March 21, 1967 W. H. DUNKIN 3,309,822

EXTERIOR ANCHORING APPARATUS FOR SURFACE SHEET

Filed Sept. 3, 1965 3 Sheets-Sheet 1

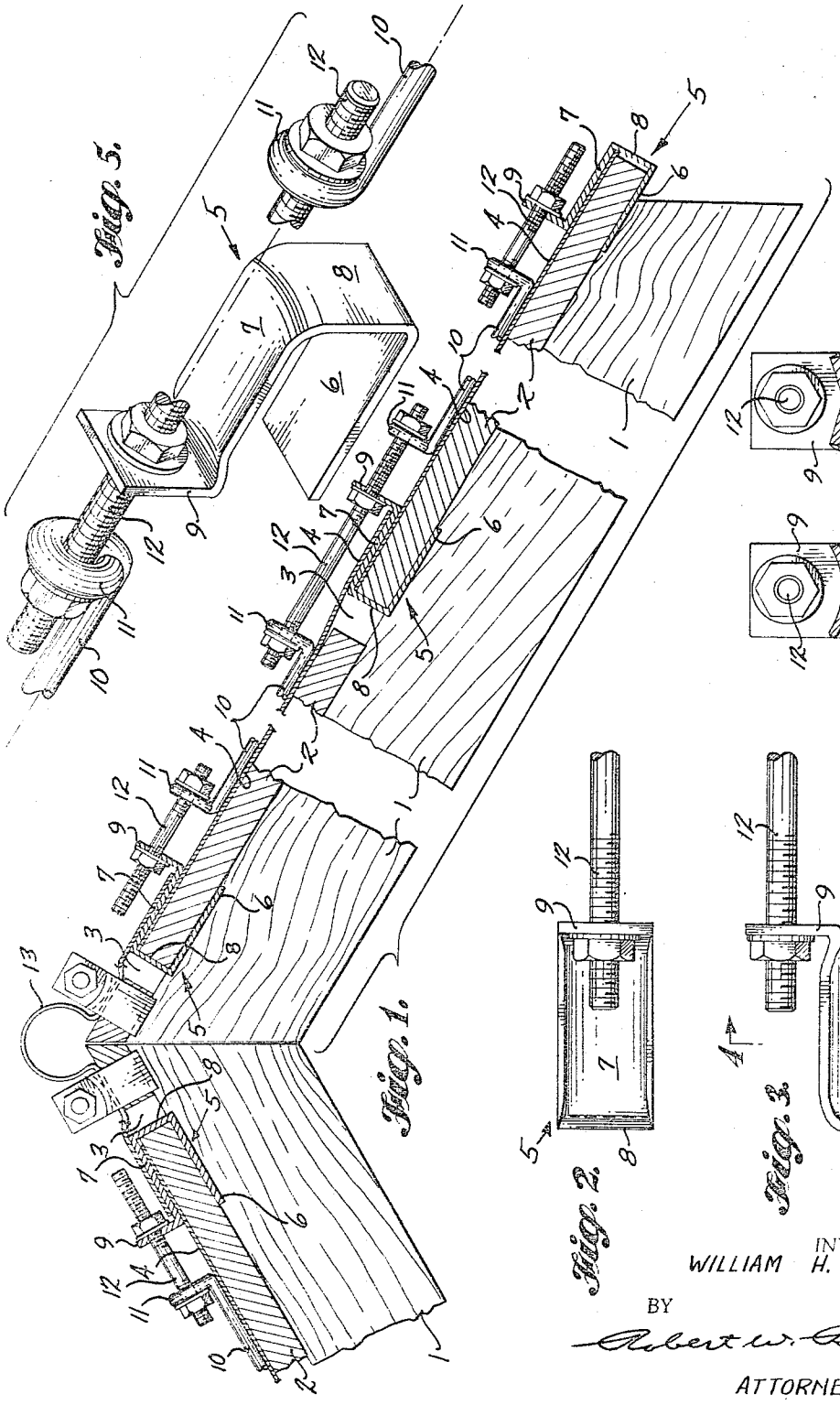


Fig. 5.

Fig. 1.

Fig. 2.

