

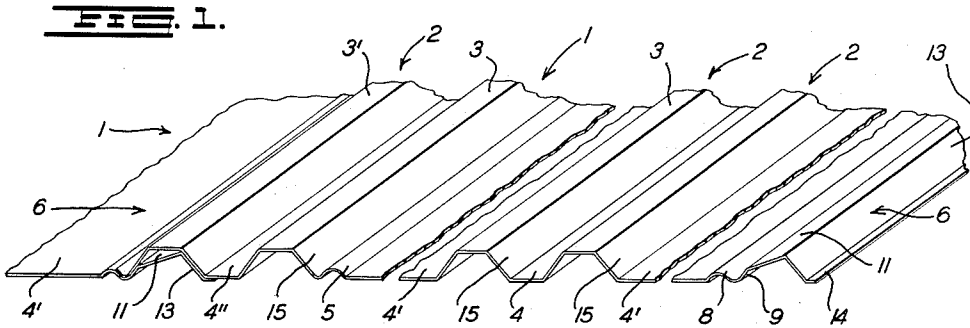
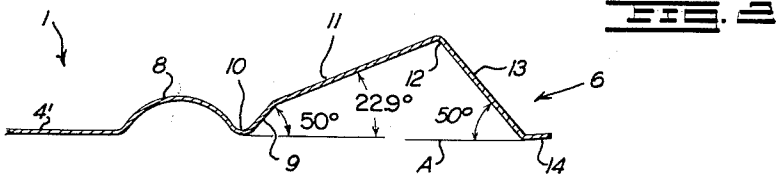
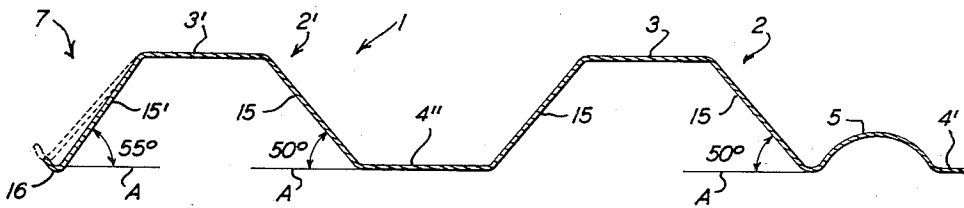
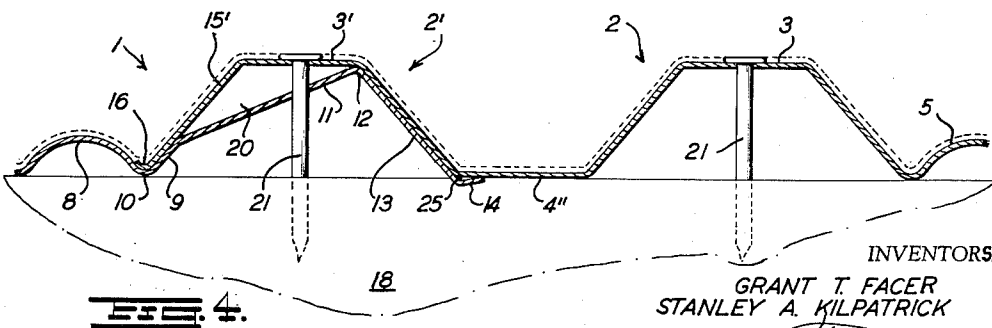
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G. T. FACER ET AL

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JOINT STRUCTURE OF OVERLAPPED SHEETS

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INVENTORS.

GRANT T. FACER
STANLEY A. KILPATRICK

BY

ATTORNEY

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JOINT STRUCTURE OF OVERLAPPED SHEETS
Grant T. Facer, Lafayette, Calif., and Stanley A. Kilpatrick, Spokane, Wash., assignors to Kaiser Aluminum & Chemical Corporation, Oakland, Calif., a corporation of Delaware

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This invention relates to roofing structures. More particularly it is concerned with providing a novel joint in roofing structures employing joints of the standing lap type.

Accordingly, it is a primary purpose of this invention to provide an improved joint of the standing lap type for roofing sheets which is substantially weatherproof and wherein the roofing sheets can be readily manufactured while at the same time using a minimum amount of material in the parts of the sheets used in the joint.

