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(54) **WALL INSULATION SYSTEM WITH BLOCKS HAVING ANGLED SIDES**

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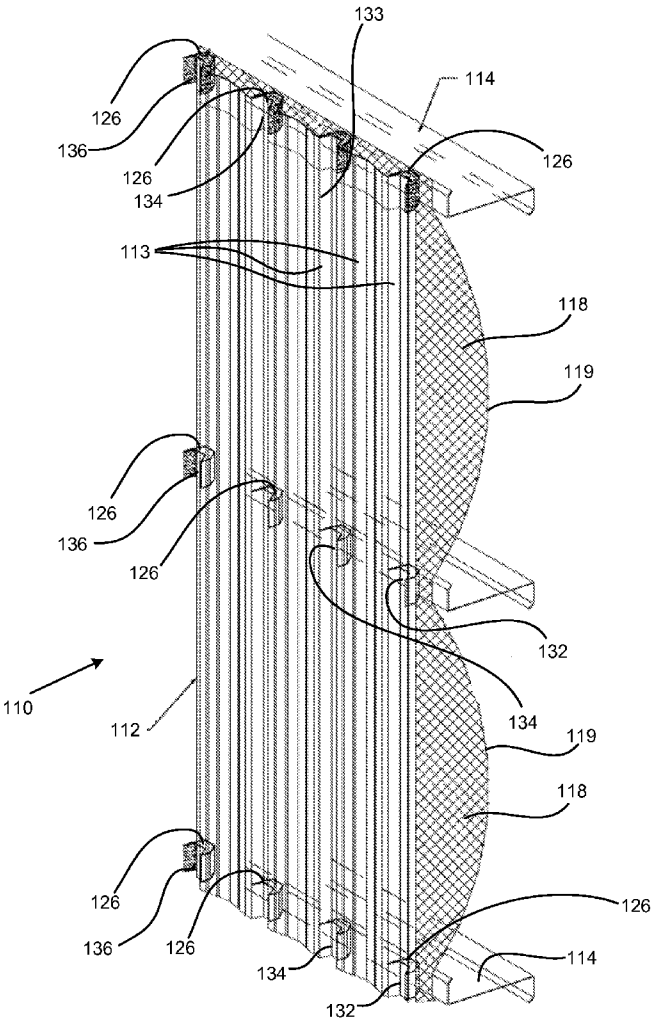
USPC **52/309.4**; 52/506.08; 52/741.4

(57) **ABSTRACT**

Wall systems and methods for making such wall systems are disclosed herein. According to one embodiment, a wall system comprises a plurality of vertically displaced horizontal support members, and a wall panel having at least one inwardly-extending ridge. The wall system also includes at least two foam insulation blocks. Each block has a surface that is adapted to conform to the shape of the inwardly-extending ridge of the wall panel. The blocks are spaced apart along each of the horizontal support members and are fastened between the panel and the support member. The spacing created by the blocks allows for a blanket of insulation between the blocks and the support members to expand, improving the system's insulative properties.



