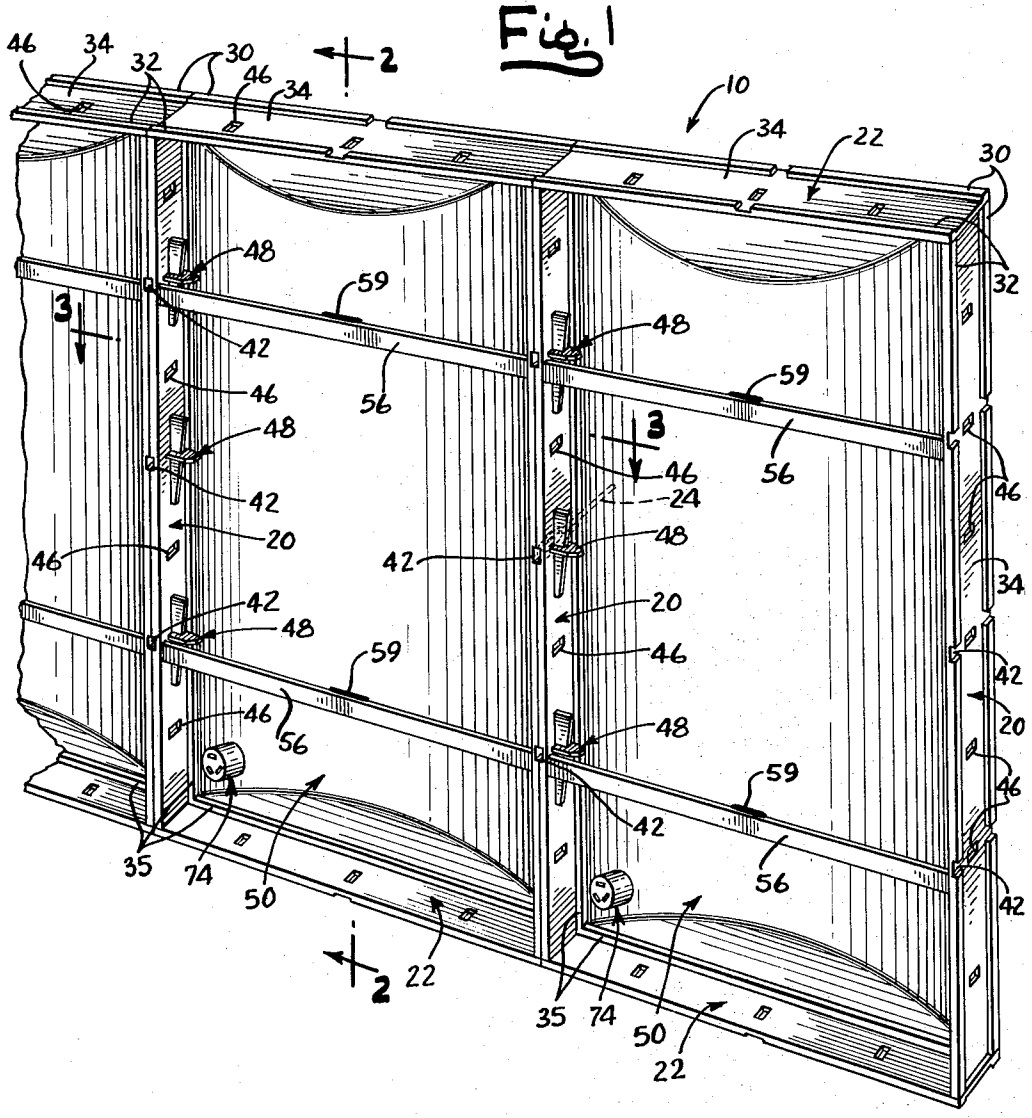
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CONCRETE WALL FORM PANEL UNIT WITH FACING-REINFORCING AND INSULATING MEANS

