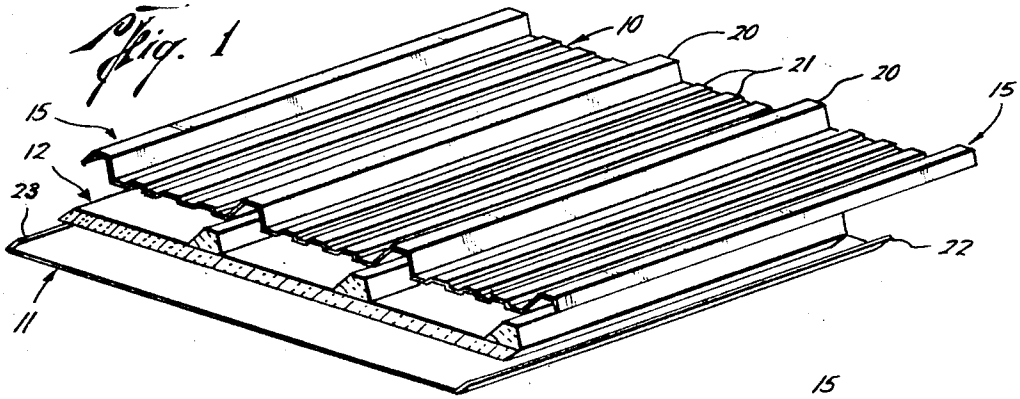
Sept. 16, 1969 W. F. LENOIR 3,466,831

SANDWICH-TYPE BUILDING PANEL

Filed May 6, 1968 2 Sheets-Sheet 1

Fig. 1



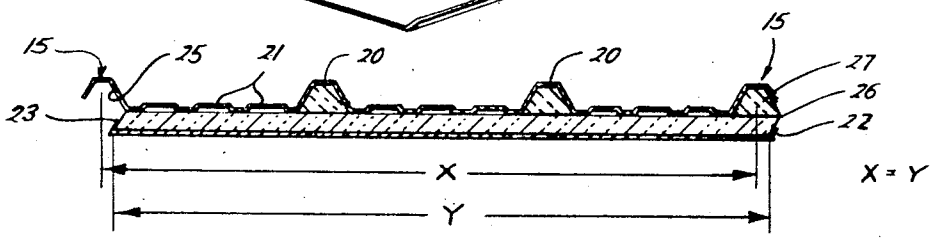


Fig. 2

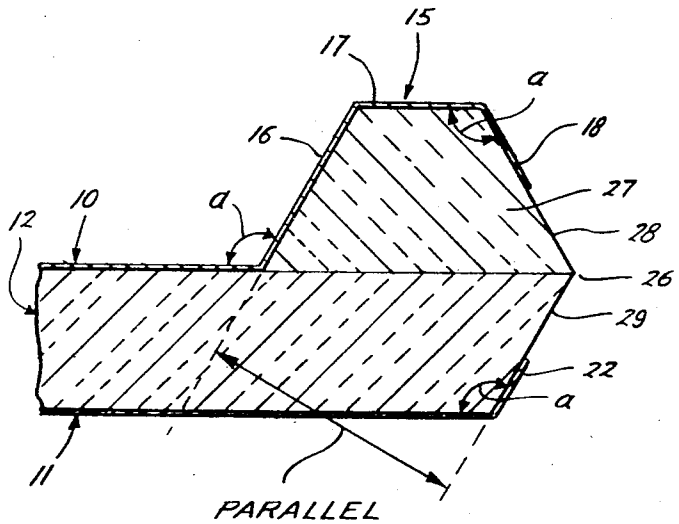


Fig. 3

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Fig. 4

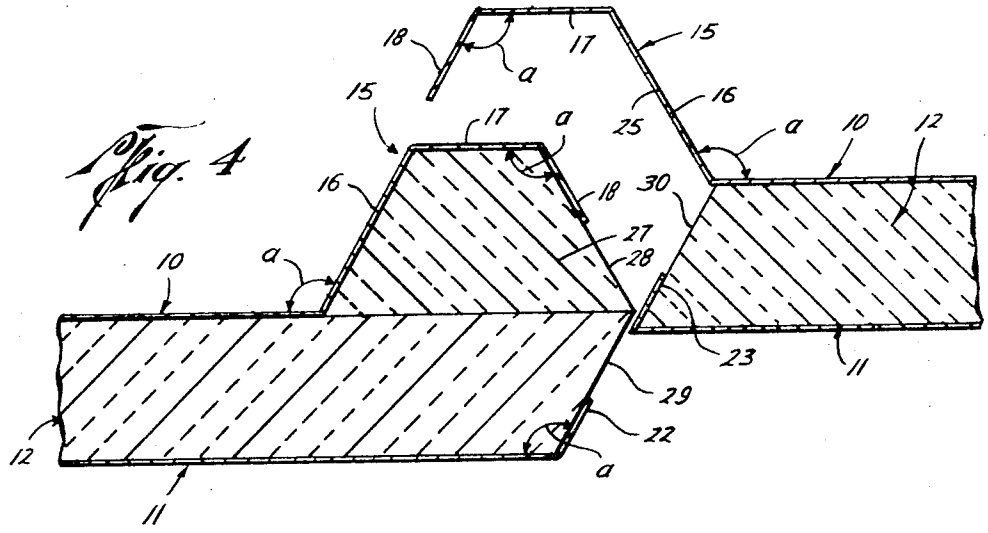


Fig. 5

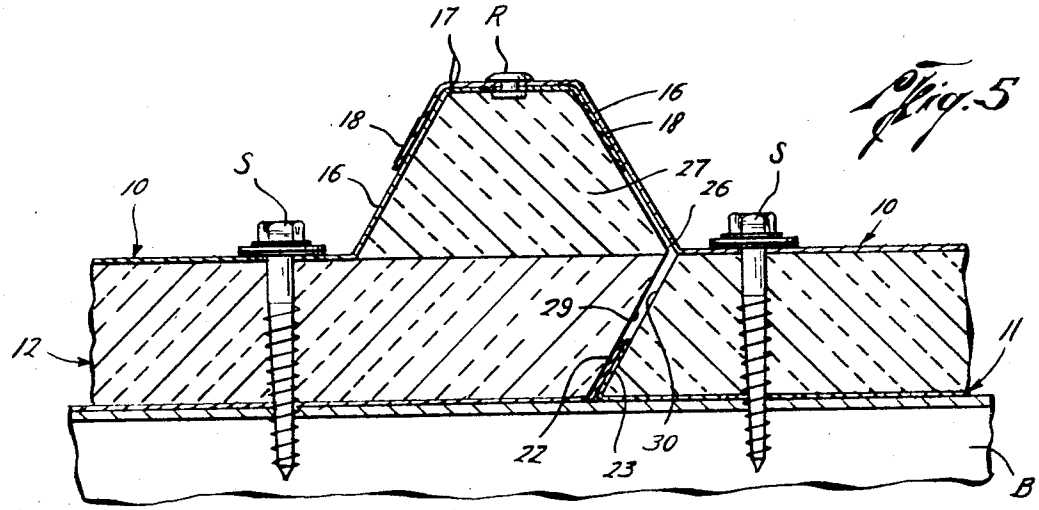
