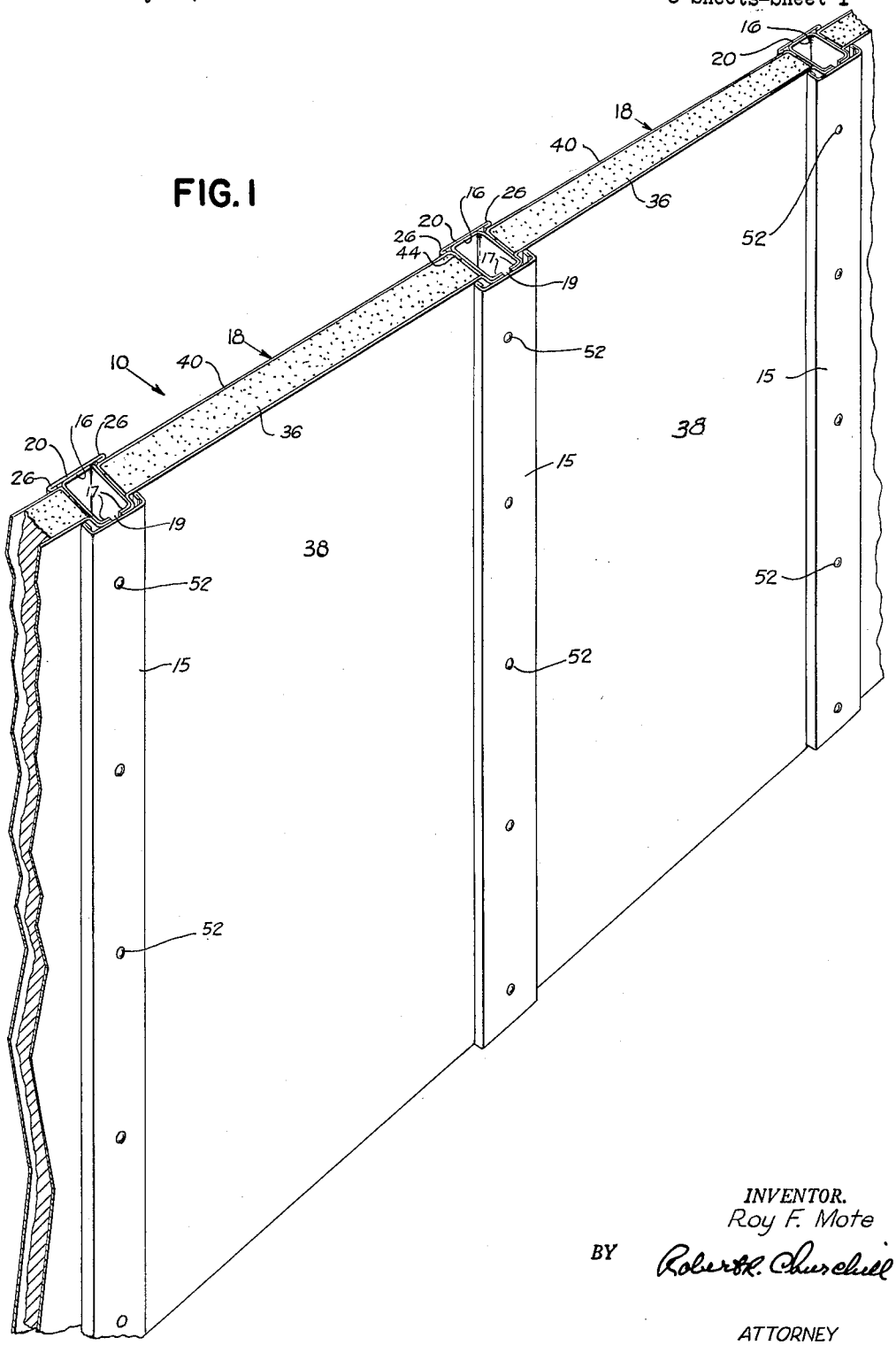
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WALL PANEL