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Fig. 1



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Fig. 2

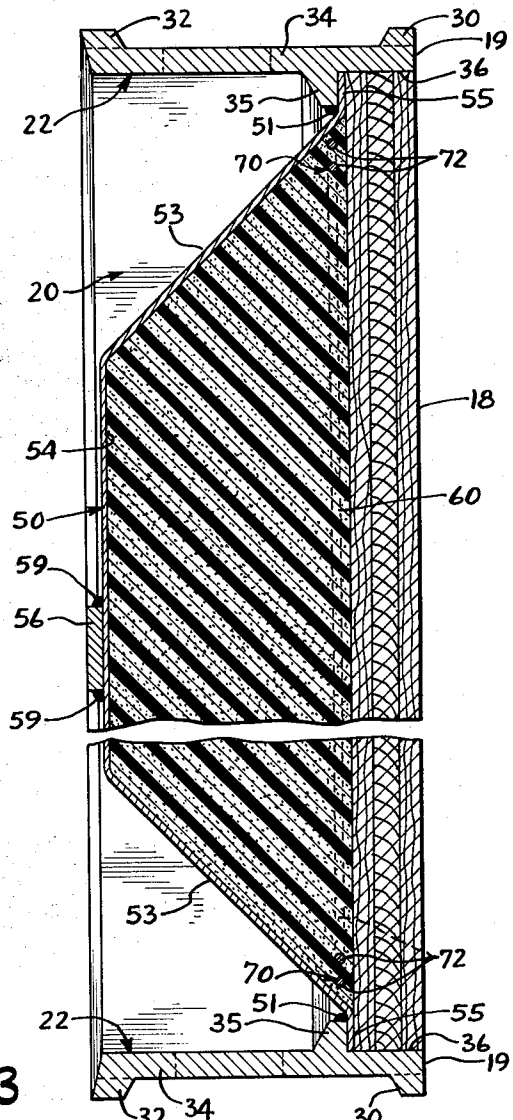
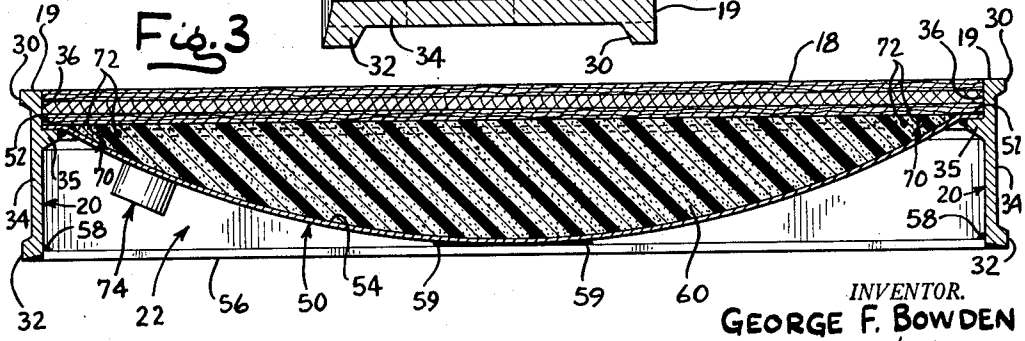


Fig. 3



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CONCRETE WALL FORM PANEL UNIT WITH FACING-REINFORCING AND INSULATING MEANS

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The present invention relates generally to a concrete wall form of the type wherein two opposed and spaced apart series of rectangular panel units in edge-to-edge relationship are adapted to have wet concrete poured into the space between them for wall-forming purposes and are connected together by horizontal, transversely extending combined tie and spreader devices in order that they are prevented from separating or moving apart under the thrust of the wet concrete. The panels which are commonly employed in this type of concrete wall form consist of facings of plywood against which the wet concrete is poured, and stiffening and strengthening frames which are applied to and extend around the margin or edge portions of the facings. Such strengthening frames embody horizontal and vertical members or bars and also intermediate crossbars which extend either vertically or horizontally and are connected at their ends to either the horizontal or the vertical marginal members or bars of the frames. The present invention has particular reference to a concrete wall form of the particular type which is known in the art as a prefabricated wall form in that the individual panel units are assembled at the factory rather than in the field, and the panel-reinforcing frames, including the horizontal and vertical marginal members, are in the form of lengths of steel channel or angle stock which is rolled to special shape and perforated, notched, grooved or otherwise fashoined in order properly to receive therein the edges of the plywood facings, as well as to facilitate the use of suitable fastening devices or other concrete wall form hardware whereby the adjacent panel units may be fastened together in edge-to-edge relationship.