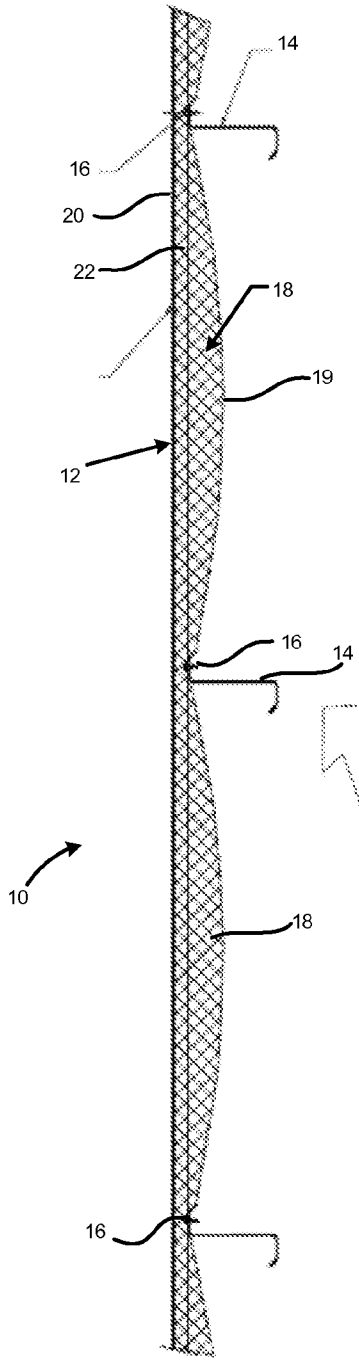


FIG. 1A
Prior Art

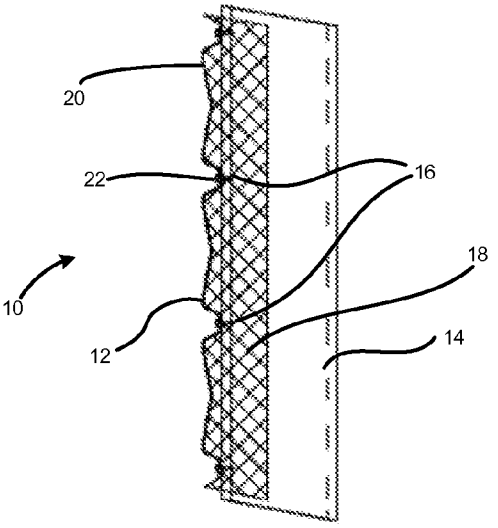


FIG. 1B
Prior Art

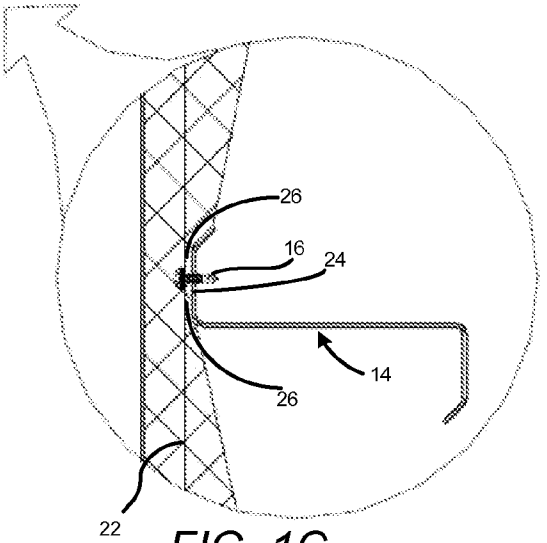


FIG. 1C
Prior Art

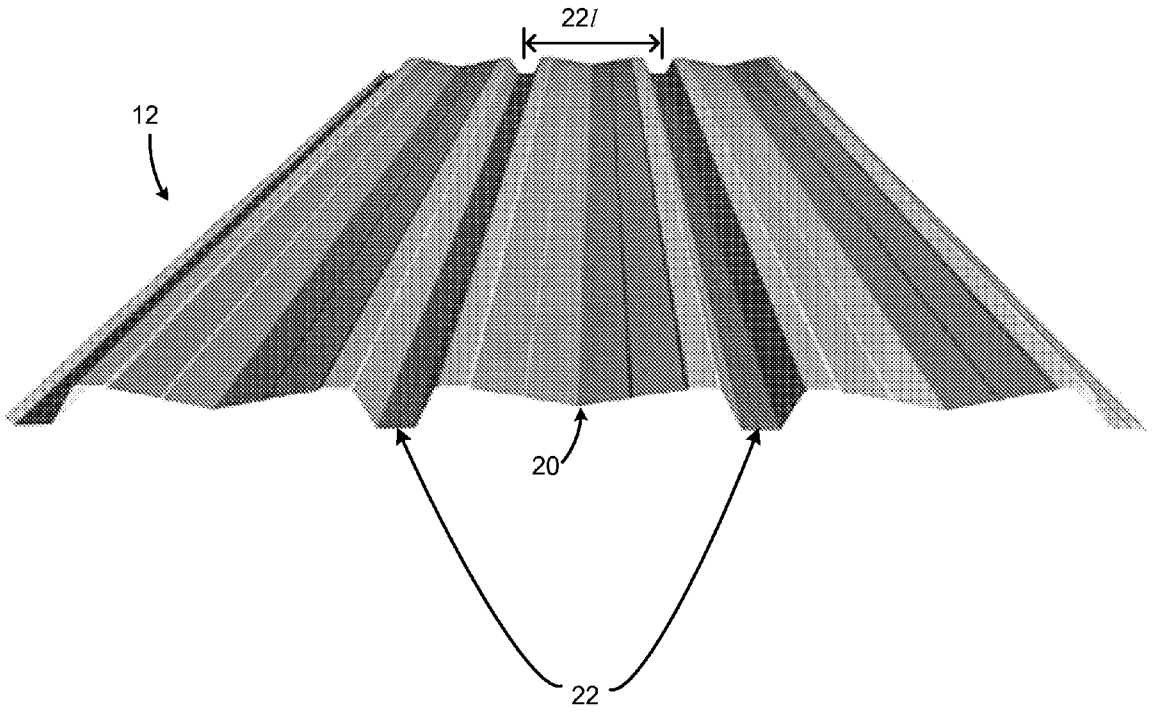


FIG.1D.
PRIOR ART

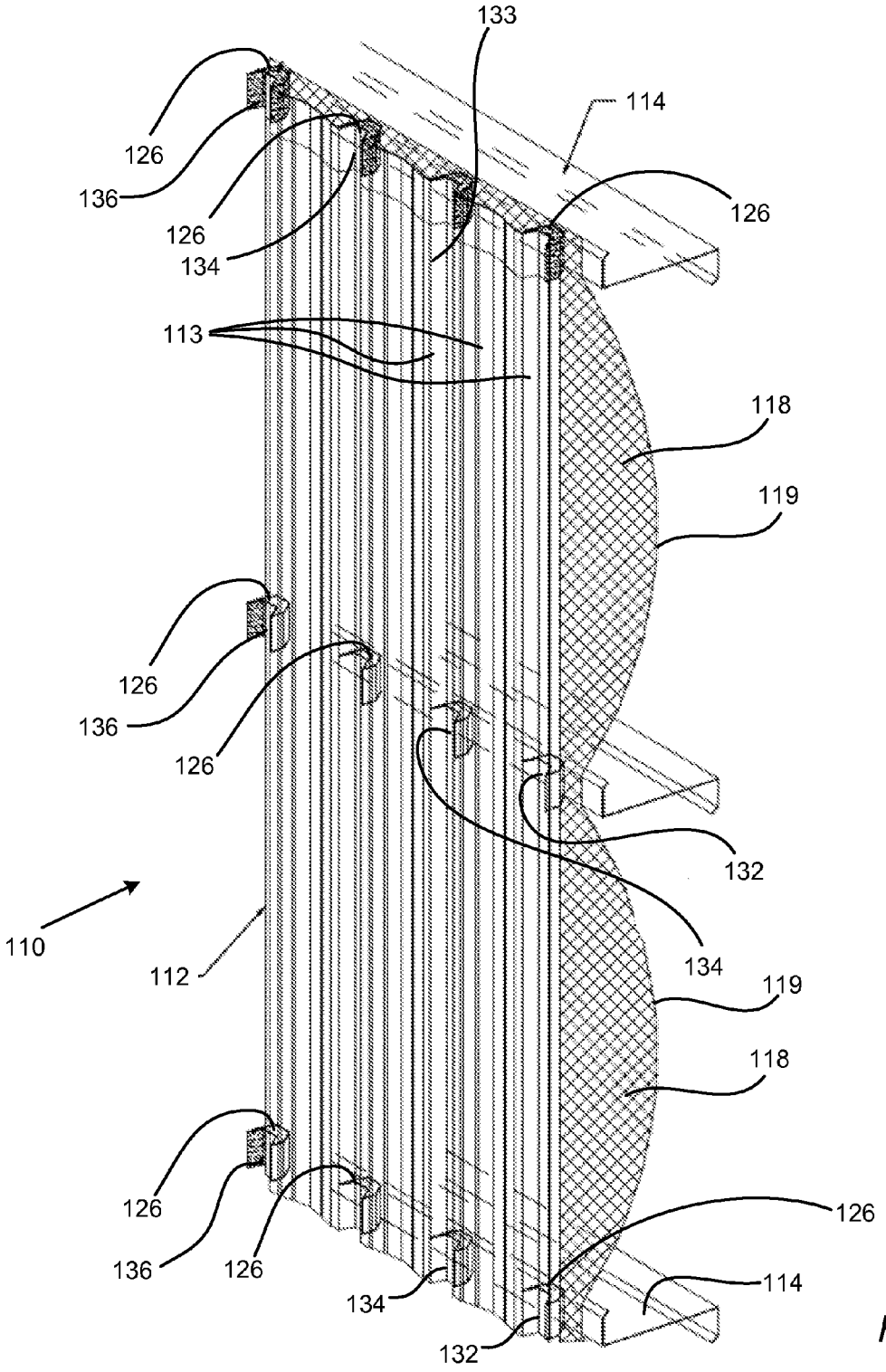

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FIG. 2

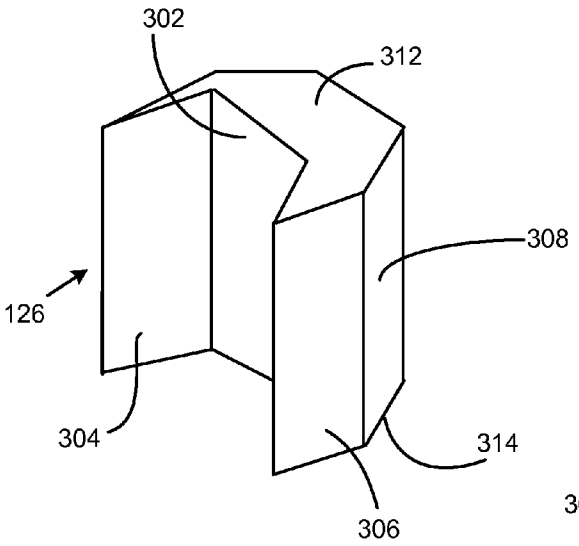

FIG. 3A

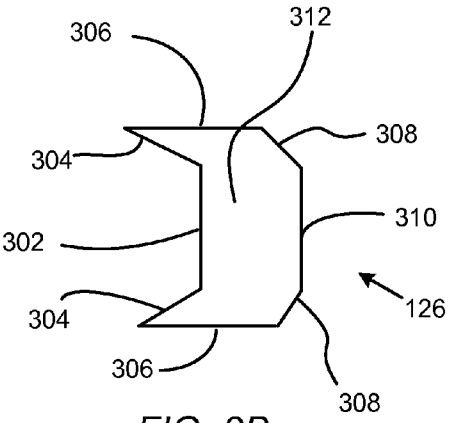

FIG. 3B

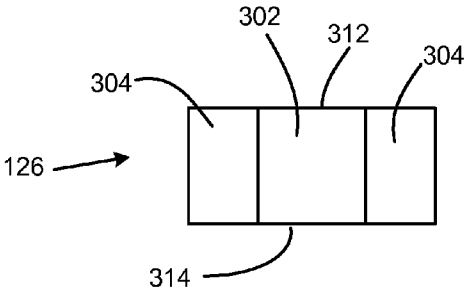

FIG. 3C

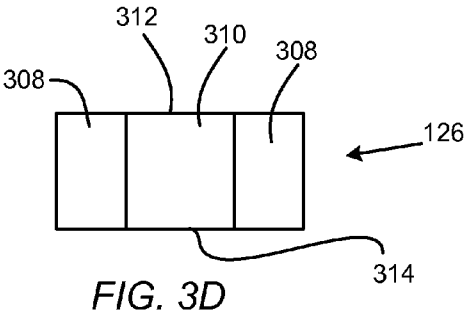

FIG. 3D

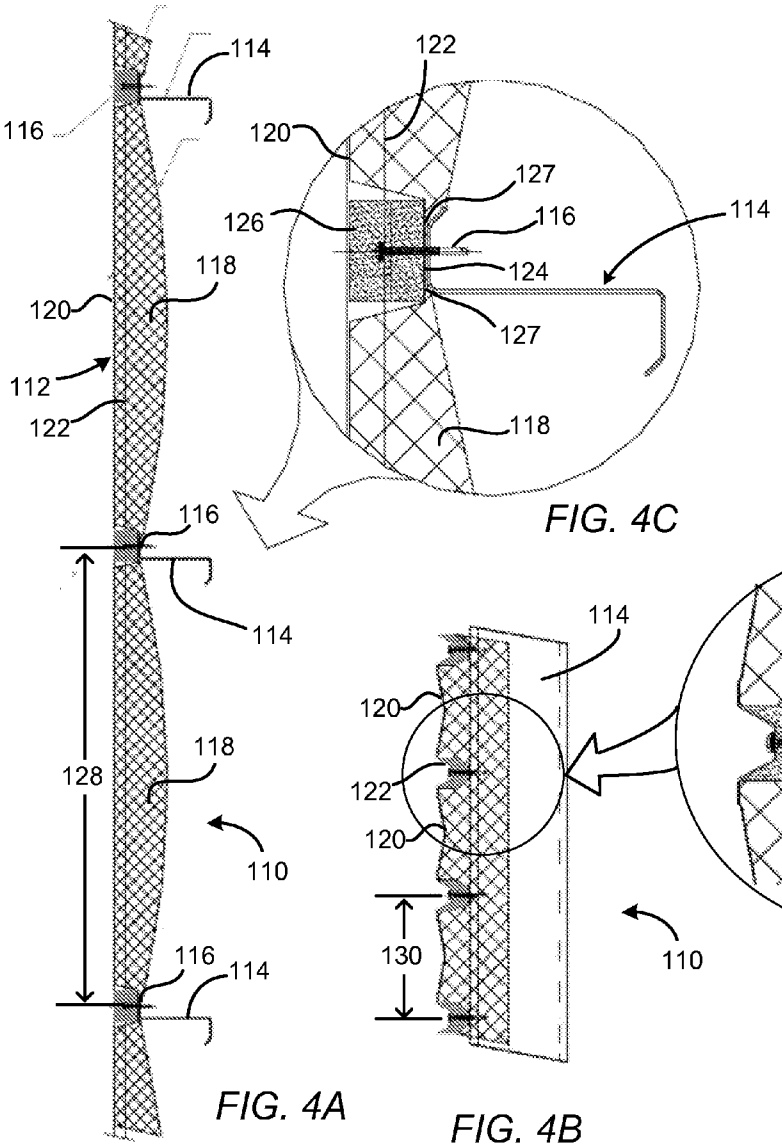

FIG. 4A

FIG. 4B

FIG. 4C

FIG. 4D

WALL INSULATION SYSTEM WITH BLOCKS HAVING ANGLED SIDES

