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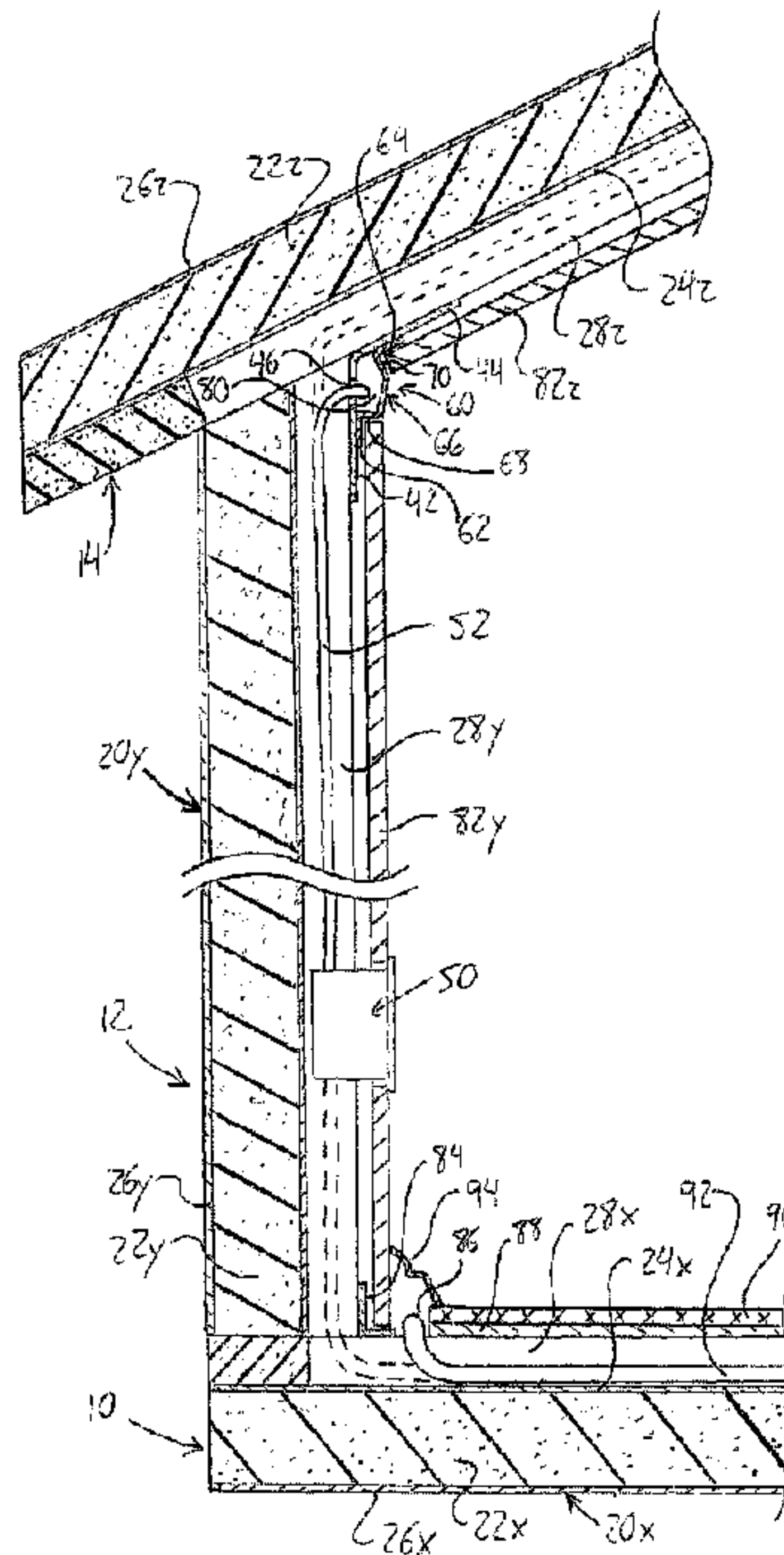
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(54) Titre : SUPPORTS ET COUVERCLES POUR ACHEMINEMENT DE FILS ELECTRIQUES AUX COINS INTERIEURS D'UN BATIMENT

(54) Title: BRACKETS AND COVERS FOR ELECTRICAL WIRE ROUTING AT INTERIOR CORNERS OF A BUILDING



(57) **Abrégé/Abstract:**

Solutions for routing electrical wiring in interior-side grooves of prefabricated structural panels used in construction of a building. A bracket is fastened between a wall structure and an additional structure forming a corner therewith, and features holes that are spaced apart according to spacing of the grooves in the wall panels, whereby installation of the bracket with a hole over a respective groove in the wall allows transitioning of electrical wiring from a path running inside the wall groove, to a path running along the interior corner between the wall and other structure. A cover member is fastened onto the inside of the bracket over the wiring to form an enclosed channel thereabout to protect and conceal the wiring. The cover is shaped to present smooth transitions with the inner face of drywall sheets finishing off the wall to enable smooth drywall taping over the channel at the corner.