Prefabricated concrete wall form panel units of the aforementioned type are manufactured in standard sizes and, in order to reduce outward bulging of the plywood facings by poured concrete against the facings, particularly in the larged units, it has been customary to reinforce the plywood facings with transverse members in the form of steel crossbars which extend horizontally across the rear or outer sides of the plywood facings and are welded at their ends to the vertical marginal members or bars of the panel-reinforcing frames. Such horizontally extending crossbars not only very materially increase the cost of manufacture of the panel units, but also are not altogether satisfactory in that they reinforce the plywood facings only in localized regions with the result that noticeable bulging frequently takes place in the different facing regions which are not contacted by the crossbars, thus causing the sides of the finished concrete wall to have a waffle-like appearance.

The present invention is designed to overcome the above noted limitation that is attendant upon the construction and use of conventional prefabricated concrete wall form panel units and, toward this end, it contemplates the provision in a panel unit of novel reinforcing means whereby the plywood facing is adequately and effectively reinforced against outward bulging throughout its entire area.

Briefly, the invention contemplates the provision in a concrete wall form panel unit of facing reinforcing means in the form of a sheet metal retaining pan which is generally arcuate in transverse cross section, has its

edge portions fixedly secured adjacent to the front edge regions of the opposed pairs of marginal members of the panel-reinforcing frame, and extends across the entire length and width of the plywood facing. The pan, in combination with the plywood facing, defines a shallow, substantially semicylindrical pocket within which there is disposed a quantity of a cellular material which is possessed of an appreciable degree of resistance to compressional forces, but is nevertheless somewhat resilient while, at the same time, possessing high heat insulating properties. This material completely fills the pocket and, since it is strong insofar as compressional forces are concerned, any tendency for bulging of the plywood facing which it completely covers is assimilated by the metal of the pan which is placed under tension with the load being transferred either indirectly or directly to the edge portions of the plywood facing. By such an arrangement, the use of crossbars or other reinforcing members is completely eliminated with the result that the improved panel unit as a whole is materially stronger and of less weight than a conventional panel unit.

Due to the fact that the cellular material within the pocket possesses high heat insulating properties, such material operates in the manner of an outer jacket which insulates the poured concrete during the setting time thereof so that, during cold weather operations, the need for applying artificial heat to the panel unit is eliminated, as is the use of tarpaulins or other enclosures which sometimes are required to retain the natural heat of hydration and thus maintain the concrete above freezing temperatures. Thus, due to the high heat insulating characteristics of the cellular material, use of a panel unit constructed in accordance with the principles of the present invention results in the elimination of such manual labor which, otherwise, would be required for heat insulating preparation work.

Still further, according to the present invention, provision is made for the application to the improved panel unit of a limited amount of artificial heat, such heat being applied by convenient electrical means. The heat, thus applied, is intended for heat distribution purposes as well as for replacement of heat losses, as will become clear as the following description ensues.

The provision of a reinforced and insulated panel unit of the character briefly outlined above being among the principal objects of the present invention, numerous other objects and advantages will become readily apparent as the nature of the invention is better understood.

In the accompanying two sheets of drawings forming a part of this specification, one illustrative embodiment of the invention has been shown.

In these drawings:

FIG. 1 is a fragmentary perspective view of one side of a concrete wall form showing a plurality of panel units constructed in accordance with the principles of the present invention operatively installed therein in edge-to-edge relation;

FIG. 2 is a sectional view taken on the line 2—2 of FIG. 1; and

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 1.