Other purposes and advantages of the instant invention will become more apparent from a review of the following detailed description when taken in conjunction with the appended drawings wherein:

FIGURE 1 is a broken fragmentary perspective view of a typical roofing installation involving the principles of the instant invention;

FIGURE 2 is an enlarged partial sectional view of one marginal side edge of one of the roofing sheets shown in FIGURE 1;

FIGURE 3 is an enlarged partial sectional view of the opposed marginal side edge of one of the roofing sheets shown in FIGURE 1; and

FIGURE 4 is an enlarged fragmentary sectional view of a roofing joint installation and discloses the manner in which the marginal side edges of the roofing sheets are overlapped to form the joint of the instant invention and with parts broken away and with certain of said sheets being shown in dotted lines.

Since the lap joint of the instant invention is adapted for use with both roofing and siding sheets employed as coverings for building structures, the word "roofing" as used in the specification and claims is to be construed as covering siding as well as roofing sheets and the joints therefor.

In one advantageous embodiment of the invention, the lap joint of the instant invention is used for roofing sheets 1 preferably made of thin-gauge aluminum and provided with a plurality of upstanding flat-topped corrugations 2. The corrugations 2 provided with flat tops and troughs 3 and 4 respectively and inclined walls 15 are preferably arranged in spaced groups separated by flat areas 4' with two corrugations to a group. Where the corrugations are arranged in groups as noted above, a small beaded portion 5 can, if desired, be disposed adjacent to the walls 15 of certain of the corrugations 2.

The opposed side marginal edges of each sheet 1 as noted particularly in FIGURES 2 and 3 have special configurations which enable the marginal side edge of one sheet to be properly overlapped by the opposite marginal side edge of an adjacent and similarly shaped sheet. The one side marginal edge generally designated by the reference numeral 6 of each sheet 1 comprises the portion of the lower sheet in the joint which is lapped by the opposed marginal side edge 7 of the upper or lapping sheet. As indicated in FIGURE 2 marginal side edge 6 is provided with a upstanding curved bead 8. Bead 8 is joined to the upwardly and inwardly inclined partial wall section 9 in such a fashion that portions of bead 8 and wall section 9 form a sinuously curved recess 10. Joined to the wall section 9 is a second partial inwardly and upwardly inclined wall section 11. Wall section 11 is advantageously inclined at a smaller angle to the normal horizontal bottom

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plane A of the sheet 1 than wall section 9 the angle of wall section 9 for example, being on the order of 50° and that of wall section 11 being on the order of 22.9°. Wall section 11 is joined at the point or crest 12 to a downwardly and outwardly inclined full wall section 13. Wall sections 9, 11 and 13 roughly form an inverted V-shaped marginal corrugation. The marginal side edge 6 is completed by means of the marginal flange 14. During manufacture of a sheet 1, this flange is normally directed upwardly a few degrees from the normal horizontal bottom plane A of the sheet 1 for a purpose to be hereinafter described.

As indicated in FIGURE 3, the opposing side edge 7 of the sheet 1 comprises a flat-topped marginal corrugation 2' provided with full diverging walls 15 and 15'. Corrugation 2' has the same general configuration, pitch, depth area for the flat top 3' and angle of inclination for its walls as the remaining flat-topped corrugations 2 of the sheet 1 except for wall 15'. In the case of the outermost wall 15' of the corrugation 2', which corrugation constitutes the lapping part of the upper sheet 1 of the joint, this wall is purposely over-bent inwardly a few degrees from the normal angle of inclination (shown in dotted lines in FIGURE 3) of the other corrugations 2. Thus instead of being at an angle of 50°, for example, like the other diverging walls 15 of corrugations 2, it is inclined at an angle of 55° with respect to line A as indicated in the drawings. In other words, if wall 15' had the same angle of inclination as the walls of the remaining upstanding corrugations 2 of the sheet, it would assume the position shown in dotted lines in FIGURE 3. The side edge 7 of the sheet finally terminates in a sinuously curved lip 16 joined to the bottom extremity of wall 15'.

During installation of the roofing sheets 1 it is contemplated that these sheets would be placed side by side in such a fashion that the marginal side edge 6 of one sheet 1 would be overlapped by the opposing marginal side edge 7 of a similarly shaped sheet 1. The manner in which a plurality of sheets 1 are overlapped will now be described with particular reference being made to FIGURE 4 which shows a typical installation. The roofing sheets 1 are placed side by side and crossways upon the conventional roofing supports 18 in such a fashion that the sinuously curved lip 16 on the wall 15' of the corrugation 2' of the upper or lapping sheet is snugly received in the sinuous recess 10 of the lower or lapped sheet 1. The partial wall section 9 of the lapped sheet is disposed as noted above at an angle to the horizontal line A generally corresponding to the normal angle of inclination of the main corrugations 2 and it is this portion of the lapped sheet which directly contacts the overly bent wall 15' of the corrugation 2' of the lapping sheet. Due to the over-bending of the wall 15' during manufacture, wall 15' will always tend to maintain surface to surface contact with the partial wall section 9 during expansion and contraction of the roofing sheets. This tensioning of wall 15' against wall section 9 has a further advantage in that it causes lip 16 of the lapping sheet to maintain contact partly with bead 8 and partly with wall section 9 of the lower sheet and to remain in the sinuous anti-siphoning recess 10. The configuration of recess 10 and lip 16 acts to prevent water and moisture from seeping through the joint to the roofing supports 18.