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FIG. 1




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FIG. 2

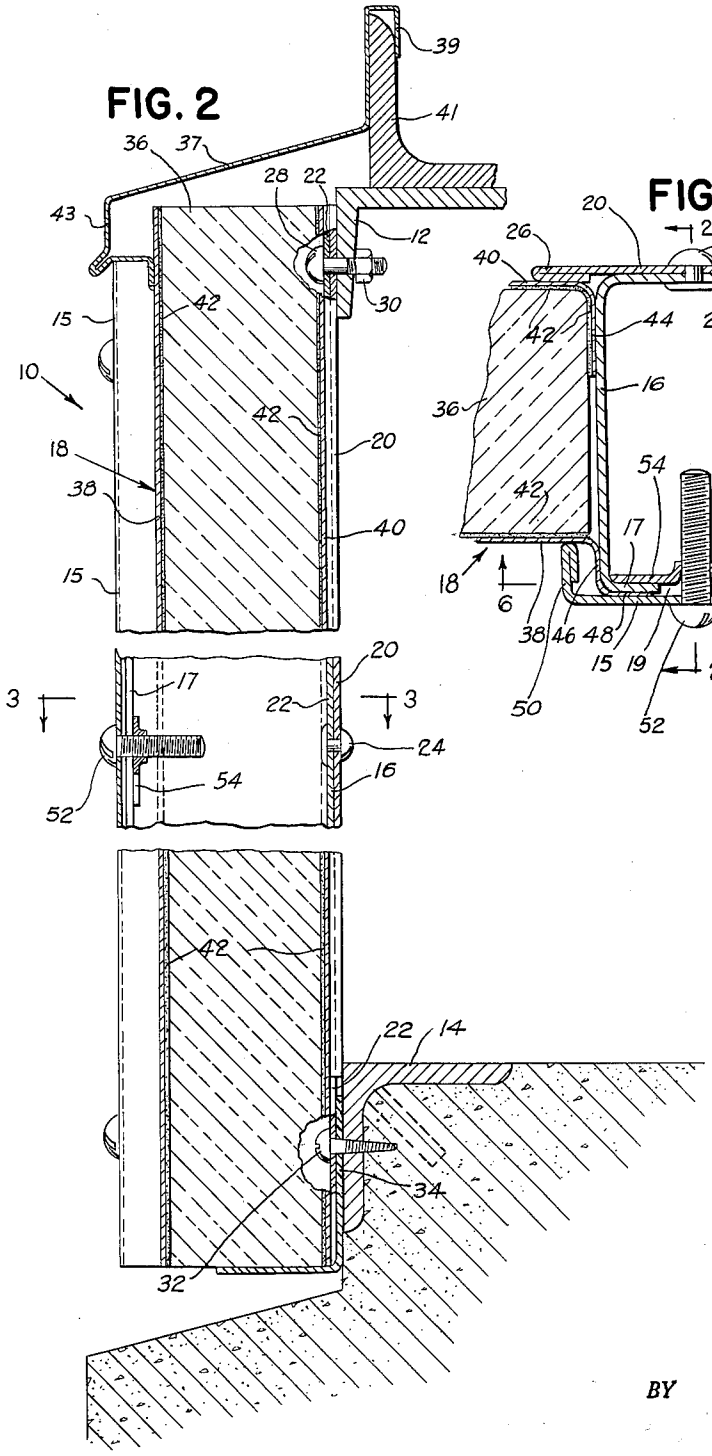



FIG. 3




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FIG. 4

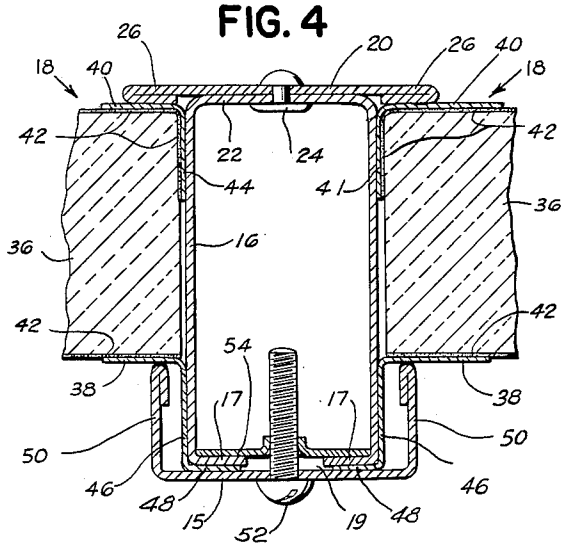



FIG. 5

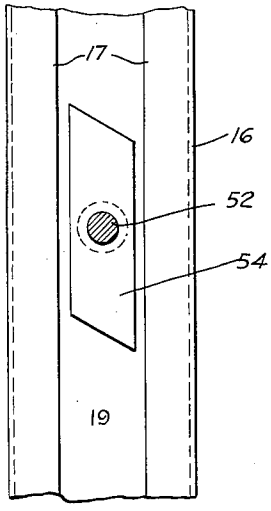
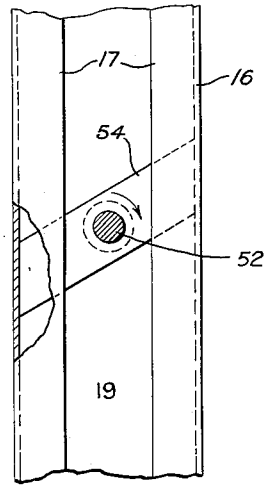



FIG. 6




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3,124,222

# WALL PANEL

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3 Claims. (Cl. 189—34)

This invention relates to a wall structure and particularly to an insulated metal wall panel structure for use in the construction of a building.

The invention has for an object to provide a novel and improved metal wall panel structure characterized by its relatively light weight, rigidity, strength and insulating characteristics and which may be economically manufactured and quickly and easily erected to form partition walls as well as the exterior walls of a building.

A further object of the invention is to provide a novel and improved metal wall panel of the character specified having novel supporting means for supporting the elements comprising the assembled wall panel such as to enable relatively lightweight facing sheets to be utilized in the construction of the panel, thereby providing an attractive and relatively inexpensive wall structure.

A still further object of the invention is to provide a novel and improved wall panel structure having novel fastening means for securing the elements comprising the wall panel structure together such as to enable the component parts of the panel to be quickly and easily erected, and to enable such components to be easily replaced if damaged.

With these general objects in view and such others as may hereinafter appear, the invention consists in the insulated wall panel structure and parts thereof hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention:

FIG. 1 is a perspective view of an insulated wall panel structure embodying the present invention;

FIG. 2 is a vertical section of the present wall panel structure erected to form a wall of a building, a portion of the section being taken through a vertical support or mullion as indicated at 2—2 in FIG. 3;