Referring now to the drawings in detail, and in particular to FIG. 1, a fragmentary portion of a concrete wall form of the pre-fabricated metal-reinforced panel unit type and embodying individual panel units constructed in accordance with the present invention has been designated in its entirety by the reference numeral **10**. The wall form selected for illustration is made up of a series of panel units, only three of which appear in FIG. 1, the three units being designated by the reference numerals **12**, **14** and **16**. Adjacent or contiguous panel units are

arranged in edge-to-edge relationship. Except for the provision of the novel reinforcing and heat insulating means of the present invention, the various units **12**, **14** and **16** are of more or less conventional shallow open box-like design and each panel unit is in the form of a rectangular plywood facing **18** and a marginal reinforcing frame applied to the outer face of the facing and consisting of vertical and horizontal marginal frame bars **20** and **22**, respectively. The bars **20** extend in contiguity at the juncture between the panel units **12** and **14**, and at the juncture between the units **14** and **16**. It will be understood that the series of panel units **12**, **14** and **16** is arranged in spaced opposition to a similar series of panel units and is maintained in spaced relationship from such similar series by means of conventional tie rod and spreader devices, fragments of which have been illustrated herien and designated in their entirety by the reference numeral **24**.

The vertical frame bars **20** are of shallow channel shape in cross section and each bar includes inside and outside, outwardly extending marginal ribs **30** and **32**, respectively (see FIG. 1 and also FIG. 3), and a connecting web portion **34**. An integral laterally and inwardly extending seating flange **35** is spaced inwardly a slight distance from the inside edge of each vertical frame bar and affords a right angle recess **36** in which the adjacent vertical edge portion of the plywood facing **18** seats with the inside face of the facing extending flush with the inside edge **19** of the associated frame bar **20**.

In erecting the concrete wall form **10**, the panel units **12**, **14** and **16** are brought into contiguity or edge-to-edge relation with adjacent vertical frame bars **20** abutting each other so that the respective ribs **30** and **32** are in edge-to-edge abutting relationship while the web portions **34** remain slightly separated. At vertically spaced regions along the ribs **30** and **32**, pairs of transversely registering notches **42** are provided and these notches, when the vertical frame bars **20** are in contiguity, define therebetween horizontal channel voids which are adapted to receive therethrough the tie rods proper of the tie rod and spreader devices **24**. A rectangular slot **46** is formed in the web portion **34** of each vertical frame bar **20** at the horizontal level of each pair of notches **42** and is adapted to receive therethrough the usual T-bolt of a bolt and wedge assembly **48** whereby the adjacent or abutting frame bars **20** may be drawn tightly together.

The horizontal frame bars **22** are substantially identical in their construction to the vertical frame bars **20** and, to avoid needless repetition of description, similar reference characters have been applied to the corresponding parts of both frame bars.

The arrangement of parts thus far described is purely conventional in its design and construction and no claim is made herein to any novelty associated with the same. Panel units of this type may vary widely in their details of construction and it will be understood that each concrete wall form panel unit which is illustrated herein is purely exemplary of one embodiment of a panel unit to which the reinforcing and insulating means of the present invention is applicable. The novelty of the present invention resides in the reinforcing and heat insulating means which is associated with each of the panel units **12**, **14** and **16** and will now be more fully described.

Referring now additionally to FIGS. 2 and 3, each panel unit has applied thereto at the rear or outer side of the plywood facing **18** thereof a pan-like retaining member **50** which, for convenience, will hereinafter be referred to as a pan. This pan **50** is in the form of a section of comparatively thin flat sheet metal stock which is preferably sheet steel of relatively light gauge and high tensile strength and has been shaped so as to have an arcuate cross section as best seen in FIG. 3. The side edge regions of the pan are turned laterally outwardly to provide attachment flanges **52** which are welded coextensively as at **51** to the seating flanges **35** of the vertical frame bars **20** on opposite sides of the panel unit. These attachment flanges **52** are interposed between the seating flanges **35** and the side edge regions of the plywood panel **18**. The upper and lower end regions of the pan are flattened and inwardly inclined as at **53** and the edge regions thereof are likewise turned laterally to provide attachment flanges **55** which are similar to the flanges **52** and similarly welded to the seating flanges **35** of the horizontal frame bars **22**.