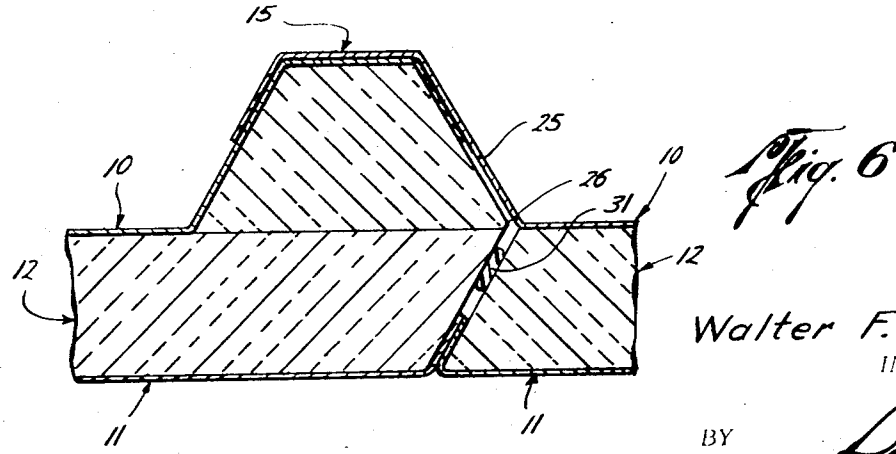


Fig. 6



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SANDWICH-TYPE BUILDING PANEL

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U.S. Cl. 52—521 6 Claims

ABSTRACT OF THE DISCLOSURE

A sandwich-type building panel having longitudinal side edge configurations providing a tongue-and-groove association adapted for quick assembly and forming weather-tight joints.