ABSTRACT

Solutions for routing electrical wiring in interior-side grooves of prefabricated structural panels used in construction of a building. A bracket is fastened between a wall structure and an additional structure forming a corner therewith, and features holes that are spaced apart according to spacing of the grooves in the wall panels, whereby installation of the bracket with a hole over a respective groove in the wall allows transitioning of electrical wiring from a path running inside the wall groove, to a path running along the interior corner between the wall and other structure. A cover member is fastened onto the inside of the bracket over the wiring to form an enclosed channel thereabout to protect and conceal the wiring. The cover is shaped to present smooth transitions with the inner face of drywall sheets finishing off the wall to enable smooth drywall taping over the channel at the corner.

BRACKETS AND COVERS FOR ELECTRICAL WIRE ROUTING AT INTERIOR CORNERS OF A BUILDING

FIELD OF THE INVENTION

The present invention relates generally to routing of electrical wire
5 during construction of a building, and more particularly to solutions for providing structural support and transitional wire passages in buildings employing prefabricated panels with interior-side grooves.

BACKGROUND OF THE INVENTION

Applicant's issued U.S. Patent No. 8,033,065 and corresponding
10 Canadian patent application 2,648,822, currently pending, disclose techniques and products for constructing buildings through the assembly of prefabricated structural panels featuring foam insulation sandwiched between steel skins. An inner one of the two metal skins, and the inner face of the foam therebeneath, have a corrugated pattern or shape to create a series of parallel grooves running the lengthwise
15 direction of the panel at the inner face thereof. The same panels are used to construct the floor structure, wall structures and roof structure of the building. The grooves in the floor structure are used to route in-floor heating wires or fluid conduits beneath floor covering materials installed atop the floor panels, and the grooves in one or more of the floor, wall and ceiling panels are used to route electrical wiring,
20 and possibly plumbing, to various locations throughout the building.

Applicant has now made further developments to aid in the routing of electrical wiring during the construction of a building employing such prefabricated panels.

SUMMARY OF THE INVENTION

According to a first aspect of the invention there is provided an electrical wiring routing apparatus for a building comprising a wall structure and an additional wall or ceiling structure cooperating with the wall structure to define a corner of an interior space of the building between said wall structure and said additional structure, wherein at least one of said structures comprises prefabricated panels having grooves in sides thereof facing into the interior space of the building and the apparatus comprises:

an elongate bracket member having a longitudinal bracket axis and, in planes normal to said longitudinal bracket axis, a cross-sectional bracket shape defining first and second bracket legs diverging from one another each for respective placement against and fastening to the wall structure and the additional structure with the longitudinal bracket axis running along the corner between the wall structure and the additional structure, at least one of the legs comprising openings therein at spaced apart locations along the longitudinal axis for placement of at least one of said openings over a respective one of the grooves in the inner faces of the prefabricated panels;

whereby fastening of the bracket legs of the elongate bracket member to the wall structure and the additional structure acts to form at least part of a connection between said structures, and enables use of each opening to transition electrical wire from a path within the respective one of the grooves to another path running along the corner defined between the wall structure and the additional structure.

Preferably the bracket member is metal.

Preferably the bracket member is steel.

The bracket legs of the bracket member may diverge at an obtuse angle for supporting a sloped roof structure at an oblique angle sloping upward from the wall structure over the interior space of the building.

Preferably there is provided an elongate cover member having a longitudinal cover axis and, in planes normal to said longitudinal bracket axis, a cross-sectional cover shape comprising a channel portion shaped to create a closed channel between the bracket member and the channel portion of the cover member under placement of said cover member over the bracket member for running of the electrical wiring through said closed channel along the corner defined between the wall structure and the additional structure.

Preferably the cross-sectional cover shape comprises first and second end legs defined on opposite sides of said channel shaped portion for placement of said legs against the bracket member at an inner side thereof opposite the structures.

Preferably an angle between the end legs of the cover member equals an angle between the bracket legs of the bracket member to enable respective placement and fastening of the first and second end legs of the cover member to the first and second bracket legs.

Preferably first and second sides of the channel portion of the cross-sectional shape of the cover member are respectively perpendicular to the first and second end legs of the cover member.

Preferably the bracket member is fastened to the structures, the cover member is fastened to the bracket member, and sheets of finishing material are fastened to the structures in positions placing edges of sheets along the first and second sides of the channel portion of the cover member.