It will be further observed by reference to FIGURE 4 that the second partial wall section 11 of the lapped sheet is out of contact with the upstanding marginal corrugation 2' of the lapping sheet except at the point or crest 12 where partial wall section 11 meets the downwardly inclined full wall section 13 of the lapped sheet while the full wall section 13 is in contact with the innermost wall 15 of the corrugation 2' of the upper sheet for the full length of said innermost wall 15. The purpose of the

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particular configuration and arrangement of partial wall section 11 with respect to the corrugation 2' of the upper sheet 1 is two-fold. It provides, first of all, a non-siphoning air pocket 20 between the corrugation 2' of the lapping sheet and wall section 11 of the lapped sheet. Air pocket 20 acts in conjunction with lip 16 and recess 10 to prevent the entrance of moisture and water between the lapped and lapping sheets at their point of juncture. Secondly, since the crest 12 of the lapped sheet contacts the underside of the flat top 3' of the corrugation 2' of the lapping sheet at substantially the point of intersection between the flat top 3' and the wall 15 of the corrugation 2' or at a point which is offset from the center of the flat top 3', the sheet fasteners or nails 21 are advantageously driven only through one thickness of metal at a time during installation of the sheets. This provides for ease in installation. Partial wall section 9 because of its particular configuration and angle of inclination, also advantageously acts to guide the wall 15' and lip 16 of the lapping sheet into proper position in the joint. By forming the marginal side edge 6 of the lapped sheet in the manner proposed such as by using partial wall sections 9 and 11 instead of a full wall section, a top such as flat top 3 can be eliminated and a minimum amount of material is used in forming this side edge of the sheet in addition to providing the other advantageous joint features mentioned above.

The flange 14 of the lapped marginal side edge 6 is purposely directed upwardly a few degrees from the horizontal during manufacture as noted above. The purpose of this is to maintain line or surface to surface contact between this flange and a trough portion 4" of the upper or lapping sheet during installation so as to compensate for any tolerances that may exist in flange 14 during manufacture, it being extremely difficult if not impossible to maintain such tolerances on standard corrugating machines presently in use. When the sheets 1 are overlapped, flange 14 will tend to flatten out under the pressure exerted thereon during nailing down of the sheets. Flange 14 will always maintain contact with the lapping sheet despite expansion and contraction of the sheets under all ordinary conditions of installation. A small trough 25 will ordinarily exist between flange 14 of the lower sheet and through 4" of the upper or lapping sheet. This adds to the resilient characteristics of flange 14 in maintaining contact with the lapping sheet.

A further advantage in the use of the lap joint of the instant invention resides in the fact that it is possible to nail first either through the outermost corrugation 2' of the lapping sheet which contacts the wall portions 9, 11 and 13 of the lapped sheet, or through the next corrugation 2 which does not contact wall portions 9, 11 and 13 but is adjacent thereto.

The particular lap joint of the instant invention also makes it possible to conveniently lap the ends of sheets 1 in super-jacent or upper rows on the wall or roof of the building with the sheets in the higher rows, the higher rows of sheets being generally indicated in dotted lines in FIGURE 4. In other words, the sheets 1 are so installed that the lap joints of all the rows of sheets 1 constituting a particular roof covering would be continuous rather than being offset with respect to each other and with the siphoning troughs formed by the sinuous recesses 10 always being in alignment from the eave to the ridge portion of a roof structure.

The sheets 1 are installed in a conventional fashion on a building structure. In the instant case therefore a lower sheet 1 is first nailed crossways on the supports 18. A second upper sheet 1 is then installed directly above the lower sheet such that the opposing end edges of the two sheets overlap and nest with each other. If necessary, additional sheets are installed directly above the second sheet in the same fashion as noted above. After the complete first line of vertically disposed and lapped sheets has been installed the second and adjacent line of lap-

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ping sheets is installed starting from the bottom of the structure being covered. As this second line of lapping sheets is installed the side edges 7 of the lapping sheets are lapped over the side edges 6 of the lapped sheets at the same time that the opposing end edges of the lapping sheets in this second line are overlapped and nested with each other. During installation therefore, the end edges of any horizontal line of sheets 1 will be in alignment and the side edges of any vertical line of sheets 1 will also be in alignment.