Structural panels which have come into wide use for exterior walls and roofs of many industrial and commercial buildings, are commonly referred to as "sandwich-type" panels, in that they ordinarily comprise a three-layer structure, formed by outer and inner metal sheets and an intervening layer of an insulating material, generally formed of one of the foamed plastics.

The panels are generally provided with some form of side edge construction to permit interlocking of the panels when erected and assembled in the usual side-to-side relationship. However, one of the problems associated with this type of construction is the difficulty of providing weather-tight joints between the panels which will also effectively limit heat transfer in both directions.

Various types of joint constructions, including plastic and metal sealing strips between the inter-engaged side edges, have been employed to meet this difficulty but these generally involve extra parts, with attendant expense and complication in construction and assembly, and frequently unsatisfactory results.

The present invention has for its principal objects the provision of an improved form of sandwich-type building panel which obviates the difficulties, such as those noted above; which has high structural strength; high heat-insulating qualities; employs a novel side edge configuration which produces a unique self-forming weather-tight joint upon assembly without interposition of special or separate joint-closing strips or the like; and which permits quick and easy erection and assembly in side-to-side relation.

In accordance with a preferred embodiment of this invention, the panel comprises a three-layer structure including outer and inner sheets, preferably constructed of sheet steel, and an intervening layer of a suitable heat-insulation material bonded to both sheets. Both longitudinal side edges of the outer sheet are formed to provide outwardly extending ribs of substantially identical trapezoidal configuration in transverse cross-section, being defined by an inner leg inclined toward the side edge of the sheet at an obtuse angle to the plane of the sheet, a flat apex portion generally parallel to the plane of the sheet, and an outer leg depending from the apex portion at said obtuse angle and forming the free edge of the sheet. The outer leg is preferably made shorter than the inner leg.

Both longitudinal side edges of the inner sheet are formed to define flat parallel lips or flanges which extend inwardly from the plane of the sheet at said obtuse angle, so that at one side of the panel the lip on the inner sheet will be parallel to the inner leg of the related rib and at the opposite side of the panel, the lip will be parallel to the outer leg of the related rib.

The length of the inner sheet between the junctures therewith of the lips is made substantially equal to the distance center-to-center of the ribs defining the side edges of the outer sheet and is offset laterally relative to the

outer sheet by an amount equal to about one-half the width of a rib. As a result, the lip and related rib on one side edge of the panel cooperate to define a hollow socket of polygonal shape and the lip and related rib at the other side edge of the panel cooperate to define a tongue corresponding closely in shape to the socket, so that when the panels are erected in side-to-side relation, the tongue on one sheet will be received snugly in the socket of an adjacent sheet while, at the same time, the opposed lips on the adjacent ends of the inner sheets will be brought automatically into close abutting contact sufficient to provide an effective weather-tight seal.

Other and more specific objects and advantages of this invention will become more readily apparent from the following detailed description when read in conjunction with the accompanying drawing which illustrates a useful embodiment in accordance with this invention.

In the drawing:

FIG. 1 is an exploded view, in perspective, of a panel in accordance with this invention;

FIG. 2 is a transverse cross-sectional view of the assembled panel;

FIG. 3 is an enlarged cross-sectional view of one side edge of the panel;

FIG. 4 is a cross-sectional view of portions of the side edges of adjacent panels in the course of assembly;

FIG. 5 is a cross-sectional view of the assembled joint between adjacent panels; and

FIG. 6 is a view similar to FIG. 5 illustrating a modification of the invention.

Referring to the drawing, the panel comprises a generally rectangular three-layer structure, comprising an outer sheet, designated generally by the numeral **10**, an inner sheet, designated generally by the numeral **11**, and an intervening layer of insulating material, designated generally by the numeral **12**.

Outer and inner sheets **10** and **11** are preferably constructed of rigid sheet material, usually steel of a suitable gauge, but may be any other metal, or even of a suitable rigid plastic material. The outer surfaces of the sheets may be painted, enamelled, or otherwise coated or colored as desired.

