

Dec. 12, 1967

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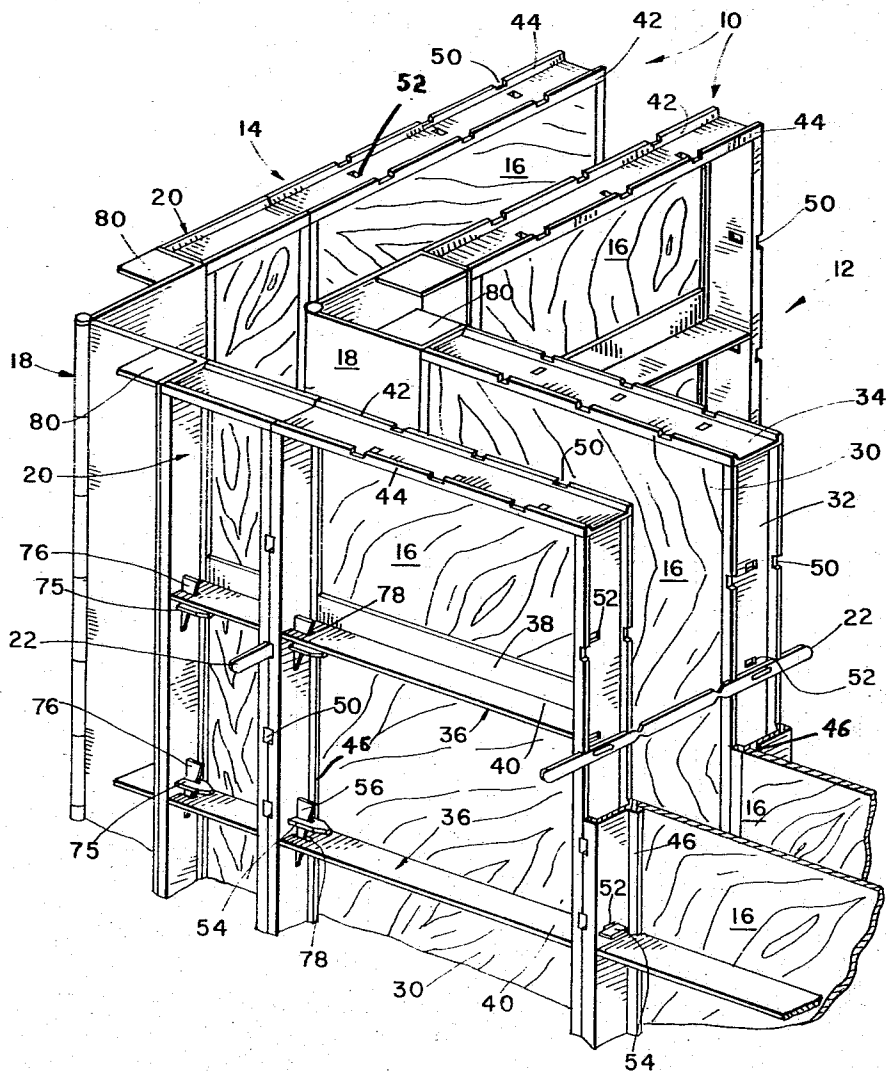
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CONCRETE WALL FORM WITH A PARTICULAR PANEL HINGE ARRANGEMENT