The pan **50** is of such width that it bridges the distance between the opposed vertical marginal frame bars **20** and, in combination wtih the inside surface of the plywood facing **18**, defines a generally semicylindrical pocket **54** having a circumferential arcuate extent of approximately 36°.

Vertically spaced horizontal struts **56**, which may be in the form of flat steel bars, extend across the panel unit at the rear thereof and have their ends welded as at **58** to the rear margins of inside faces of the vertical frame bars **20**. While two such struts have been shown herein for illustrative purposes, it will be understood that a greater or lesser number of these struts may be employed. As previously stated, the panel units are made up in standard sizes which vary in longitudinal extent but which are of uniform transverse width. Commercial units are generally two feet in width and they are made in selected standard lengths. Specifically, the units are made up in three, four, six and eight-foot lengths. The number of struts **56** is commensurate with the length of any given unit. The various struts **56** extend in tangential fashion across the crest portion of the associated arcuate pan **50** and are welded as at **59** thereto, the struts thus serving to reinforce the marginal frame bars **20**.

Disposed within and completely filling the pocket **54** within the confines of the pan **50** of each panel unit is a quantity or mass of a load transferring, heat-insulating material **60**. While the mass may be comprised of various substances which offer the necessary load transferring, water repellent, rot-resistant and heat-insulating characteristics, the same is preferably formed of a cellular material containing occluded air cells and commonly referred to as "plastic foam." Chemically, the material is classified as a polyether urethane foam. Various grades of such "plastic foam" are manufactured and sold by the Glidden Paint Company of Cleveland, Ohio, under the trade name "Glidfoem." It is contemplated that the particular grade of material (plastic foam) which is employed in each pocket **54** will offer an appreciable degree of resistance to compressional forces, but will, nevertheless, be somewhat resilient. Such a material is widely sold at the present time for ice box insulation purposes.

As best seen in FIG. 3, the material **60** is coextensive with the entire inside face of each panel facing **18**, as well as with the inside curved surface of the associated pan **50**. The material **60** is maintained under compression within the pocket **54** and thus, when there is a tendency for the panel facing **18** to bulge outwardly under the influence of the weight of the poured concrete, the load will be assimilated by the material **60** and transferred, so to speak, first through the material directly to the pan **50** and then from the pan to the vertical and horizontal frame bars **20** and **22**, and also to the welded regions **62** of the struts **56**, these parts serving as reaction regions for direct assimilation of the thrust that is exerted by inward bulging of the panel facing **18**. By reason of the fact that the pan is arcuate in cross section it possesses a catenary effect and, together with the "plastic foam" material, serves to resist to a maximum outward bulging of the plywood facing **18** when the latter is subjected to the outward force or thruust of wet concrete thereagainst. By so reinforcing the facing **18** as to reduce to a minimum outward bulging or deflection by wet concrete thereagainst, the adjacent side of the wall which is formed upon hardening or setting of the concrete will be for all intents and purposes flat. By reason of the catenary effect of the

pan due to the pan being arcuate in cross section, the tension or outward bulging to which the pan is subjected by the "plastic" foam material **60** in connection with placement of wet concrete against the facing **18** is effectively opposed by corresponding compression of the plywood facing.

It is to be noted at this point that, since the material **60** possesses good heat-insulating properties, it may be relied upon to retain within the concrete form confines the heat of hydration which is generated within the poured concrete during hardening of the latter. Panels constructed in accordance with the principles of the present invention will, therefore, be found particularly useful in the field during exteremely cold weather when there is danger of freezing weather conditions. By the use of the present insulated panel units, the straw, tarpaulin or other concrete enclosures which are commonly employed to prevent concrete freezing, and the attendant labor that is required in the erection of the same, may be completely eliminated.