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The application claims the benefit of U.S. Provisional Application No. 61/451,056 filed Mar. 9, 2011, the entire contents of which are herein incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The invention relates generally to the field of constructing buildings. More specifically, the invention relates to the field of insulating metal buildings.

[0004] 2. Description of the Related Art

[0005] Conventionally, metal buildings are constructed according to a series of steps. First, a metal frame is constructed. The metal frame includes numerous structural support members. The roof portions include sloped roof structural members referred to as purlins. The walls include vertically spaced horizontally extending members, which are referred to as girts. Once the frame is installed, it is common to insulate both the roof and wall portions of the building.

[0006] With respect to roof arrangements, blanket insulation is draped over the tops of the purlins, and then roof panels are fastened over the insulation. In some cases, it has been known to install a longitudinal thermal block above the top flange of the purlin such that it runs the entire length of the purlin over the draped blanket insulation.

[0007] With respect to the conventional wall, blanket insulation is secured from above such that it is draped over horizontally extending girts. Then metal wall panels are fastened to the outer flanges of the girts, mashing the blanket insulation between the wall panel and the outer flange of each girt where they interface. These lines of packed-down insulation create heat losses.

SUMMARY

[0008] The disclosed embodiments include a wall system that is adapted to be installed onto vertically displaced horizontal support members (e.g., girts) on a building. In one embodiment, the system comprises a wall panel having at least one inwardly-extending feature (e.g., a ridge or channel). In embodiments, a number of foam insulation blocks are adapted (on one side) to conform to the shape of the inwardly-extending feature. Further, the blocks can be spaced apart (vertically) along each of the horizontal support members, and then fastened between the wall panel and the support members. The blocks are also spaced apart horizontally which creates an array. The thickness of the blocks creates a gap. The gap allows a blanket of insulation to be expanded into space created between the blocks.

