secured thereto by the means and method of the invention and further showing preinsulated flashing in conjunction therewith for insulating a structural member secured to the duct having

means for permitting expansion thereof in a plurality of directions relative to the duct.

FIGURE 7 is a section through the heating duct and insulation therefor illustrated in FIGURE 6 taken substantially on the line 7—7 in FIGURE 6.

With particular reference to the figures of the drawing, one embodiment of the invention will now be disclosed.

In accordance with the invention the preinsulated building panels **10** are installed on the wall of a medium or high temperature heating duct **12** by means of the clips **14**, offset bars **16** and nails **18**. In installation the offset bars **16** are secured to the duct **12**, the panels **10** are held in position on the duct **12**, as shown in FIGURES 1–3, the clips **14** are clamped between the male and female edges of adjacent panels, as shown best in FIGURE 4 with the bifurcated end **20** positioned on opposite sides of a bar **16** and a fastening member such as nail **18** is passed through the cylindrical edge portions **22** and **24** of the clip **20** and between the bar **16** and duct **12**, as shown in FIGURES 1–3. Since the bifurcated end **20** has a wider grip or space between the adjacent ends of the cylindrical edge portions **22** and **24** thereof than the width of the bar **16** the panels **10** are supported for differential expansion with respect to the duct **12** in a plurality of directions.

More specifically the duct **12** may be constructed of steel plates welded together forming an enclosure for the purpose of conducting heated gases between remote locations. Duct **12** is supported by convenient framing members, such as frame member **27**, and is required to be insulated to prevent uneconomical loss of heat therefrom. Further the insulation applied to the duct **12** must be protected from dirt, rain and so forth whereby it is necessary to apply sheet metal covering or lagging thereover.

Duct **12** is subjected to high temperatures which may be as great as 1000° F. The sheet metal skin or lagging for the duct **12** is not of course subjected to such high temperatures and therefore expands a different amount from the duct **12**. The different expansion is accentuated since it is common to use dissimilar metals having different coefficients of expansion for the duct and lagging. Provision must therefore be made for securing the lagging to the duct **12** to provide for the different expansion without opening of the seams of the lagging or destroying the connection between the lagging and duct.

In accordance with the present invention the insulation **26** and metal lagging **28** are provided in a single preinsulated panel **10** adapted to be installed on duct **12**. Panel **10**, as best shown in FIGURE 4, comprises an elongated metal lagging sheet **28** having a male rib **30** at one side thereof and a female rib **32** along the opposite side. The sheet **28** is further provided with spaced apart inwardly open longitudinally extending ribs **34**, as shown best in FIGURE 4.

The insulation **26**, as shown in FIGURE 4, is secured to the lagging sheet **28** by means of insulation pins **36** secured to the inner surface of the lagging sheet **28** by welding or other convenient means and clips **38** adapted to fit over the ends of the insulation pins **36** after the insulation **26** has been impaled thereon, as shown in FIGURE 4. Thus the insulation **26** may be installed on lagging sheet **28** at a location remote from a building site and subsequently installed on a duct **12** or similar structure without the necessity of first securing the insulation to the structure and later individually covering the insulation with lagging as has previously been the practice.

For the installation of the individual panels **10** on a duct **12**, bars **16** are secured to the duct **12** in spaced apart horizontal rows. It will be particularly noted that the bars **16** have offset portions **40** which are fastened directly to the duct **12** and that the major portion of the bars **16** are in spaced relation to the duct **12**.

In a particular installation it has been found that with panels **10** up to twenty feet long eighteen inches wide and supporting thermal insulation up to four inches thick that the spacing of bars **16** should not exceed a six feet maximum vertical spacing nor should the distance between the bars and the end of the panel be more than six feet. Maximum spacing of the bars should be reduced to four feet on horizontal bottom surfaces.

The clips **14** are provided with an open return end **42** adapted to fit over the male side of a panel as illustrated best in FIGURE 4. The other ends **20** of clips **14** are bifurcated as previously indicated and have cylindrical side portions **22** and **24** adapted to fit over the bars **16** in installation, as shown best in FIGURES 1–3.