FIG. 3 is a horizontal section through a vertical support taken on the line 3—3 of FIG. 2;

FIG. 4 is a similar view showing a support or mullion of different proportions; and

FIGS. 5 and 6 are detail views illustrating different positions of novel fastening elements for securing the panels to the vertical supports.

One of the greatest stumbling blocks to the general acceptance and use of such materials as stainless steel, aluminum and porcelainized aluminum sheets in the production of interior and exterior walls for a building is the high cost of the raw material. The high cost is primarily due to the fact that up to the time of the present invention in order to obtain sufficient structural strength and rigidity, relatively heavy gauge sheets of such metals had to be used in the construction of the wall panel structures, or if lighter gauge sheets were used they had to be supported by additional framing and be fluted or corrugated and, of course, such materials substantially increase the cost of the wall structure.

The present invention substantially eliminates this stumbling block since relatively thin, flat lightweight metal sheets, such as stainless steel, aluminum or galvanized metal sheets may be used in the construction of the present wall panel structure.

In general the present invention contemplates a novel insulated wall panel structure particularly adapted for



use in the construction of the interior partitions as well as the exterior walls of a building and which is simple in construction and may be easily and quickly erected. The illustrated wall structure includes a plurality of spaced vertical hollow supports or mullions spanning the opening to be enclosed and secured at their upper and lower ends to the structural steel framework of the building. Lightweight insulating panels which may comprise relatively rigid insulating blocks having relatively thin and lightweight metal sheets laminated thereto are supported between and secured to adjacent spaced hollow supports or mullions, the longitudinal marginal edges of the panels being clamped between flange portions secured to the vertical supports by novel fastening means.