5 The bracket member may be employed between the wall structure and a roof structure disposed above the wall structure to cover the interior space of the building.

 According to a second aspect of the invention there is provided an electrical wiring routing apparatus for running electrical wiring along an interior
10 corner defined between a wall structure of a building and an additional wall or ceiling structure of said building, the apparatus comprising an elongate cover member having a longitudinal cover axis and, in planes normal to said longitudinal bracket axis, a cross-sectional cover shape having first and second end legs for respective placement against surfaces located at interior sides of the wall structure and the
15 additional structure, and a channel portion defined between the end legs to create a closed channel between the surfaces and the channel portion of the cover member for running of the electrical wiring through said closed channel along the interior corner defined between said structures.

 The present invention also extends to wire routing methods using one
20 or more of the above bracket and cover members.

 According to a third aspect of the invention, there is provided an electrical wire routing method comprising fastening a bracket member in place between a wall structure of a building and an additional structure forming a corner

with said wall structure on an interior side of said corner, and routing wiring through the hole of the bracket during pre-wiring for, or installation of, electrical components on the wall structure.

Preferably the fastening of the bracket in place is performed during
5 mounting of the additional structure atop the wall structure to form a roof structure, whereby the bracket forms at least part of a structural support carrying the roof structure atop the wall structure.

According to a fourth aspect of the invention there is provided an electrical wire routing method comprising fastening a cover member in place
10 between a wall structure of a building and additional structure defining a corner with said wall structure on an interior side of said corner to define a channel running along said corner, routing wiring through the channel, and fastening finishing materials to the wall and additional structure in positions placing edges of said finishing materials against or closely adjacent opposite sides of the channel.

15 Preferably the method further comprises creating a corner seam joining inner surfaces of the finishing materials together over the channel.

Preferably the method comprises application of drywall compound in creation of said corner seam.

BRIEF DESCRIPTION OF THE DRAWINGS

20 In the accompanying drawings, which illustrate exemplary embodiments of the present invention:

Figure 1 is a vertical cross-sectional view of a building featuring floor, wall and ceiling structures all constructed with a same type of grooved prefabricated

panel, wherein the present invention adds a hole-equipped, electrical-routing and roof-supporting corner bracket and corresponding cover member running along the corner defined between the wall and ceiling.

Figure 2 is a perspective view from the interior space of a building showing a corner bracket of the type of Figure 1 prior to the installation of the cover member and subsequent application of finishing materials to the wall and ceiling.

Figure 3 is a partial perspective view of the corner bracket of Figure 1.

Figure 4 is a partial perspective view of the cover member of Figure 1.

Figure 5 is a cross-sectional view taken in the same plane as Figure 1, but showing a second embodiment bracket and cover combination for use at a right angle corner rather than the obtuse angle corner between the wall and sloped roof of Figure 1.

DETAILED DESCRIPTION

Figure 1 shows a cross-section of a single story building in which a horizontal floor structure 10, vertical exterior wall structures (of which one is shown at 12) projecting upward from atop the floor structure around the perimeter thereof, and a pitched roof structure 14 mounted atop the wall structures to cover the interior space of the building are all constructed from multiple prefabricated structural panels of a same type. The floor panels 20x, wall panels 20y and ceiling panels 20z each have a middle layer of foam insulation 22x, 22y, 22z sandwiched between thinner inner and outer steel skins 24x, 24y, 24z, 26x, 26y, 26z. Each panel has a corrugated shape at the interior face thereof to form a plurality of parallel, linear grooves (one of which is visible in each illustrated floor, wall and ceiling panel at 28x,

28y, 28z) running the lengthwise dimension of the panel, from one end thereof to another. In each structure, panels fastened together along their lengthwise sides to lie parallel one another in adjacent pairs. In the illustrated embodiment, the vertical groove 28y in the wall panel 20y aligns with both the horizontal groove 28x in the floor panel 20x and the inclined groove 28z in the ceiling panel 20z, and opens to to these ceiling and floor grooves at the top and bottom ends of the wall structure.

The structures of the preceding paragraph differ from those of Applicant's aforementioned patent in that the ceiling panels define a peaked roof of the structure. The illustrated ceiling panel thus slopes upwardly from atop the wall panel over the interior space of the building toward a peak or the roof, and it will be appreciated that the ceiling panels at the opposing exterior wall of the building likewise slope upward to the peak from their respective side of the building. To accomplish this peaked roof structure, or other sloped roof configuration, where the interior ceiling and exterior roof are both defined by the same panels, the top end of each panel of the wall structure from which the corresponding ceiling panels slope is cut an oblique angle to be longer at the inner face of the wall panel than at the outer face thereof, whereby the inner side of the ceiling panel lies atop this angled top end of the wall structure.