Filed June 30, 1965

2 Sheets-Sheet 1

FIG. 1



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FIG. 3

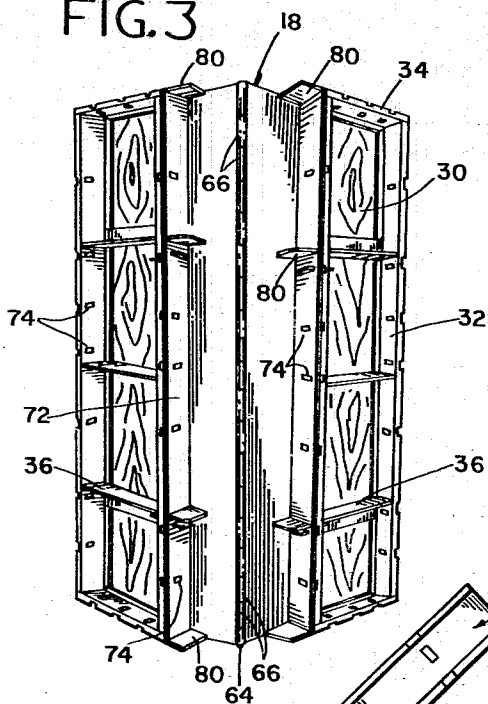


FIG. 4

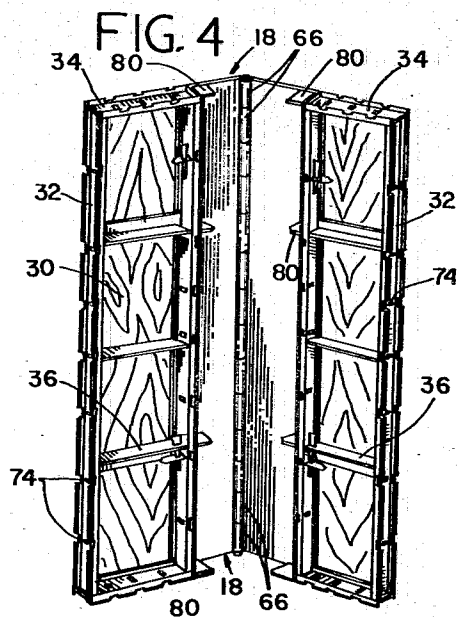


FIG. 2

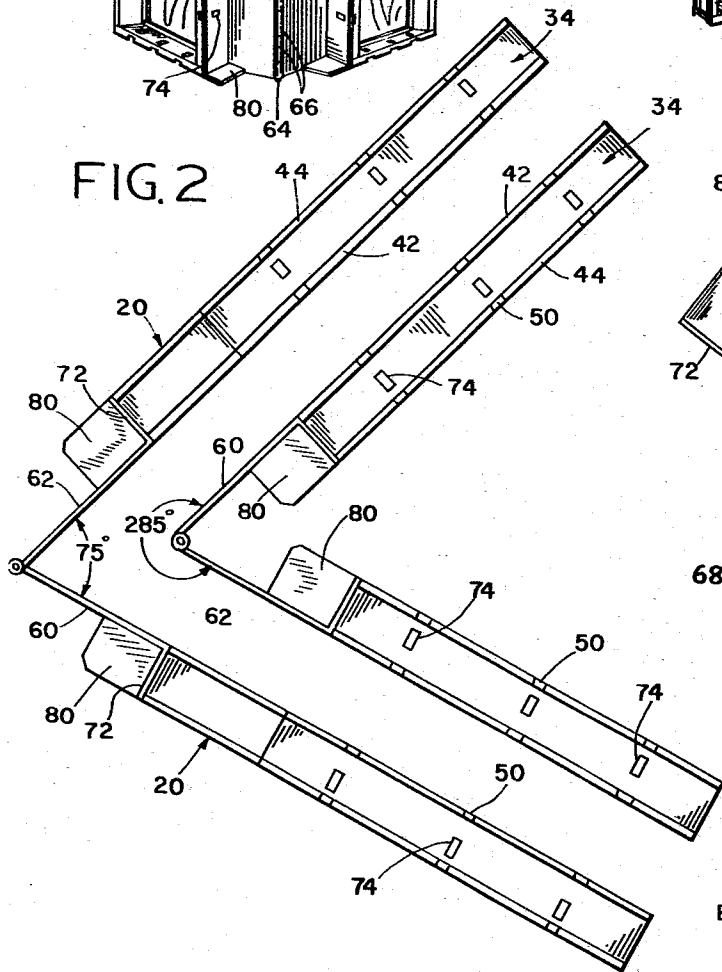


FIG. 5

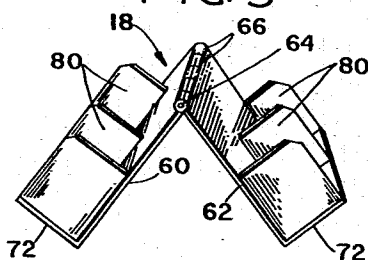
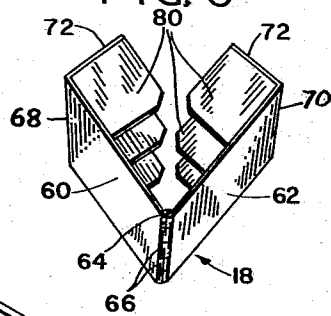