[0009] In one embodiment, each of the blocks in the plurality has forwardly angled opposing sides which conform to a reciprocal shape of the feature (e.g., a ridge) and a backside that is adapted to be fixed to an outer flange on each girt.

[0010] A method is also disclosed which involves (i) providing a building structure having a plurality of vertically displaced horizontal support members; (ii) obtaining a wall panel having at least one inwardly-extending feature on an inside surface of the wall; (iii) conforming the shape of one side of each of a plurality of insulating blocks to the inwardly extending feature; (iv) placing the plurality of foam insulation blocks between an outside of the horizontal support members and the inwardly-extending feature; and (v)fastening the wall to the horizontal support members, thus sandwiching the blocks.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0011] Illustrative embodiments of the present invention are described in detail below with reference to the attached drawing figures, which are incorporated by reference herein and wherein:

[0012] FIG. **1**A shows a cross-sectional wall section of a conventional insulated wall panel.

[0013] FIG. **1**B shows a top view of a horizontal section taken from a conventional insulated metal building wall design.

[0014] FIG. **1**C is a broken out section showing the specifics around a girt for the conventional design shown in FIGS. **1**A and **1**B.

[0015] FIG. **1**D shows a conventional wall which could be used to accomplish the objectives of the disclosed embodiments.

[0016] FIG. **2** shows a perspective view of an insulated wall according to the invention disclosed herein.

[0017] FIGS. **3**A, **3**C, and **3**D show an angle-edged spacer block from perspective, above, and in front, respectively.

[0018] FIG. **4**A shows a vertical section taken from the insulated wall of the present invention.

[0019] FIG. **4**B shows a horizontal section taken of the insulated wall of the present invention.

[0020] FIG. **4**C shows a broken out section taken from the vertical section of FIG. **4**A.

[0021] FIG. **4**D shows a broken out section taken from the horizontal section taken from FIG. **4**B.

DETAILED DESCRIPTION

[0022] Embodiments of the present invention provide an insulated metal panel system for a building, and a method for constructing a metal panel for the wall of a building.

[0023] In order to provide a context for the disclosed embodiments, prior art drawings FIG. **1**A, FIG. **1**B, and FIG. **1**C show that which is known in the prior art. Referring first to FIG. **1**A, a conventional system **10** is shown in which a metal wall panel **12** is installed to create a building wall. This sort of wall panel **12** is normally fastened to a plurality of horizontally running and vertically spaced Z-girts **14**. The metal wall panel **12** is typically fastened to the horizontal Z-girt using fasteners **16**, which are typically self-tapping screws.

[0024] When insulation is desired, a blanket of insulation **18** having a facing **19** on the inside is typically unrolled, draped down the wall, and then secured between the wall panel **12** and the Z-girts **14** using fasteners **16**. The fasteners **16** are screwed into the outer flange **24** of the girt, as shown in FIG. **1**C. The facing **19** prevents undesirable contact with inhabitants, presents a more appealing look, and creates a vapor barrier. When installed, the insulation is pinched between the inside surface of the vertical channels **22**. The vertical channels **22**, which run up and down the wall **12**, are the innermost part, meaning that they extend towards the building interior the furthest (See FIG. **1**B). Between each of these channels, an outermost raised portion **20** of the wall **12** also extends uniformly in a vertical direction. It is through the

channel area **22** of the wall **12** that the fasteners **16** are driven, then through the insulation blanket **18**, then into the girt outer flange **24**.

[0025] Looking at the exploded view in FIG. **1**C, it can be seen that when the fastener **16** is screwed through the inner portion **22** of the wall it presses against the outermost flange **24** of the girt **14** sandwiching a portion **26** of the insulation.

[0026] The compacting of insulation **18** in area **26** causes significant heat losses. As those skilled in the art will recognize, the mashing down of blanket creates an area where the thermal resistance is weakened. Because of this, if one were to look at heat flow diagrams in the areas near the outer flange of the girt, they would see significant flow of heat energy through the area surrounding the fastener **16**, with the heat losses being reduced at the locations spaced above or below the girt outer flanges. This is because the insulation **18** (e.g., half way between the girts in FIG. **1**A) billows and fluffs outward the further it is from the sandwiching girt outer flanges **24**. And considering that the insulation blanket is pinned between the inside surface of the channel **22** and the girt outer flange **24** at numerous locations in the panel **112**, the heat loss resulting would appear as a plurality of vertically displaced parallel horizontal stripes of heat loss on the outside of each so-configured wall of the building.