Insulating layer **12** may be any suitable and known material but will generally be constructed from one of the various foamed plastics, such as polystyrene, having high heat-insulating properties. Layer **12** will be secured to the inner and outer sheets by a suitable adhesive composition whereby the three layer structure forms a unitary panel.

Both longitudinal side edges of the outer sheet are formed by suitable shaping operations to define outwardly projecting ribs, designated generally by the numeral **15**, of generally trapezoidal configuration in transverse cross section. Each rib **15** is defined by an inner wall or leg **16** inclined toward the side edge of the sheet at an obtuse angle *a*, a generally flat apex portion **17** generally parallel to the plane of sheet **10**, and an outer wall or leg **18** depending from the apex portion at an included angle substantially equal to said obtuse angle *a*. Outer leg **18** is preferably made shorter than inner leg **16** and defines a free side edge of the outer sheet.

In addition to the ribs **15** defining the side edges of the outer sheet, the latter may be formed to provide one or more laterally spaced ribs **20**, generally similar in shape to ribs **15**, intermediate the side edges, as well as a plurality of shallower ribs **21**, which, together with the deeper ribs **15** and **20**, serve to structurally stiffen the sheet.

The opposite longitudinal side edges of inner sheet **11** are bent or otherwise formed to define flat parallel flanges or lips **22** and **23** which extend inwardly toward outer sheet **10** at said angle *a* with respect to the plane of the inner sheet. By virtue of this angular relationship, it

will be evident that the lip **22** at one side edge of the panel will be parallel to inner leg **16** of the related rib **15**, while the lip **23** at the opposite side edge of the panel will be parallel to outer leg **18** of the related rib **15**.

The width of inner sheet **11** betwen the junctions therewith of lips **22** and **23** is made substantially equal to the center-to-center spacing of ribs **15**, as indicated in FIG. 2 where the center-to-center distance between ribs **15** is indicated by the value "*x*" and the corresponding width of sheet **11** by the value "*y*," and the relationship by "*x*=*y*."

Inner sheet **11** is laterally displaced or offset with respect to outer sheet **10** by a suitable amount such that, as best seen in FIGS. 2, 4 and 5, lip **23** and its related rib **15** will define a polygonal recess or socket **25**, while lip **22** and its related rib **15** will define a convex tongue **26** of cross-sectional configuration which will be substantially identical in shape to socket **25** so as to be snugly received therein when the panels are erected in conventional overlapping side-to-side relationship.

As illustrated, the interior of rib **15** opposite lip **22** will preferably be filled with a block **27** of the same insulating material constituting layer **12**, block **27** being of the same trapezoidal shape as the rib, while the related edge of insulating layer **12** will be cut to the same angle as lip **22** with the result that the outer side edges **28** and **29**, respectively, of block **27** and insulating layer **12** will effectively form extensions of lip **22** and outer leg **18** which will meet substantially in the plane of outer sheet **10**, forming the generally triangular tongue **26**.

At the opposite side edge of the panel, insulating layer **12** will be cut to the same angle as lip **23** so that the outer edge of layer **12** will effectively form an extension **30** of the latter which, by reason of the several angular relations described, will meet the related inner leg **16** at its juncture with outer sheet **10**.

In assembling the panels to form a wall or roof, one panel will be suitably secured to a purlin or beam B (FIG. 5), as by means of suitable self-tapping screws S which will extend entirely through the panel into beam B. The next panel, as seen in FIG. 5, will be erected so that rib **15**, defining socket **25**, will overlap and receive rib **15** which with lip **22** defines tongue **26**. By means of the angular relationships noted above, tongue **26** will be snugly received in socket **25** with the apex portion **17** of one rib closely overlying that of the other, outer leg **18** of the socket overlying inner leg **16** of the received rib, and inner leg **16** of the socket rib overlying the outer leg **18** of the tongue rib. At the same time, lip **23** defining the lower portion of socket **25** will be caused to slide under lip **22** of the tongue portion and as the side edges of the panels are thus brought into tongue-and-socket engagement, lips **22** and **23**, by reason of their parallelism, will be brought into close contact throughout their length, thereby providing an excellent weather-tight joint between the panels. With the second panel in place it will be secured to beam B by additional screws S. Then stitching screws or blind rivets R of any suitable and conventional form will be inserted at spaced points along the engaged ribs, preferably through the adjacent apex portions of the ribs, and as the overlapped ribs are thus drawn tightly together, lips **22** and **23** will be brought to the final stages of their tight contact.