It will be particularly noted that the bifurcated ends **20** of the clips **14** provide clearance to permit movement of the clips **14** transversely of the bar **16** with the bifurcated end positioned over the bar **16**, as shown in FIGURES 1–3. Thus differential longitudinal expansion of the installed panels **10** relative to the duct **12** is permitted when the panels **10** are secured to the bars **16** by clips **14** movable with panels **10**.

Differential expansion longitudinally of the bar **16** relative to the panels **10** or, in other words, transversely of the panels **10** relative to the bar **16**, is then permitted due to the bars **16** being offset from the surface of the duct **12**. The bifurcated end **20** of the clips **14** slide along the bars **16** to permit the differential expansion transversely of the panels **10**.

Thus it will be seen that differential expansion both longitudinally and horizontally of the panels **10** relative to the duct **12** or for that matter in any direction in the plane of the panels and duct is possible by installation of panels **10** on the duct **12** by the means set forth above. Further, it will be readily apparent that installation of the preinsulated panels **10** on the duct **12** by means of clips **14** is extremely simple and economical.

Where the panels **10** are inclined from a vertical direction and the support bars are therefore inclined from a horizontal direction or where vibration could cause the panels to slide in one direction thereby tending to disengage the male and female ribs of adjacent panels, it becomes necessary to limit movement and therefore expansion of the panels transversely of the panels. This is accomplished by welding a slotted "Nelson" stud **39** to the support bars at the location of each clip **14** and engaging the clip in the slot **41** in the stud as shown in FIGURE 5. The slotted stud **39** will limit the movement of the clip **14** transversely of the panel to a predetermined amount, without limiting the expansion longitudinally of the panel.

While it is believed that the steps in the method of installing the panels **10** on the duct **12** will be evident from the foregoing, the method will be considered in more detail. In installing the preinsulated panels **10** on a duct **12**, the offset bars **16** are first welded or otherwise conveniently attached to the duct **12** at the offset portions **40** thereof. Exact spacing between the bars **16** is not required since the position of the clips **14** relative to the panels **10** may be varied to accommodate approximately spaced bars **16**.

Panel **10** is positioned adjacent the duct **12** as shown in FIGURES 1–3. A clip **14** is then positioned so that the open returned end **42** thereof is placed over the male edge **30** of the panel **10** and the bifurcated end **20** of the clip **14** extends on both sides of a bar **16**. With the clip, panel and bar so related, a nail or similar securing means **18** is passed through the cylindrical edge portions **22** and **24** of end **20** of clip **14** and between the bar **16** and duct **12**.

A second panel is positioned adjacent the first panel with the female edge **32** thereof including the male edge **30** of the adjacent panel and the open returned end **42** of the clip **14** therebetween as shown best in FIGURE 4. The male and female edges of the adjacent panels and the clip **14** are then secured together through the rib

formed thereby by convenient means such as screws, nuts, and sealing washers or tight button punches. In general, the more secure fastening means, such as screws and nuts, should be used at the top clip of a panel and on inclined hanging surfaces.

The method may then be repeated on subsequent panels until an entire duct **12** is covered. If desired the ends of panels **10** and structural members such as members **27** may be finished with the usual flashing **44** and roofing material **46** as shown in FIGURES 1 and 3. However, it is preferred to provide insulated flashings over structural members at the ends of panels and at corners similar to that shown in FIGURES 6 and 7.

As shown in FIGURES 6 and 7 the flashing **50** is formed to close the ends of the panels **10** on the opposite sides of the horizontally extending structural member **27**. Flashing **50** is preinsulated with insulating material **26** similar to that with which the panels **10** are insulated. If necessary pins **36** and clips **38** may be used to secure the insulating material **26** to the flashing **50**. The flashing may be provided with longitudinally extending folds **54** therein where desired to permit expansion thereof relative to the heating duct **12** and structural member **27** in one direction. The flashing **50** is supported on duct **12** by the angle members **56** attached to the duct **12** by convenient means such as welding. The flashing **50** is secured to the angle members **56** by studs **58** which studs are fastened to the angles **56** and extend through elongated slots **60** in the flashing **50** as shown best in FIGURE 7. The elongated slots **60** in conjunction with the studs **58** permit differential expansion between the flashing **50** and the heating duct **12** in a second direction. Insulating spacers **62** are provided between the flashing **50** and the heating duct **12** as shown best in FIGURE 6.