[0027] The arrangement of the present invention **110** which can be seen in FIGS. **2** through **4** greatly reduces the heat losses in the metal wall **112**. As with the conventional system, the metal wall **112** is attached outside of the girts **114** of the building using fasteners **116**. Also like with the conventional systems a blanket of faced insulation **118** is draped down, and installed between the wall and the girt **114** when the wall is mounted. Also like with the conventional systems, the insulation blanket has a facing **119** on the inside of the insulation. Further, the new system **110**, like conventional system **10**, is fastened at the innermost channel portions **122** of the wall **112**.

[0028] But the new system **110** is different in that the outer flanges of the girt **124**, upon fastening of the wall panel **112**, are not directly pressed against the blanket insulation **118**. Instead, a plurality of foam spacer blocks **126**, each having forwardly angled opposing sides, are intermittently fastened between the wall **112** and girt outer flange **124** along the length of the girt **14**.

[0029] As can be seen in FIG. **4**A, spacer blocks **126** are spaced vertically by a considerable distance **128**. Distance **128** is far greater than the lengthwise dimension of each block allowing for significant vertical spacing between blocks. Also, laterally, the spacer blocks **126** (as can be seen in FIG. **4**B) are laterally spaced a distance **130**. This creates significant thermodynamic advantages in that the spacer blocks **126**, since they are constructed of insulating foam, thermodynamically isolate and displace the metal wall panel **112** from the girt. The lateral dimension of each block is significantly less than the horizontal distance **130** between the blocks, this distance **130** being dictated by the distance between the ridges/channels **122** on the wall panel **112**. See FIG. **2**. Further, the blanket insulation **118** is only pinched against the girt outer flanges **124** in a few spread-apart locations. Thus, the blocks **126**, in addition to providing thermal resistance, also serve to space the wall apart from the girt outer flange. This creates more area for the blanket insulation to billow out (fluff) into, and also prevents the heat loss from extending nearly the full distance of the girt outer flange, as happens in the conventional designs like that shown in FIGS. **1**A-C.

[0030] Details of the spacer block **126** can best be seen in FIGS. **3**A-D. Referring first to FIG. **3**A, it can be seen that each spacer block **126** has a front face **302** (see FIG. **3**C) and two opposing angled front faces **304**. Laterally, spacer block **126** has sides **306** which extend back to two rear portions **308** which are created by truncating the back portions of the block at converging angles, and then a rear face **310**. FIG. **3**D shows the back of the block **126**. A top **312** of the block **126** can be seen in FIG. **3**B and is pointed to in both of FIGS. **3**C and **3**D. Although it is not shown, the bottom of block **126** is the same as the top **312**, and the block **126** is symmetrical from side to side, and top to bottom.

[0031] As can best be seen in FIGS. **2** and **4**C-D, these blocks **126** are specially configured to fit inside between the inside ridge surfaces of the channel/ridge portions **122** of the wall and the girt outer flange **124**. More specifically, face **302** will butt against the ridge of the channel **122**, and the angled sides **304** will correspond to the sloped surfaces of the channel **122** so that the block fit inside the wall is true. On the other side of the block **126**, the back **310** will butt against the girt outer flange **124** when the wall is fastened.

[0032] Each of the blocks **126** has a thickness dimension (between faces **302** and **310**). Because of this, the placement of the blocks (in the array shown in FIG. **2**) results in a gap between innermost portions of the wall (e.g., the ridges) and the outer flanges **124** of the horizontal support members **114**. This enables the expansion of the blanket of insulation into the gap created.