The spaced hollow vertical mullions or supports comprise the load bearing members of the present wall structure and may be made from sheet metal fabricated to produce a hollow support substantially rectangular in cross section.

In practice in order to provide a wall panel structure capable of enclosing spans of varying dimensions the cross sectional proportions of the hollow supports may be increased or decreased, and whenever necessary the gauge of the metal from which the supports are made may be increased or decreased whereby to provide maximum structural strength consistent with the requirements for supporting the wall without additional intermediate struts or horizontal framing, or providing corrugations or flutes in the sheets themselves.

Referring now to the drawings, the novel insulating wall panel structure, indicated generally at 10, is illustrated herein as secured to the structural steel framework of a building including a structural steel head member 12 forming a part of the roof and a structural steel sill member 14 grouted into the concrete floor as shown. The wall structure includes a plurality of elongated vertical hollow supports or mullions 16 spaced apart in accordance with the module centers desired and a plurality of insulated panel members, indicated generally at 18, extending between and secured to the vertical supports 16 by retaining caps 15 and novel fastening elements as will be described. The supports or mullions 16 are generally rectangular or U-shaped in cross section having inwardly bent flange portions 17 forming the front wall and providing an opening or longitudinal space or slot 19 between the edges of the flange portions in the front wall as shown.

The supports may and preferably will comprise protected metal having a sheet steel core provided with an asbestos felt covering impregnated with an asphaltic compound secured to the steel core by a metal adhesive. The coated sheets may then be provided with an additional weatherproof outer coating if desired, such protected metal being sold in the trade under the name of "Galbestos."

As shown in FIG. 3, each support 16 is provided with a flange plate 20 secured to the rear or inner wall 22 thereof by fasteners or rivets 24. The fastening elements 24 are aligned with slot 19 and extend centrally through the rear wall 22 such that they are accessible through the slot. The longitudinal marginal edges of each plate 20 are folded over or bent inwardly upon themselves, as shown, such folded-over portions providing marginal flanges 26 extending laterally from each side of the mullion. The bent-over portions 26 of the plate 20 increase the strength and rigidity of the plate and further provide rounded decorative edges which enhance the appearance of the wall structure. The flange plate 20 may comprise metal, such as stainless steel, galvanized steel or aluminum, and may preferably be preassembled with the rear wall 22 of the support at the factory.

In practice the vertical supports or mullions 16 are of a length such as to span the vertical height or opening defined by the head member 12 and the sill member 14, and in the erection of the wall panel structure the supports are secured to the structural steel members 12, 14 on the module centers which may, for example, be spaced three feet on centers. The upper end of each support or mullion is secured to the head member 12 by a bolt 28 which extends through the rear wall 22 of the support, the flange plate 20 and the depending leg of the head member 12, the bolt being secured in position by a nut 30. The lower end of each support or mullion 16 is secured to the sill member 14 by a screw 32 which extends through the rear wall 22, through the vertical leg of an intervening angle member or sill flashing 34 and into the depending leg of the sill member 14. As illustrated in FIG. 2, the flange plate 20 may be discontinued a short distance below the upper surface of the sill member 14. It will be understood that during the erection of the wall the fastening elements 28, 32 extending through the rear wall 22 of the support are aligned with the slot 19 in the front wall of the support and are accessible through the longitudinal slot 19.

The insulated panels 18 preferably extend the full length of the supports 16 and, as herein shown, each panel comprises a central core or block 36 of relatively rigid lightweight insulating material, preferably of a non-combustible character. The insulating block 36 may be of substantial thickness, approximately two inches thick, and preferably each face of the block is provided with a flat, as opposed to corrugated, relatively thin gauge metal facing sheet comprising a front or outer facing sheet 38 and a rear or inner facing sheet 40. The facing sheets 38, 40 are preferably laminated or bonded to the rigid insulating block 36 by a suitable adhesive as indicated at 42. As shown in FIGS. 1 and 3, the inner facing sheet 40 is channel shaped in that the longitudinal marginal edges thereof are bent inwardly at right angles to provide protective marginal flanges 44 about the rear corners of the relatively rigid insulating block, the flanges 44 serving to protect the ends of the block and to increase the rigidity of the panel. The longitudinal marginal edges of the outer facing sheet 38 are provided with right angle offset portions extending in a direction away from the insulating sheet, said portions having an outwardly bent leg 46 and an inwardly bent flange 48 as shown.