The present invention employs an elongated bracket 40 formed of sheet metal or metal plate to have a uniform cross-section in planes normal to its longitudinal axis L1. The bracket is bent to define a single corner running in the longitudinal direction of the bracket to define first and second diverging legs 42, 44 in the cross-sectional planes of the bracket. The bracket legs 42, 44 diverge from the

corner at an obtuse angle equal to the obtuse angle between the wall structure 12 and the ceiling structure 14 to enable flush seating of the first and second bracket legs 42, 44 against the inner skins 24y, 24z of the wall and ceiling at the plateaued ridges 30y, 30z defined between the grooves 28y, 28z at these inner faces of the wall and ceiling, where the legs of the brackets can be fastened to these panels using suitable screws. While this placement and fastening of the bracket is similar to that described in Applicant's aforementioned patent, where a right-angle bracket is similarly placed and fastened between a vertical wall and horizontal ceiling, the bracket of the present invention differs in the presence of multiple holes or openings 46 passing through the first leg at spaced apart positions along the length of the bracket. The spacing apart of these holes along the bracket corresponds to the uniform spacing between the grooves 28x in the wall structure 12, so that when the bracket 40 is placed against the wall and ceiling panels at the corner defined therebetween at a position aligning one of the holes 46 over a respective one of the grooves 28x in the wall 12, each other hole 46 is likewise aligned with another respective one of the grooves.

Figure 2 shows two brackets 30 abutted end-to-end with their first and second legs respectively placed against the wall and ceiling to extend the longitudinal axes of the brackets along the horizontal corner defined therebetween, each hole 46 in each bracket 40 aligning with a respective one of the grooves 28x in the wall 12 at a short distance below the junction between the wall and ceiling. Screw fasteners 48 driven through each leg of each bracket attach the bracket to the wall and ceiling panels 20y, 20z at the ridges 30y, 30z between adjacent grooves

28y, 28z of the panels. Fastened between the wall and ceiling panels at the corner therebetween, the bracket 40 thus serves to form at least part of a structural connection supporting and securing the roof structure in place atop the wall structure. However, the presence of the holes 46 adds a second level of function to the bracket of the present invention.

Referring again to Figure 1, an electrical outlet box 50 is fastened to the wall panel 12y at a height above the floor with the width of the box 50 accommodated within the illustrated groove 28y of the wall panel 20y, and the hole 46 in the bracket 40 provides a passage near the top end of the groove 28y for the electrical wiring 52 to transition into and out of the wall groove in the wiring's connection to the electrical outlet 50. Accordingly, the electrical wiring 52 can be routed to various locations along the side of the building defined by the wall structure by running the wiring along the corner between the wall and ceiling, and then transitioning into a wall groove at which an outlet or other electrical component (e.g. wall-mounted light fixture, light switch, other control switch, thermostat, alarm console, etc.) is desired by passing the wiring through the respective hole 46 in the bracket.

To protect and conceal the portion of the wiring running along the corner between the wall and ceiling, a cover member 60 configured for cooperation with the bracket 40 is provided. Like the bracket 40, the cover is an elongated piece of sheet metal or metal plate having a bent, uniform cross-section in planes normal to its longitudinal axis L2. However, the cover has a more complex cross-sectional

shape, featuring a number of bends or corners therein, each lying parallel to the longitudinal axis L2.

Opposite ends of the cross-sectional cover shape are defined by first and second linear legs 62, 64 oriented at the same relative angles to one another as the first and second legs 42, 44 of the bracket 40. Accordingly, flat faces defined by these two end legs 42, 44 of the bracket are positioned and oriented relative to one another for placement against the flat faces of the first and second legs 42, 44 of the bracket 30 from the inner side thereof (i.e. against the side of the bracket facing into the interior space of the building and away from the wall and ceiling structures). A central channel portion 66 of the cover 60 features first and second sides 68, 70 that respectively project perpendicularly from the first and second end legs 62, 64 of the cover 60 to the sides of these legs opposite the faces thereof that are to be placed against the bracket 40. The channel portion 66 of the first embodiment cover is completed by a central span 72 connecting the first and second sides 68 at the ends thereof opposite the end legs 62, 64 of the cover member.