[0033] In terms of assembly in the erection of the building, the girts **114** will already be in place as shown in the figures, and the remaining wall components will be installed outside them. In some embodiments, the blanket insulation **118** will be draped over the outsides of the girts **114**. It is not necessary to independently fasten the insulation **118** at this point, but in may instances it will make sense to secure the blanket **118** from above and allow it to drape down before fastening the wall onto the girts **114**. The next step, in embodiments, involves the securement of the blocks in some way. In some embodiments, this would mean that the blocks would be adhered or in some other way fastened to the inside surfaces (ridges) of the wall in the positions shown before the wall is fastened in place. The precise position for adhering each block **126** will be determined by spacing the horizontal rows of blocks **126** at the vertical positions of each horizontally extending girt (see FIG. **2**). This enables the user with all of the blocks **126** adhered, to place the panel **112** over the draped insulation **118** and hold the panel **112** in place. Then, each fastener **116** (e.g., self-tapping screw) can be screwed through the panel **112** outside of where each block **126** exists, through the block, and bite into the girt outer flange **124**. Once all of the fasteners **116** have been installed, the panel/block assembly will be secured to the building, but significant open space will be created by the distance between the panel **112** and the girt **114**. The blocks **126** create this space. This space created not only allows for more fluffing of the insulation **118** between the girts **114**, but also allows for the fluffing into the spaces created between the blocks along the girt flange.

[0034] Fluffed blanket insulation is considerably more effective as a heat barrier than insulation that is matted down. Thus, a much higher percentage of the wall panel **112** is backed by insulation which is billowed rather than matted down. Therefore, as opposed to the conventional system shown in FIG. **1**, heat losses are greatly reduced by use of the blocks. Also, in the FIGS. **2**-**4** embodiments where there is no

fluffed insulation behind the wall, the foam insulation blocks **126** exist. Thus, a high level of heat resistance is provided across the whole panel after it is installed, unlike the conventional systems.

[0035] Many different arrangements of the various components depicted, as well as components not shown, are possible without departing from the spirit and scope of the present invention. Embodiments of the present invention have been described with the intent to be illustrative rather than restrictive. Alternative embodiments will become apparent to those skilled in the art that do not depart from its scope. A skilled artisan may develop alternative means of implementing the aforementioned improvements without departing from the scope of the present invention.

[0036] It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations and are contemplated within the scope of the claims. Not all steps listed in the various figures need be carried out in the specific order described.

The invention claimed is:

1. A wall system comprising:

a plurality of vertically displaced horizontal support members;

a wall panel having at least one inwardly-extending ridge; and

a plurality of foam insulation blocks, each of the blocks having a surface adapted to conform to the shape of the inwardly-extending ridge;

wherein the plurality of foam insulation blocks are spaced apart along each of the horizontal support members, the blocks being fastened between the panel and the support members and allowing a blanket of insulation between the support members and the blocks to be expanded into a space created between the blocks.

2. The wall system of claim **1** wherein each of the blocks in the plurality has forwardly angled opposing sides which conform to a reciprocal shape of the ridge.

3. The wall system of claim **1** wherein the blocks are made of insulating foam.

4. The wall system of claim **1** wherein the blocks are vertically spaced from one another by a distance that is greater than a length of one individual block.

5. The wall system of claim **1** wherein the blocks are horizontally spaced from one another by a distance that is greater than a width of one individual block.

6. The wall system of claim **6** wherein the blocks are also vertically spaced from one another by a distance that is greater than a length of one individual block.

7. The wall system of claim **1** wherein the horizontal support members are girts, and the blocks are fastened into an outer flange of each girt.

8. The wall system of claim **1** wherein:

each of the blocks has a thickness dimension; and

the placement of the blocks results in a gap between innermost portions of the wall and a plurality of outer flanges on the horizontal support members to enable the expansion of the blanket of insulation into the gap.

9. The wall system of claim **1** wherein each spacer block comprises:

a front face;

two opposing angled lateral faces adapted to conform to the shape of the ridge on the wall panel; and

a substantially flat rear face for engaging an outer flange of the horizontal support member .

10. A method of making a wall comprising:

providing a building structure having a plurality of vertically displaced horizontal support members;

obtaining a wall panel having at least one inwardly-extending feature on an inside surface of the wall;

conforming the shape of one side of each of a plurality of foam insulating blocks to the inwardly extending feature;

placing the plurality of foam insulation blocks between an outside of the horizontal support members and the inwardly-extending feature; and

fastening the wall to the horizontal support members, thus sandwiching the blocks.

* * * * *