FIG. 6 illustrates a modification to be employed where extra protection is desired against possible moisture leakage through the joint. In this modification a strip or bead **31**, constructed of a conventional non-hardening type of plastic sealant, will be laid longitudinally against either end face **29** or end face **30** of the insulating layer **12** so as to be squeezed between them when the joint is made up, as previously described, and thereby provide a supplemental seal between the adjoining faces of the joint.

Angle *a* may be varied to vary the configuration of ribs **15** and the corresponding configurations of the tongue and socket portions defined by the opposite side edges of the panel. In general, the shape of the ribs will be determined by the structural characteristics desired, as well as appearance. In the preferred embodiment, angle *a* is made to 120° (or to its complement 60°) but obviously may be any angle greater than 90° and less than 180°.

In the preferred embodiment, lips **22** and **23** will be made to a length in the range from about one-quarter inch to about one-half inch, although this is not critical, so long as they are shorter than the related side edges **29** and **30** of the insulating layer.

Sandwich-type panels constructed in accordance with this invention possess a number of important advantages in addition to the formation of an effective weather-tight-seal through the tight contact obtained between lips **22** and **23** by reason of the described angular relationship of the joint parts.

One such advantage arises from the angular interlapping of lips **22** and **23**, which eliminates deformation of one panel with respect to an adjacent panel between supporting members, such as purlins or girts due to the tongue and groove action between these elements, a condition not possible in joints where the side edge members of the inner sheet are formed with 90° lips. The angular relation of lips **22** and **23** provides a smooth connecting joint on the inner surface of adjacent panels which resists warpage of one panel with respect to another and generally provides easier and smoother installation and a better appearance of the finished wall.

What I claim and desire to secure by Letters Patent is:

1. A sandwich-type building panel for assembly in side-to-side relationship to form a wall comprising;

(a) spaced apart outer and inner sheets constructed of relatively rigid material and an intervening layer of insulating material secured to both sheets;

(b) both longitudinal side edges of the outer sheet being shaped to form outwardly extending ribs of generally identical trapezoidal configuration in cross section, each rib being defined by an inner leg inclined toward the side edge of the sheet at an obtuse angle to the plane thereof, an apex portion, and an outer leg depending from said apex portion at said obtuse angle and forming the free edge of said sheet;

(c) both longitudinal side edges of said inner sheet being formed to define flat parallel lips extending inwardly from the plane of said inner sheet at said obtuse angle;

(d) the length of said inner sheet between the junctures therewith of said lips being substantially equal to the distance center-to-center of said ribs and being offset laterally relative to the outer sheet by an amount such that the lip and related rib at one side edge of said panel cooperate to define a hollow socket, and the lip and related rib at the other side edge of said panel cooperate to define a tongue corresponding in shape to said socket for snug reception therein and to dispose the opposed lips on the adjacent ends of the inner sheets in closely abutting relation when the panels are assembled in side-to-side relation.

2. A sandwich-type building panel according to claim **1** wherein the opposite side edges of said layer of insulating material are parallel to each other and formed to the same angles as the related lips.

3. A sandwich-type building panel according to claim **1** wherein the rib defining a portion of said tongue is filled with a body of said insulating material conforming in trapezoidal shape to the interior of said rib.

4. In wall constructions employing sandwich-type building panels according to claim **1**, securing means extending through the apex portions of the inter-engaged ribs of adjacent panels when assembled, whereby to draw

the ribs closely together and to urge said lips on adjacent panels into said closely abutting relation.

5. A sandwich-type building panel according to claim 1 wherein said obtuse angle is about 120°.

6. A sandwich-type building panel according to claim 1 wherein said inner and outer sheets are constructed of sheet metal.

References Cited

UNITED STATES PATENTS

162,722	4/1875	Wands	52—521
3,209,502	10/1965	Donegan	52—394
3,228,162	1/1966	Gregoire	52—536 X
3,290,845	12/1966	Snyder	52—478
3,320,711	5/1967	Johnson	52—521 X

FOREIGN PATENTS

467,209	10/1928	Germany.
1,392,017	2/1965	France.

ALFRED C. PERHAM, Primary Examiner

U.S. Cl. X.R.

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