FIG. 6



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CONCRETE WALL FORM WITH A PARTICULAR PANEL HINGE ARRANGEMENT

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1 Claim. (Cl. 249—194)

The present invention relates generally to concrete wall forms and has particular reference to a concrete wall form employing panels which are known in the concrete construction industry as "Steel-Ply" panels and are manufactured and sold by Symons Mfg. Company of Des Plaines, Ill., U.S.A. Steel-Ply panels, in various forms, are widely used in the building industry. They are assembled at the factory rather than in the field, and when shipped to a given scene of installation or construction, they are designed to be used with various concrete hardware articles which are of special construction and permit the panels to be easily erected in a wall form installation and subsequently removed from the installation for re-use after they have served their intended purpose.

A concrete form panel of the Steel-Ply type consists essentially of a shallow tray-like structure including a rectangular plywood facing, the edges of which are completely encased in a rectangular steel reinforcing frame comprising longitudinal and transverse frame members, together with a series of parallel, spaced apart, transverse crossbars which extend between the longitudinal frame members and lend reinforcement to the medial or central regions of the plywood facing by constituting a backing therefor. Such a panel is adapted to be set up for wall form work in edge-to-edge relationship with similar panels in such a manner that the plywood facings of the panel lie in a common vertical plane. Where angular concrete corners are concerned, such, for example, as in the erection of a rectangular concrete column, or where a concrete wall makes a right angle bend, two of the panels are set up in edge-to-edge relationship but with the adjacent plywood facings extending at a right angle to each other, outside 90° angle irons being required to effect the connection between the two panels. Such right angle bends are sufficiently common as to warrant the manufacture of angle irons in appropriate lengths to accommodate the various standard sizes in which the Steel-Ply panels are manufactured, as well as the stocking of such angle irons in inventory by contractors. However, with the advent of many odd-shaped modern buildings representing the current trend toward modern and "far out" architecture, more and more non-right angle corners are encountered and involving both inside angles of either an acute or an obtuse nature, and outside or reflex angles whose supplements are either acute or obtuse. Heretofore, in order to accommodate such non-right angle corners and enable the positioning of wall form panels appropriately, it has been customary for the contractor to order the necessary angle irons on a special basis, thus resulting in extra shipping costs and other additional expense. Installation procedures are sometimes hampered due to lack of proper working space, especially where small acute angles are involved.

The present invention is designed to overcome the above-noted limitations that are attendant upon the erection of concrete wall forms involving such odd or non-right angle corners and toward this end, the invention contemplates the provision of a novel panel hinge which, when applied to a pair of adjacent Steel-Ply or similar concrete wall form panels for use in a concrete wall form installation, will permit an infinite relative swinging adjustment of the two panels whereby the general planes of

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the panels may be caused to assume an infinite range of angles extending from a very small acute angle to a very large obtuse or reflex angle. The panel hinge of the present invention is, furthermore, useable without any modification whatsoever and without altering its mode of attachment to the panels in the formation of either inside or outside angles or corners.

The provision of such a panel hinge, as well as a novel concrete wall form embodying such a hinge, constitutes the principal object of the present invention.

Other objects and advantages of the invention will readily suggest themselves as the nature of the invention is better understood from a consideration of the following detailed description.

In the accompanying two sheets of drawings forming a part of this specification, one embodiment of a panel hinge constructed according to the present invention has been shown in detail and several exemplary uses thereof in a wall form installation have been portrayed.

In these drawings:

FIG. 1 is a fragmentary perspective view, partly in section, of a concrete wall form employing two panel hinges embodying the present invention;

FIG. 2 is an enlarged top plan view of the concrete wall form which is shown in FIG. 1;

FIG. 3 is a reduced outside perspective view of the outside part of the structure of FIG. 1;

FIG. 4 is a reduced inside perspective view of the inside part of the structure of FIG. 1;

FIG. 5 is a perspective view of one of the panel hinges of the present invention, showing the same in the condition which it assumes when it is employed in connection with the formation of an outside or reflex angle corner; and

FIG. 6 is a perspective view similar to FIG. 5 but showing the other panel hinge in the condition it assumes when it is employed in connection with the formation of an inside acute angle.