As shown in Figure 1, when the cover member 60 is placed against the inner side of the bracket 40 with the end legs 62, 64 of the cover member 60 flush against the bracket legs 40, 42, the sides and central span of the channel portion 66 cooperate with the bracket 40 to form an enclosed channel 80 running horizontally along the corner defined between the wall and ceiling structure. The electrical wiring 52 thus transitions between this enclosed channel 80 and the groove 28y of the wall panel through the hole 46 in the bracket. The cover 60 conceals and protects the electrical wiring where it runs along the joint between the wall and ceiling. The legs

of the bracket 30 extend past the ends of the cover 60 so that the screws 48 used to fix the bracket in place can be driven through the legs far enough out so as not to later interfere with flush seating of the cover on the bracket. During installation, when the cover is in place, additional screws (not shown) are driven through the end
5 legs of the cover into the legs of the bracket, and may pass therethrough into the wall and ceiling panels, in order to fix the cover in place.

As also shown in Figure 1, after installation of the bracket, routing of wiring in the panel grooves through the bracket holes, and installation of the cover to enclose the wiring along the bracket during installation of the electrical components,
10 the wall and ceiling are then finished off with sheets of drywall 82y, 82z or other finishing material that are fastened to the inner faces of the wall and ceiling panels 20y, 20z at the ridges 30y, 30z defined between the grooves 28y, 28z therein. The drywall thus closes off all the grooves in the wall and ceiling panels, including those with electrical wiring 52 therein, and in a conventional manner, the drywall has
15 suitably sized holes cut therein at the appropriate positions to accommodate the electrical outlets 50, switches or other components mounted in these wire-containing panel grooves. An upper edge of each of the wall structure's drywall sheets 82y lies closely beneath the first side 68 of the channel portion 66 of the cover 60, with the drywall's lower edge lying a short distance above the floor, for example above the
20 horizontal leg of a right-angle bracket 84 joining the floor and wall panels 20x, 20y together along the corner defined therebetween. As described in Applicant's aforementioned patent, a gap 86 may be left between covering and flooring layers 88, 90 on the floor structure and the drywall 82y and right angle bracket 84 at the

corner between the floor and wall structures to allow an in-floor heating element or conduit 92 to transition from one floor groove 28x to another over the ridge(s) between these grooves, with a baseboard member 94 then spanning over the gap from the drywall to the flooring to close off this space and conceal the in-floor heating element or conduit.

On the ceiling, the drywall sheets 82z nearest the respective wall structure have their outer ends (i.e. the edge of the drywall nearest said wall and running therealong) situated adjacent the adjacent the second side 70 of the channel portion 66 of the cover 60. The distance by which each side of the channel projects from its respective end leg of the cover equals, or at least closely matches, the thickness of the drywall. Each side of the channel portion thus defines a ledge that faces away from the channel 80 for placement of the edge of the respective drywall sheet adjacent or against this ledge face with the outer face of the drywall situated against the respective leg of the cover's channel portion, which acts to situate the inner face of the drywall in a position flush with the corner defined between the channel portion's respective side and central span. This way, a smooth seam can be created using conventional drywall taping and mudding techniques to transition from each drywall sheet to the central span of the cover member. The cover member thus enables running of electrical wiring along the juncture between the wall and ceiling in a concealed and protected manner outside the wall, while still providing a neat and pleasant finished appearance at this corner of the room.

It will be appreciated that the bracket and cover members may take on other shapes to suit particular applications. For example, Figure 5 shows an

alternate embodiment bracket 40' and cover 60' where the legs 42', 44' of the bracket 40' are oriented at right angles to one another, as are the end legs 62', 64' of the cover 60', for example for use between a vertical wall and horizontal ceiling, whether a lower level ceiling of a multi-story building, or an interior ceiling over which a separate roof structure is mounted. This embodiment thus features only two right angle sides 68', 70' at the cover's channel portion 66', each of which equals or closely matches the drywall thickness in order to enable the two drywall sheets to nearly meet at the inner corners of their end edges for taping 96 of the drywall sheets directly together over the corner interior corner of the resulting rectangular channel 80'.

As shown in broken lines in Figure 1, electrical wiring may additionally be routed into a groove 28z of the ceiling structure, for example to run to a ceiling-mounted lighting fixture, fan, or other ceiling or roof-mounted fixture or equipment requiring electrical power. Where the ceiling fixture and wall mounted component are located at aligned wall and ceiling grooves 28y, 28z, wiring may transition between wall and ceiling through an opening where these grooves meet, as shown in Figure 1. As also shown in broken lines in the same figure, electrical wiring may likewise transition between a wall groove and respective floor groove. In other situations, electrical wiring may transition from a wall groove into the corner channel defined by the bracket and cover, where it runs along the wall/ceiling joint before transitioning to a ceiling groove via a respective hole in the second leg of the bracket, such a hole 46a being shown in broken lines in Figure 2. Broken lines 46b in Figure 2 also illustrate how holes may be present at adjacent grooves in a

structure, or with reference only to the solid-line hole 26, the number of holes may be less than the number of grooves spanned by the bracket, thus providing access at only particular grooves in the structure.