The substantially flat sheet metal facing sheets 38, 40 may preferably comprise relatively thin gauge stainless steel, aluminum, galvanized steel or protected metal sheets whereby the weight and expense of the wall structure is reduced to a minimum, and in practice while the laminated panels are sufficiently rigid to support themselves they are not designed to serve as supporting members, the load being taken substantially entirely by the vertical supports or mullions 16 between which the panels are clamped without benefit of any intermediate subgirts or structural steel framing.

While it is preferred to provide a metal facing sheet on both sides of the insulating block 36, as hereintofore described, in some cases, if desired, a single facing sheet may be provided on the exterior wall of the insulating block.

In erecting the wall panel structure the inner marginal edges of the panel 18 are placed against the doubly bent marginal flanges 26 of the flange plate 20 and preferably may be placed in engagement with the side walls of the supports or mullions 16, and when thus positioned the offset portions of the outer metal facing sheet 38 embrace the front corners of the supports, the outwardly bent legs 46 engaging the side walls of the supports and the inwardly bent flanges 48 engaging the inwardly bent flange portions 17 of the supports as shown.

The outer retaining caps 15 are U-shaped in cross section, the legs of the U having portions folded inwardly upon themselves forming relatively rigid panel engaging



flanges 50 as shown. The inner face of the cap is arranged to bear against the offset flanges 48 of the panels, and the width of the cap is such as to straddle the offset portions. The cap members 15 may also comprise metal of a gauge similar to that of the supporting members, such as stainless steel, aluminum or galvanized steel. The cap members provide a continuous attractive covering for the support 16 and thereby serve to enhance the appearance of the structure.

The novel fastening elements herein shown for securing the cap member 15 to the supports 16 and for frictionally engaging and firmly clamping the insulating panels 18 in assembled relation with the supports comprise a plurality of screws 52 having a head and a shank portion being extended through the cap member, each screw being provided with an "oblique" retaining nut 54 comprising a metal plate having a parallelogram shape. The width of the plate is sufficiently less than the width of slot 19 to enable the same when held in a vertical position to be inserted into slot 19 defined by the marginal edges of the flange portions 17 of the support 16 as shown in FIG. 5. After the nut is inserted into the hollow support through the slot 19, rotation of the screw will effect a rotation of the nut therewith until the shorter sides of the nut engage the inner side walls of the support at which time rotation of the nut is terminated and the continued rotation of the screw effects a clamping of the marginal edges of the insulating panels 18 between the inner flange plate 20 and the panel engaging flanges 50 of the cap member 15, and at the same time the support flanges 17 and offset flanges 48 of the outer facing sheet 38 are clamped between the cap member and the nut 54 as shown in FIG. 4. The nut may be weighted so that it will assume a vertical position by gravity to facilitate insertion into slot 19. In practice the screws 52 and "oblique" nuts 54 are preferably preassembled with the cap member 15 at the factory so that a minimum of assembly work is required at the building site. It may also be observed that the nut 54 aids in centralizing the cap 15 with respect to the support.

As illustrated in FIG. 2, the upper end of the wall panel structure may be enclosed by head flashings indicated at 37, the upper end 39 of the flashing being shaped to hook over the upstanding leg of a structural steel member 41 forming a part of the head framing. The flashing extends outwardly and downwardly from the frame member 41, and the outer and lower end 43 of the flashing is shaped to provide a right angle portion extending inwardly across the top of the cap member 15 and then downwardly into a cutout portion of the cap member to extend between the cap member and the front face of the insulating panel 18.

From the description thus far it will be seen that the present invention provides a wall panel structure having the necessary structural strength to be capable of being used to enclose vertical spans of varying lengths and enables lightweight thin gauge flat metal sheets to be used as facing sheets. In this manner the cost of the materials utilized in the construction of the wall is reduced to a minimum. The present wall panel structure is also characterized by structure which enables the components of the wall to be easily and rapidly assembled and erected. A substantial portion of the structure is also capable of being preassembled in the factory, thereby further facilitating erection in the field. It will also be apparent that the use of the thin gauge facing sheets and the elimination of intermediate supporting struts minimizes the cost of the wall and also substantially reduces the weight thereof.