Referring now to the drawings in detail and in particular to FIGS. 1 and 2, a fragmentary corner portion of a complete concrete wall form installation is designated in its entirety by the reference numeral 10, and it is comprised of an inside wall form assembly 12 and an outside wall form assembly 14. The illustrated portion of the inside wall form assembly 12 includes three full size standard Steel-Ply panels 16 and one of the panel hinges 18 of the present invention. The illustrated portion of the outside wall form assembly 14 includes three full size standard Steel-Ply panels 16, two filler panels 20, and another of the panel hinges 18. The concrete wall form assemblies 12 and 14 are maintained in spaced apart relationship by means of conventional horizontally extending tie rods 22. The panels 16 and the hinge 18 of the inside wall form assembly 12 are so positioned as to accommodate the forming of an inside acute angle corner in the wall structure which is to be formed by the pouring of wet concrete into the space existing between the two form assemblies 12 and 14. The panels and the hinge of the outside wall form assembly 14 are so positioned as to accommodate the forming of an outside angle corner which is a supplement of the side acute angle corner that is formed by the inside wall form assembly 12. For exemplary purposes, the angles that have been selected for illustration are 75° and 285° and they have been so labelled in FIGS. 1 and 2.

In order that the nature, function and operation of the panel hinges 18 of the present invention may be better understood, it is deemed necessary that the nature of the Steel-Ply panels 16 first be understood. Each panel 16 is of the prefabricated type. It is of open shallow tray-like design and comprises a rectangular plywood facing

30 and a marginal steel reinforcing frame. The latter includes longitudinal frame members 32 and transverse frame members 34. Each of the panels 16 is shown as being positioned with its longitudinal frame members 32 extending vertically and with its transverse frame members 34 extending horizontally, this being the normal position of the panel when it is employed with similar panels in a conventional concrete wall form installation. Thus, further reference to any of the panels 16 will be made on the basis of its vertical position in a concrete wall form. At appropriate levels in each of the panels 16, intermediate horizontal crossbars 36 extend between and are welded to the opposed vertical frame members 32. The various crossbars 36 of each panel are in the form of angle bars having vertical flanges 38 fitting flatly against the plywood facing 30 for reinforcing purposes and horizontal flanges 40 which extend at a right angle to the plywood facing. The frame members 32 and 34 are in the form of structural steel bars which are of shallow channel shape so far as cross section is concerned. Each bar includes inside and outside outwardly extending marginal ribs 42 and 44 and a connecting base or web 46. On the side of each web that is opposite the ribs 42 and 44 is a laterally and inwardly extending seating flange 46 on which the adjacent edge portion of the plywood facing 30 seats, the inside face of the facing being flush or coplanar with the inside edges of the frame members 32 and 34. At vertically spaced regions along the marginal ribs 42 and 44, pairs of transversely registering notches 50 are cut and these notches, when the frame members of a given panel are in contiguity with the frame members of adjacent panels, define channel voids through which the looped ends of the tie rods 22 may pass when the various panels 16 are employed as parts of a concrete wall form installation. A rectangular slot 52 is formed in the web portion of each frame member at the level of each pair of notches 50 and such slot is adapted to receive therethrough the slotted shank portion of a conventional T-bolt 54, the bolt shank passing the adjacent tie rod loop and through a complementary similar slot in the web portion of the adjacent frame member. A wedge 56 is driven through the slotted shank of each T-bolt 54 as shown in the lower right-hand corner of FIG. 1 so that the contiguous or abutting frame members of adjoining panels are drawn tightly together and maintained in firmly clamped coplanar relationship. This manner of connection between adjacent Steel-Ply panels is a basic feature of such panels and no claim is made here to any novelty therein. Such manner of panel connection has been described herein inasmuch as the rectangular slots 52 in the web portions 46 of the panel members cooperate with the panel hinges 18 of the present invention in a novel manner that will be described subsequently when the nature of these hinge panels is better understood.

The filler panels 20 of the outside wall form assembly are the same in design and construction as the Steel-Ply panels 16 and will hereafter be considered as panels 16.