Still referring to FIG. 3, it is to be noted that in the relatively thin regions of the pocket **54** where the side edges of the pan approach and contact the attachment flanges **35** of the vertical frame bars **20**, the thickness of the material **60** is considerably less than it is in the medial regions of the pocket. The protection to the adjacent regions of the poured concrete offered in the marginal regions of the panel unit is thus considerably less than is offered in the medial regions of the unit. Stated in other words, any heat of hydration which may be generated by the concrete in these marginal regions of the panel is susceptible to being transferred through the metal of the pan **50** directly into the flanges **35** and from thence into the adjacent metal of the frame bars **20**. Accordingly, in order to counteract this tendency for heat escapement, an electrical resistance unit, such as has been shown at **70**, may be embedded in the marginal portions material **60**. The resistance unit illustrated herein is in the form of a number of loops **72** of insulated resistance wire which extend around and through the narrow side and end regions of the pocket. The unit **70** has a terminal plug-in connection **74** which may conveniently be positioned at an accessible point on the pan **50**. Energizing current for thet various panel units which are associated with any given concrete form installation may be of the 220-volt variety and supplied through a common or manifold conduit (not shown) having suitable outlet connections for the various terminal connections **74** with provision being made for grounding the panel units through the conduit.

It will be understood that the resistance unit **70** is provided solely for the purpose of supplying heat to compensate for heat losses by conduction in the marginal regions of the pan **50**. The units **70** are not intended to supply external heat to the concrete mass undergoing hardening. From a commercial aspect, panel units which are intended for use in above freezing temperatures need not be equipped with the above-described heating means.

While one specific embodiment of a panel unit constructed in accordance with the principles of the present invention has been shown and described herein for illustrative purposes, it will be understood that the illustrated form does not indicate all the different forms of units suitable for the functions intended. The illustrated form is only one of those which have been developed for commercial application of the invention. The invention, therefore, is not to be limited to the particular form of panel unit which is specifically disclosed herein and it is intended to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

This application is a continuation-in-part of United States patent application Serial No. 49,672, filed on August 15, 1960, entitled "Concrete Wall Form Panel With Reinforcing and Insulating Means," and now abandoned.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. As a new article of manufacture, a prefabricated rectangular panel unit adapted to be arranged in an upstanding position and also in edge-to-edge relation with similar panel units and to form with such similar units one side of a wall form into which wet concrete is to be poured and then set for wall-forming purposes, said panel unit comprising a normally flat rectangular plywood facing, a rectangular frame extending around and serving to reinforce the facing, having its front marginal portions connected to the marginal regions of the facing, having its intermediate and rear marginal portions projecting rearwards of the rear surface of the facing and forming therewith a rectangular space of appreciable thickness, a rectangular rearwardly bulged pan formed of imperforate sheet material of comparatively high tensile strength, disposed for the most part within and shaped in outline substantially conformably to said space, having its marginal portions, substantially throughout their entire length, connected fixedly in place adjacent to the junctures of the front marginal portions of the frame and the marginal regions of the facing, and defining with said rear surface of the facing a closed pocket, and a mass of material possessing lightness of weight, a comparatively high degree of resistance to compression and a slight amount of resiliency, disposed in and entirely filling the pocket, and arranged so that the inner surface thereof is in coextensive contact with substantially the entire area of the rear surface of the facing and its rear surface is in coextensive contact with substantially the entire area of the inside surface of the pan, said pan being for the most part uniformly arcuate in cross section from end to end in order that it possesses a catenary effect, said mass being of such character that when wet concrete is poured against the front surface of the facing and the facing thereby tends to bulge rearwards, it is placed under compression and any rearward pressure which it exerts against the pan, places the pan under tension and is, due to the catenary effect of the pan, opposed by corresponding compression of the facing with the result that the mass and pan effectively coact to resist to a maximum rearward bulging of the facing in connection with pouring of wet concrete against it.

2. A prefabricated rectangular panel unit as set forth in claim 1 and wherein the end regions of the pan are substantially flat and slope forwards in the direction of the facing.

3. A prefabricated rectangular panel unit as set forth in claim 1 and wherein the frame and pan are formed of steel, the marginal portions of the pan are bent laterally outward to form flat coplanar attaching flanges, and said flanges are in abutting relation with and welded directly to parts of the front marginal portions of the frame.

4. A prefabricated rectangular panel unit as set forth in claim 1 and wherein the material of which the mass is made is cellular "plastic foam."

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