In prior wall structures of which I am aware the facing sheets in and of themselves are required to provide structural strength and, of course, must be of relatively much heavier gauge metal. This substantially increases the cost of the wall structure and in instances where it is desired to utilize substantially flat metal sheets, such as stainless

steel or aluminum, makes the use of such metal impractical.

For the purpose of illustrating the present invention, but not limiting the same, for example, a stainless steel facing sheet designed to be a structural component of a wall would have to be 20 gauge in thickness and would also have to be corrugated or otherwise supported by struts or subgirts. On the other hand, the present facing sheets may be about 30 gauge in thickness such as to provide a relatively thin "skin" of metal bonded to a relatively rigid block of insulating material, the structural strength and rigidity being substantially entirely provided by the present novel supporting members **16**.

It may also be observed that the provision of a protective weatherproof asphaltic coating for the steel core sheet used in forming the hollow supports **16** minimizes thermal conduction through the wall thereby increasing the insulating characteristics of the wall structure. The present hollow vertical supports, for example, but not limitation, may comprise 10 to 12 gauge sheet steel cores which are particularly designed to have the necessary strength to provide sufficient structural support for the wall panel **18** and to resist stress and deflection under varying conditions in accordance with the height of the vertical span of the wall opening to be enclosed by the present wall structure, and in order to meet various structural requirements the depth of the supports may be varied to provide increased strength in accordance with or proportionate to increases in the length of the vertical span, and in addition the gauge of the metal forming the supports may also be increased. As shown in FIG. 4, when a support or mullion **16** of increased depth is utilized, the offset portions **46** of the outer facing sheets and the legs **50** of the U-shaped cap members **15** may be correspondingly increased in length in order to engage and clamp the panels **18** to the supports **16**.

From the foregoing description it will be seen that the present invention provides an attractive, lightweight and rigid wall panel structure of economical construction which may be quickly and easily erected with a minimum of labor cost. The novel fastening elements employed not only enable the entire panel structure to be assembled rapidly but also enable individual panels to be readily replaced whenever necessary.

It will be understood that various changes may be made in the proportions and details of construction of the invention described herein without departing from the principles of the invention.

Having thus described the invention, what is claimed is:

1. A lightweight insulated wall panel structure particularly adapted for erection upon the structural framework of a building to enclose a vertical opening defined by a structural steel head member and a structural steel sill member, said wall panel structure comprising a plurality of spaced, hollow vertical supports spanning said opening and secured at their upper and lower ends to said head and sill members respectively, said hollow supports being substantially rectangular in cross-section, the rear wall of each support having a flange plate secured thereto providing laterally extended rear flanges, insulating panels, spanning said opening and extending between the sides of adjacent supports and engaged with said laterally extended rear flanges, each insulating panel comprising a relatively rigid sheet of insulating material having a relatively thin and lightweight metal facing sheet laminated to opposed sides thereof, the said facing sheets being entirely spaced apart and out of contact with each other, said supports being of greater cross-sectional depth than the thickness of the panel, the front sheet of each panel having offset longitudinal marginal portions extended outboard from the said front sheet and overlapping marginal portions of the front wall of the supports, a U-shaped cap member engaging said overlapping marginal portions, the legs of the U engaging the adjacent edges of the panel, and fastening means, each comprising a screw extended through the cap member and secured to the support, said fastening means effecting clamping of the said overlapping portions of the front facing sheet between the said cap member and the front wall of the supports and effecting clamping of adjacent panels between the leg portions of the cap member and said laterally extended rear flanges.

2. A wall panel structure as defined in claim 1 wherein the hollow supports are provided with a protective asphalt coating whereby to reduce to a minimum thermal conductivity through the wall panel structure.

3. A wall panel structure as defined in claim 1 wherein the supports are adapated to be secured at their upper and lower ends only to the structural framework and are free of intermediate structural support.

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