Each of the two panel hinges 18 which are illustrated herein is of the leaf hinge type, which is to say, it comprises two generally planar hinge leaves 60 and 62 (see particularly FIGS. 5 and 6) which are connected together for relative swinging movement about the axis of a vertically extending connecting hinge pin 64. The hinge pin 64 of each panel hinge passes through a series of interlaced tubular hinge eyes 66 in the usual manner of a conventional piano hinge. The axial extent of each panel hinge 18 is equal to the longitudinal extent of the panels 16 to which the hinge is adapted to be applied, which is to say, that the height of the hinge leaves 60 and 62 is approximately equal to the length of the vertical frame members 32. The panel hinges 18 may, therefore, be manufactured in standard lengths commensurate with or corresponding to the lengths of the various standard size Steel-Ply panels that are used in the concrete wall form installations 10. The width or radial extent of the

hinge leaves 60 and 62 of the panel hinges may, however, remain constant, it being on the order of six inches. The outer edge or marginal regions of the hinge leaves 60 and 62 of each panel hinge 18 are turned laterally as indicated at 68 and 70, thus providing a pair of vertical attachment flanges 72 by means of which the panel hinge may be connected to adjacent panels 16.

To effect the connection of the panel hinges 18 to the adjacent panels 16, the vertical attachment flanges 72 on the hinge leaves 60 and 62 are formed with rows of spaced slots 74, the number and spacing of these slots being commensurate with the number and spacing of the slots 52 in the webs 46 of the vertical frame members 32. Attachment of the panel hinges 18 to adjacent panels 16 is made by aligning the slots 74 in the vertical attachment flanges 72 with the slots 52 in the webs of the adjacent vertical frame members 32 and then securing the attachment flanges in position against said frame members (see FIGS. 2, 3 and 4) by means of conventional T-bolts 75 and wedges 76 which are identical with the T-bolts 54 and the wedges 56 that are employed for holding adjacent panels 16 together in edge-to-edge relationship.

It is to be noted at this point that regardless of whether the T-bolt and wedge assemblies are employed for maintaining two adjacent panels in edge-to-edge relationship or for attaching a panel hinge 18 to the adjacent edges of two angularly disposed panels, the T-bolts are passed through the slots 52 in the webs 46 of the vertical frame members 32 from outside the panel confines so that the wedges of the assemblies assume positions within the panel confines. In order to permit downward driving of the wedges through the slots in the shank portions of the T-bolts, clearance slots 78 are provided in the horizontal flanges 40 of the crossbars 36 and these clearance slots immediately underlie the slots in the shank portions of the T-bolts when the latter are inserted through the slots 52 in the webs of the vertical frame members 32.

As best seen in FIGS. 4, 5 and 6, the panel hinges 18 of the present invention are provided with vertical series of reinforcing gusset plates 80. These plates are generally rectangular and they fill the right angle corners which exist between the two hinge leaves 60 and 62 and their respective laterally turned attachment flanges 72. The specific number of such gusset plates and their spacing along the corners which they fill are not critical. In the illustrated form of each panel hinge 18, three gusset plates are provided on each hinge leaf. It will be understood, however, that a greater or lesser number of these gusset plates 80 may be employed if desired. The gusset plates 80 on one hinge leaf are, of course, offset slightly from the gusset plates on the other hinge leaf so that there will be no interference between these plates when the two leaves are swung toward each other in the formation of a hinge angle of small acute proportions. The various gusset plates 80 are separately formed from the hinge leaves and are welded in position thereon in edge-to-face relationship.

Referring again to FIGS. 1 and 2, it will be observed that the two panel hinges 18 are identical and both of them have their hinge leaves 60 and 62 extending at an angle of about 75° to each other. However, since the hinge 18 of the inside wall form assembly 12 is designed to produce an inside acute angle corner in the finished concrete wall, such hinge is so disposed that the gusset plates 80 thereof oppose one another on opposite sides of the hinge pin 64. On the other hand, since the hinge of the outside wall form assembly 14 is designed to produce an outside reflex angle corner in the finished concrete wall, such hinge is so disposed that the gusset plates 80 thereof face outwardly away from one another on opposite sides of the hinge pin 64. It is one of the salient features of the present invention that in either condition of a panel hinge 18, the concrete-contacting sides of the hinge leaves 60 and 62 present smooth unbroken con-