It will be appreciated that a cover of the present invention may be employed to similarly mount on surfaces at interior sides of wall and ceiling structures to likewise define a channel that is closed to the interior space of the room in contexts where a bracket of the present invention is not necessarily employed, even where one or both of the wall and ceiling are not grooved, or not formed of prefabricated panels at all. Although described as metal components, it will be appreciated that other materials may be employed for the bracket or cover. Where the bracket is being relied upon not only for wire-routing functionality, but structural support of the roof or ceiling structure, care should be taken to use material of sufficient strength and integrity.

Since various modifications can be made in my invention as herein above described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without departure from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

CLAIMS:

1. An electrical wiring routing apparatus for a building comprising a wall structure and an additional wall or ceiling structure cooperating with the wall structure to define a corner of an interior space of the building between said wall structure and said additional structure, wherein at least one of said structures comprises prefabricated panels having grooves in sides thereof facing into the interior space of the building and the apparatus comprises:

an elongate bracket member having a longitudinal bracket axis and, in planes normal to said longitudinal bracket axis, a cross-sectional bracket shape defining first and second bracket legs diverging from one another each for respective placement against and fastening to the wall structure and the additional structure with the longitudinal bracket axis running along the corner between the wall structure and the additional structure, at least one of the legs comprising openings therein at spaced apart locations along the longitudinal axis for placement of at least one of said openings over a respective one of the grooves in the inner faces of the prefabricated panels;

whereby fastening of the bracket legs of the elongate bracket member to the wall structure and the additional structure acts to form at least part of a connection between said structures, and enables use of each opening to transition electrical wire from a path within the respective one of the grooves to another path running along the corner defined between the wall structure and the additional structure.

2. The apparatus of claim 1 wherein the bracket member is metal.

3. The apparatus of claim 1 wherein the bracket member is steel.

4. The apparatus of any one of claims 1 to 3 wherein the bracket
legs of the bracket member diverge at an obtuse angle for supporting a sloped roof
structure at an oblique angle sloping upward from the wall structure over the interior
5 space of the building.

5. The apparatus of any one of claims 1 to 4 further comprising an
elongate cover member having a longitudinal cover axis and, in planes normal to
said longitudinal bracket axis, a cross-sectional cover shape comprising a channel
portion shaped to create a closed channel between the bracket member and the
10 channel portion of the cover member under placement of said cover member over
the bracket member for running of the electrical wiring through said closed channel
along the corner defined between the wall structure and the additional structure.

6. The apparatus of claim 5 wherein the cross-sectional cover
shape comprises first and second end legs defined on opposite sides of said
15 channel shaped portion for placement of said legs against the bracket member at an
inner side thereof opposite the structures

7. The apparatus of claim 6 wherein an angle between the end
legs of the cover member equals an angle between the bracket legs of the bracket
member to enable respective placement and fastening of the first and second end
20 legs of the cover member to the first and second bracket legs.

8. The apparatus of claim 7 wherein first and second sides of the
channel portion of the cross-sectional shape of the cover member are respectively
perpendicular to the first and second end legs of the cover member.

9. The apparatus of claim 7 in combination with the building, wherein the bracket member is fastened to the structures, the cover member is fastened to the bracket member, and sheets of finishing material are fastened to the structures in positions placing edges of sheets along the first and second sides of
5 the channel portion of the cover member.

10. The combination of any one of claims 1 to 8 in combination with the building, wherein the additional structure is a roof structure disposed above the wall structure to cover the interior space of the building.

11. The combination of any one of claims 1 to 8 in combination with
10 the building, wherein electrical wiring transitions from one or more said grooves of the prefabricated panels through a respective one or more said openings of the bracket to run along the corner defined between the wall structure and the additional structure.

12. The combination of any one of claims 5 to 8 in combination with
15 the building, wherein electrical wiring transitions from one or more of said grooves of the prefabricated panels into the closed channel defined between the bracket member and the channel portion of the cover member through a respective one or more of said openings of the bracket.

13. In combination with a building, an electrical wiring routing
20 apparatus for running electrical wiring along an interior corner defined between a wall structure of the building and an additional wall or ceiling structure of said building, the apparatus comprising an elongate cover member having a longitudinal cover axis and, in planes normal to said longitudinal bracket axis, a cross-sectional

cover shape having first and second end legs placed against surfaces located at interior sides of the wall structure and the additional structure, and a channel portion defined between the end legs to create a closed channel between the surfaces and the channel portion of the cover member for running of the electrical wiring through
5 said closed channel along the interior corner defined between said structures, wherein first and second sides of the channel portion of the cross-sectional shape of the cover member are respectively perpendicular to the first and second end legs of the cover member, the cover member is fastened in place to extend along the corner defined between the structures, and sheets of finishing material are fastened to the
10 wall structure and the additional structure in positions placing edges of sheets along the first and second sides of the channel portion of the cover member.