While one embodiment of the present invention has been disclosed it will be understood that modifications thereof are contemplated. Thus while a specific insulated flashing has been particularly described for closing the ends of the panels **10** and insulating a structural member **27** similar structures may be provided at roof edges, corners and elsewhere as needed. It is therefore the intention to include all such modifications as suggest themselves from the above disclosure within the scope of the invention.

The drawings and the foregoing specification constitute a description of the improved method of and means for insulating heating ducts or the like in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. Insulating construction for high temperature heating ducts and similar structures comprising a plurality of vertically spaced apart horizontally extending substantially parallel elongated bars intermittently secured to the structure in spaced relation with respect thereto, a plurality of elongated preinsulated panels positioned adjacent the bars and extending transversely thereof, clips comprising substantially flat vertically positioned rectangular members extending perpendicularly outwardly from said structure having a bifurcated end adjacent said structure with vertically spaced apart portions terminating in cylindrical parts extending on both sides of a bar, linear holding means extending through the vertically aligned cylindrical parts of the bifurcated end of the clips and between the bar and structure for loosely connecting the clips to the bars, means at the other end of said clips for rigidly securing the panels to the clips, said panels being provided with longitudinally extending open returned ribs to permit lateral expansion and contraction of the panels with longitudinal expansion and contraction of the bars and means for anchoring the clips to the bars against movement longitudinally of the bars.

2. Structure as set forth in claim **1** wherein the means for anchoring the clips against movement longitudinally of the bars comprises a plate extending perpendicularly to and secured to the bar including a slot therein receiving said clip.

3. Insulating construction for high temperature heating ducts and similar structures comprising a plurality of vertically spaced apart horizontally extending substantially parallel elongated bars intermittently secured to the structure in spaced relation with respect thereto, a plurality of elongated preinsulated panels positioned adjacent the bars and extending transversely thereof, clips comprising substantially flat vertically positioned rectangular members extending perpendicularly outwardly from said structure having a bifurcated end adjacent said structure with vertically spaced apart portions terminating in cylindrical parts extending on both sides of a bar, linear holding means extending through the vertically aligned cylindrical parts of the bifurcated end of the clips and between the bar and structure for loosely connecting the clips to the bars and means at the other end of said clips for rigidly securing the panels to the clips comprising male and female adjacent edges on the panels interfitting to secure the panels together and an open returned portion at said other end of each of the clips extending over the male edge of one panel with the female edge of the adjacent panel extending over the open returned end of the clip and the male edge of the one panel over which the other end of the clip extends.

4. Insulating construction for high temperature heating ducts and similar structures comprising a plurality of spaced apart horizontally extending parallel elongated bars intermittently secured to the structure in spaced relation thereto, a plurality of elongated preinsulated panels positioned adjacent the bars and extending transversely thereof having interfitting adjacent edges, clips having one end sandwiched between the interfitting edges of the panels fixedly securing the clips to the panels in predetermined positions, said clips each having another bifurcated end with aligned openings in separate portions thereof extending over a bar with the bar between the separate portions of the bifurcated end and holding means extending through said openings and between said bar and structure for loosely connecting said clips to the bars for permitting differential expansion between the structure and panels longitudinally of the panels and means for securing the clips in fixed positions with respect to the longitudinal direction of the bars including plates rigidly secured to said bars extending perpendicularly therefrom having slots therein receiving a portion of the bifurcated end of said clips.

5. Structure as set forth in claim **4** wherein the panels further include open returned longitudinally extending ribs for permitting transverse expansion and contraction of the panels.

6. Structure as set forth in claim **4** wherein the distance between the portions of the bifurcated end of a clip is greater than the dimension of a bar in a direction between said portions.

7. Structure as set forth in claim **4** wherein the panels are provided with male and female adjacent interfitting edges to secure the panels together and said one end of each of the clips is open returned and extends over the male edge of one panel and the female edge of the adjacent panel extends over the open returned end of the clip positioned over the male edge of the one panel and further including means securing the adjacent edges of the panels and one end of the clip in assembly.

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