An advantageous embodiment of the invention has been herein disclosed and described. It is obvious that various changes and modifications may be made therein without departing from the spirit and scope thereof as defined in the appended claims wherein

What is claimed is:

1. A weatherproof lap joint for roofing sheets comprising a pair of roofing sheets overlapped at their marginal side edge portions, the overlapping edge portion of the upper sheet having an upstanding marginal corrugation provided with a substantially flat top and a pair of downwardly and outwardly inclined full walls, the outermost wall of the said corrugation terminating in a sinuously curved lip, the overlapped edge portion of the lower sheet having sinuously bent portions including a bead defining a sinuous recess within which the sinuously curved lip of the upper sheet is snugly received, said lower sheet also having an upwardly and inwardly inclined partial wall section for engaging a part of the outermost wall of the corrugation of the upper sheet and a second upwardly and inwardly inclined partial wall section connected to and disposed at a different angle to the horizontal from said first-mentioned partial wall section, said last-mentioned wall section normally being out of contact with the corrugation of the upper sheet, and a downwardly and outwardly inclined full wall section on said lower sheet connected to said second-mentioned partial wall section, said full wall section being normally in contact with the innermost wall of the corrugation of the upper sheet and for the full length of the said innermost wall, the point of juncture between said full wall section and said second-mentioned partial wall section comprising a crest in contact with the underside of the flat top of the corrugation of the upper sheet at a point which is offset from the central portion of said flat top, said crest serving as a support for the corrugation of the upper sheet and said full wall section of the lower sheet terminating in a flange which resiliently contacts the underside of a trough in the upper sheet.

2. The lap joint as defined in claim 1 wherein said upper sheet is provided with a plurality of symmetrical and uniform corrugations including said marginal corrugation and wherein the outer wall of said marginal corrugation is over-bent inwardly during manufacture whereby said outer wall of said marginal corrugation will always be under tension when it contacts the first-mentioned partial wall section of the lower sheet.

3. The lap joint as defined in claim 1 wherein the flange of the lower sheet is bent upwardly during manufacture whereby as it engages the underside of the trough in the upper sheet and tends to flatten out during this engagement it still maintains contact with the upper sheet.

4. A roofing structure comprised of a plurality of similarly shaped corrugated roofing sheets, each of said sheets having a plurality of generally symmetrical and uniform corrugations and similar opposing marginal side edge portions, the marginal side edge portion of one sheet being overlapped by the opposing marginal side edge portion of the adjacent sheet and forming a lap joint therebetween, the overlapping side edge portion of the upper sheet in said joint having an upstanding marginal corrugation provided with a substantially flat top and a pair of downwardly and outwardly inclined full walls, the outer wall of said marginal corrugation terminating in a sinuously curved lip, the overlapped mar-

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ginal side edge portion of the lower sheet in said joint having sinuously curved portions including a bead defining a sinuous recess within which the sinuously curved lip of the upper sheet is snugly received and an upwardly and inwardly inclined partial wall section for engaging the lower part of the outer wall of the marginal corruga- 5 tion of the upper sheet, said lower sheet also having a second upwardly and inwardly inclined partial wall section connected to said first partial wall section and normally out of contact with the marginal corrugation of the upper sheet, a downwardly and outwardly inclined full wall section connected to said second-mentioned partial wall section, said full wall section being normally in contact with the innermost wall of the marginal corruga- 10 tion of the upper sheet and for the full length of the said innermost wall, the point of juncture between the full wall section and the second-mentioned partial wall section of the lower sheet comprising a crest which engages the underside of the flat top of the marginal corrugation of the upper sheet at a point which is offset from the center of the said top, said full wall section of the lower sheet terminating in a flange which contacts the underside of the upper sheet and fasteners driven through the flat top 20

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of the marginal corrugation of the upper sheet and the second partial wall section of the lower sheet and then through roofing supports so as to anchor said sheets to the supports.

5. A roofing structure as defined in claim 4 wherein the outer wall of the marginal corrugation of the upper sheet is over-bent inwardly during manufacture whereby said over-bent outer wall will normally be under tension when it contacts the first-mentioned partial wall section of the lower sheet.

6. A roofing structure as defined in claim 4 wherein the flange of the lower sheet is bent upwardly during manufacture whereby as it engages the underside of the upper sheet and tends to flatten out during this engagement it still maintains contact with the upper sheet.

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