14. The apparatus of claim 13 wherein the additional structure of the building is a sloped roof structure sloping obliquely upward from the wall structure over an interior space of the building, and the end legs of the cross-
15 sectional cover shape diverge at an obtuse angle.

15. The combination of claim 13 wherein the additional structure is a roof structure disposed above the wall structure to cover the interior space of the building.

16. The apparatus of any one of claims 13 to 15 wherein at least
20 one of the structures comprises prefabricated panels having grooves in sides thereof facing into the interior space of the building, and wherein electrical wiring transitions from at least one of said grooves into the closed channel defined between the

channel portion of the cover member and the surfaces located at the interior sides of the wall structure and the additional structure.

17. An electrical wire routing method comprising fastening a bracket member in place between a wall structure of a building and an additional structure forming a corner with said wall structure on an interior side of said corner, and routing wiring through the hole of the bracket during pre-wiring for, or installation of, electrical components on the wall structure, wherein the fastening of the bracket in place is performed during mounting of the additional structure atop the wall structure to form a roof structure, whereby the bracket forms at least part of a structural support carrying the roof structure atop the wall structure.

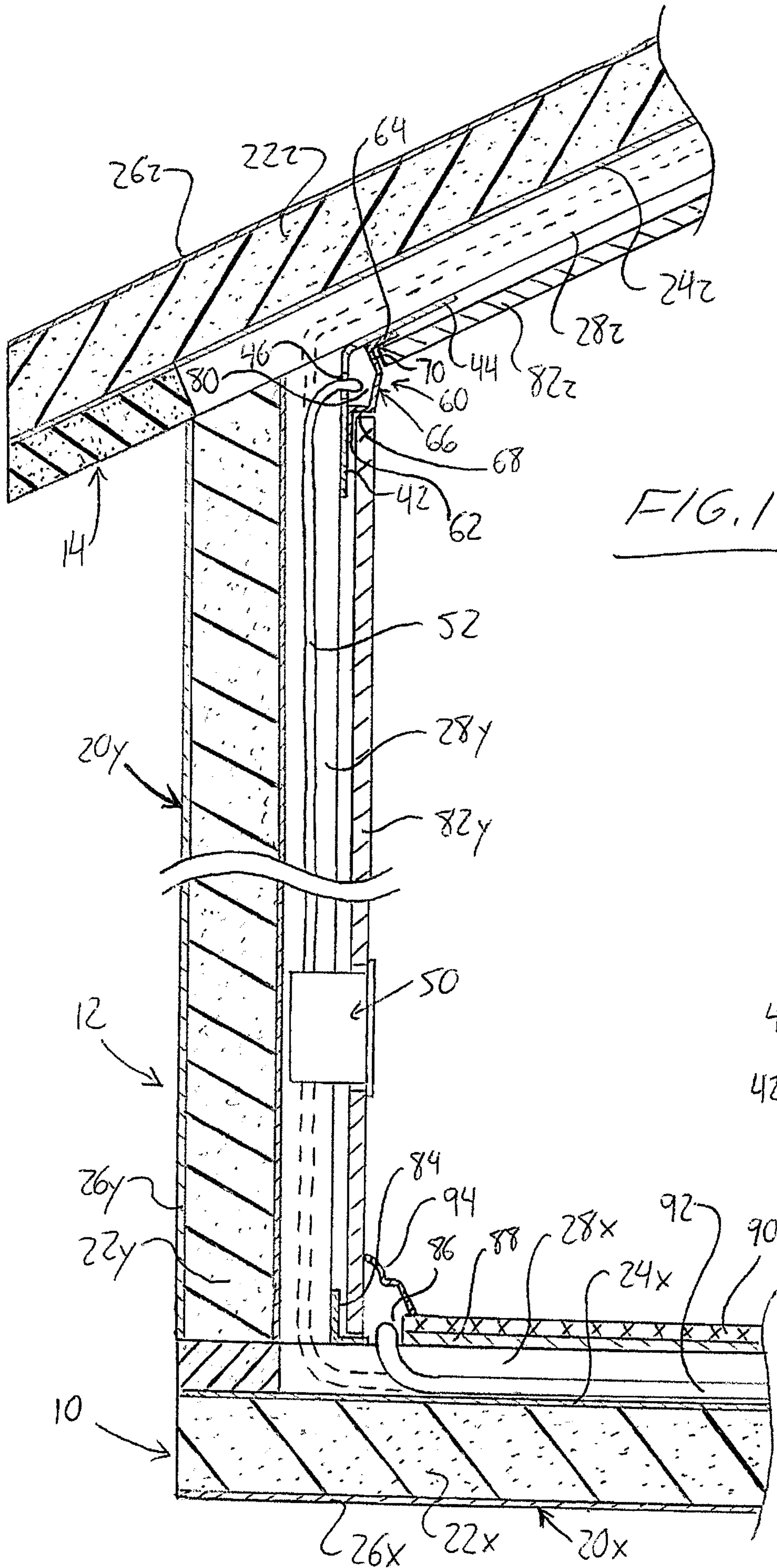


FIG. 1

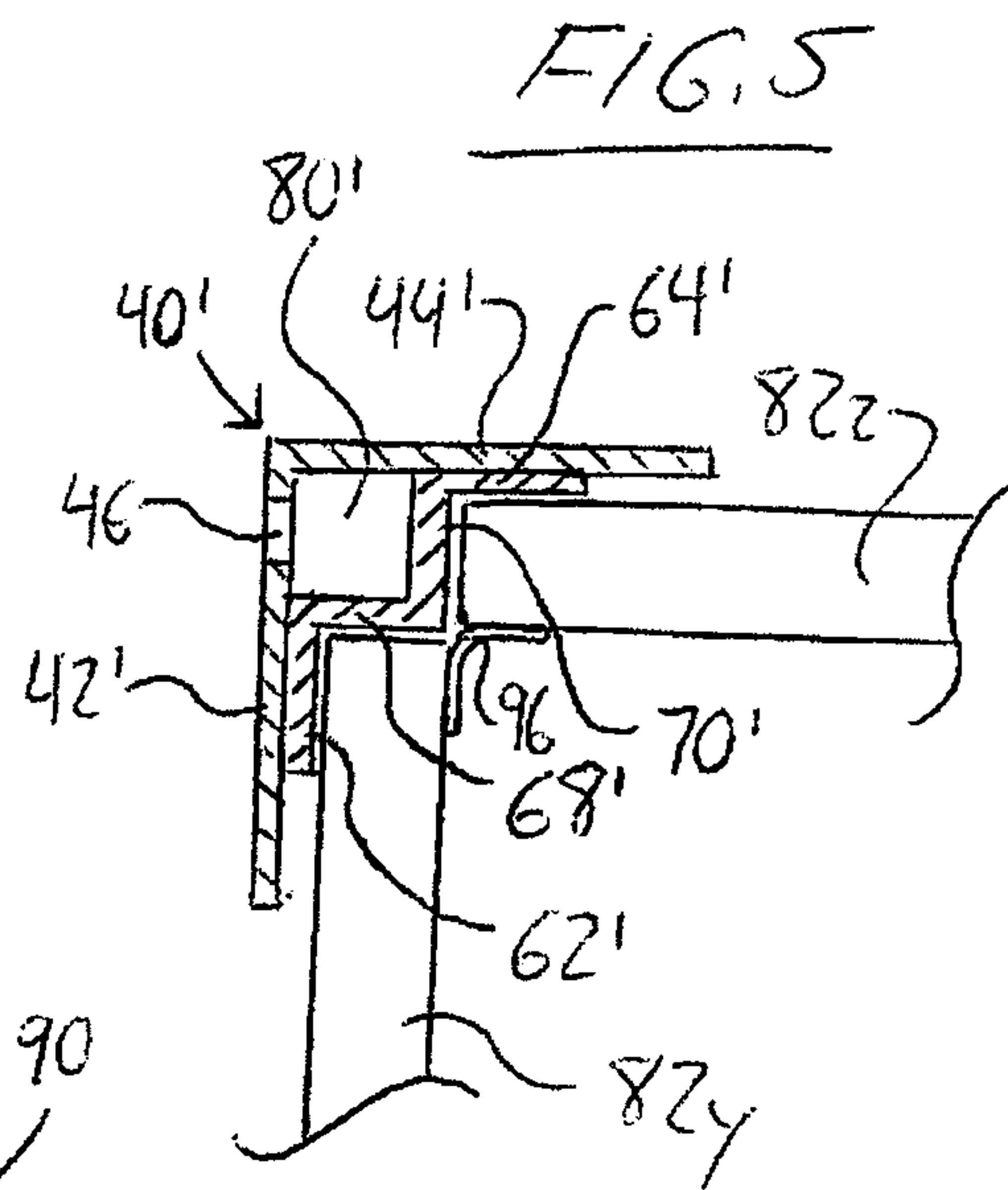


FIG. 5