tinuations of the adjacent plywood facings 30. To attain this coplanar relationship of the panel facings and the hinge leaves of the panel hinges, it is, of course, necessary that panel hinges be initially applied to the adjacent panels with their gusset plates 80 extending in the same direction from the plywood facings as the direction of the frame members 32 and 34 of the reinforcing frames around the facings. Due to the specific offset spacing of the gusset plates 80 on the hinge leaves 60 and 62, the hinge leaves are not precisely identical. However, for all practical purposes, these leaves are functionally equivalent so that in the application of a panel hinge 18 to a given panel, reversibility of the hinge is possible providing a coplanar relationship of hinge leaves and plywood facings is maintained. Stated otherwise, the elongated panel hinges 18 are reversible in end-to-end fashion. To further illustrate this reversibility, it will be observed that in FIG. 2, one of the hinges 18 is reversed in its orientation so that the hinge leaf 60 thereof opposes the hinge leaf 62 of the other panel hinge. The only effect of this reversal in orientation is that the direction of offset between opposing gusset plates 80 will be reversed.

Finally, it is to be observed that since conventional Steel-Ply panels are intended for panel matching across the concrete wall form installation so that each panel on one wall form assembly is opposed by a substantially identical panel on the opposite wall form assembly, the diagonal offset that is occasioned by the nesting of one panel hinge 18 within another panel hinge for corner producing purposes as illustrated in FIG. 2 necessitates the use of a fractional width filler panel 20 on each hinge leaf of the outside panel hinge 18. The effective width of such filler panels 20 will, of course, be a combined function of effective concrete wall form width and the magnitude of the corner angles involved. The greater the effective width of the wall form, the wider will be the employed filler panels. The greater the departure of the involved angles from a right angle, the wider will be the filler panels 20.

From the above description, it will be appreciated that the present panel hinge may be installed upon a pair of adjacent panels prior to erection of the panels and the assembly may be transported to the scene of installation at which time the panels need only be attached to adjacent panels and the panels positioned in their proper oriented relationship in the concrete wall form installation with no thought being given to the fitting of panels together to produce the desired corner angle. Regardless of the magnitude of the involved angle, the proper angular relationship between the various hinge leaves 60 and 62 will automatically be attained once the panels are properly set up in the installation.

The invention is not to be limited to the exact arrangement of parts shown in the accompanying drawings or described in this specification as various changes in the details of construction may be resorted to without departing from the spirit or scope of the invention. Therefore, only insofar as the invention is particularly pointed out in the accompanying claim is the same to be limited.

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

For use in a concrete wall form installation in the production of exposed angular wall corners ranging from a small acute inside angle to a large reflex outside angle, the combination of a pair of similar rectangular panels each of which is comprised of a plywood panel facing bounded by a rectangular marginal steel reinforcing frame including longitudinal and transverse frame members which extend laterally from one side of the panel facing, the longitudinal frame members being formed with respective series of longitudinally spaced slots therein, a panel hinge connecting one pair of opposed adjacent longitudinal edges of said panels together and permitting relative swinging movement of the panels toward and away from each other in either face-to-face or back-to-back relationship, said panel hinge comprising two elongated planar panel leaves hingedly connected together along adjacent proximate longitudinal edges by a piano-type hinge connection including interfitting alternately arranged hinge eyes on the two leaves and a hinge pin loosely projecting through said hinge eyes, the distal longitudinal edge regions of said leaves being turned laterally to provide a pair of attachment flanges, said attachment flanges being formed with a series of longitudinally spaced slots therein the spacing of which is commensurate with the spacing of the slots in said adjacent longitudinal frame members, said attachment flanges being substantially coextensive with and bearing against the adjacent frame members with the slots thereof in paired register with the slots in the adjacent frame members and with the panel leaves of the hinge extending in coplanar and contiguous edge-to-edge relationship with respect to the plywood panel facings, fastening devices projecting through the paired slots and serving to draw together the attachment flanges of the panel hinge and the longitudinal frame members of the panels, and a series of longitudinally spaced gusset plates extending between each of said hinge leaves and its associated attachment flange and disposed in right angular on-edge relationship with respect to both the attachment flanges and leaves, said gusset plates on the two hinge leaves being staggered with respect to each other so that when the panel hinge is folded so as closely to approach its condition of minimum angularity, the gusset plates of the two hinge leaves will overlap one another.

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