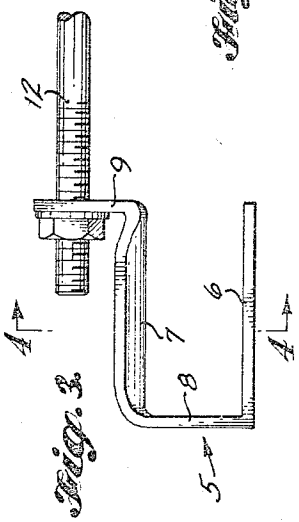


Fig. 3.

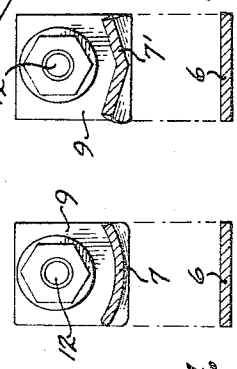


Fig. 6.

Fig. 4.

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EXTERIOR ANCHORING APPARATUS FOR SURFACE SHEET

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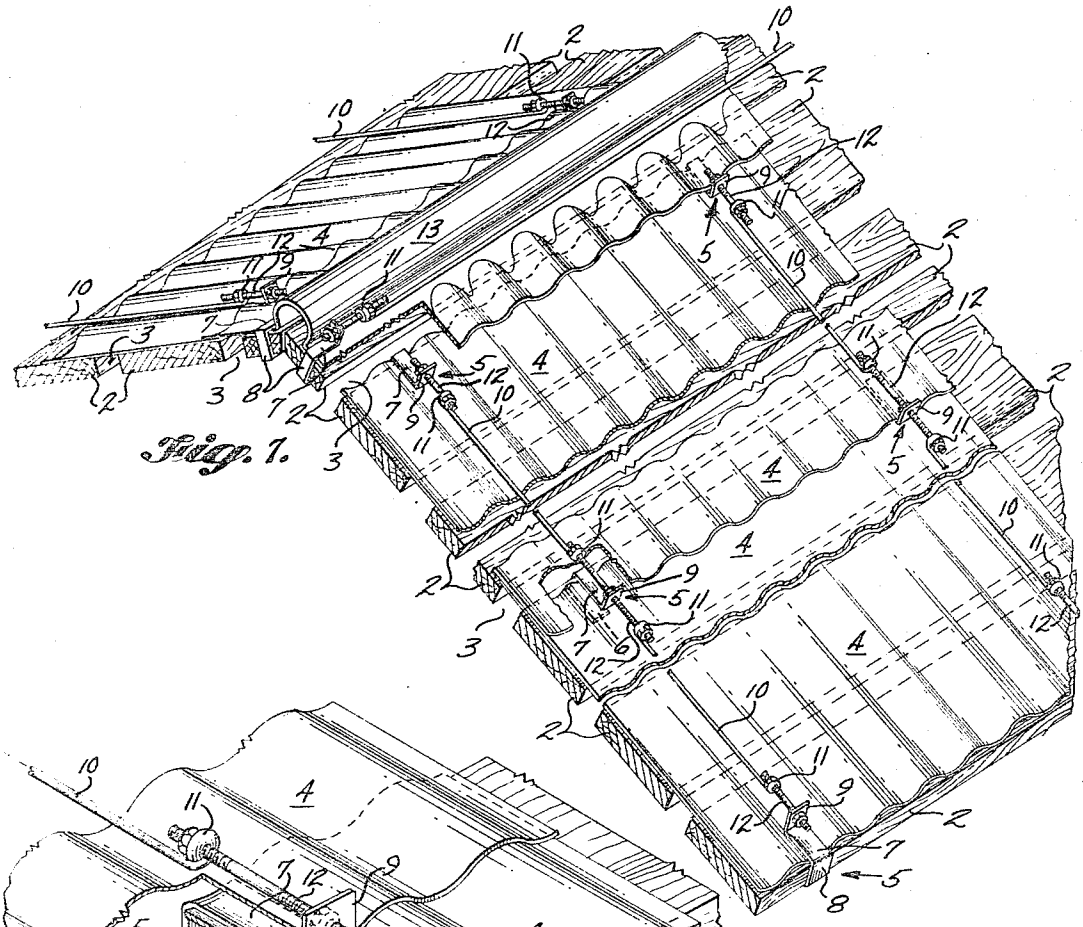


Fig. 7.

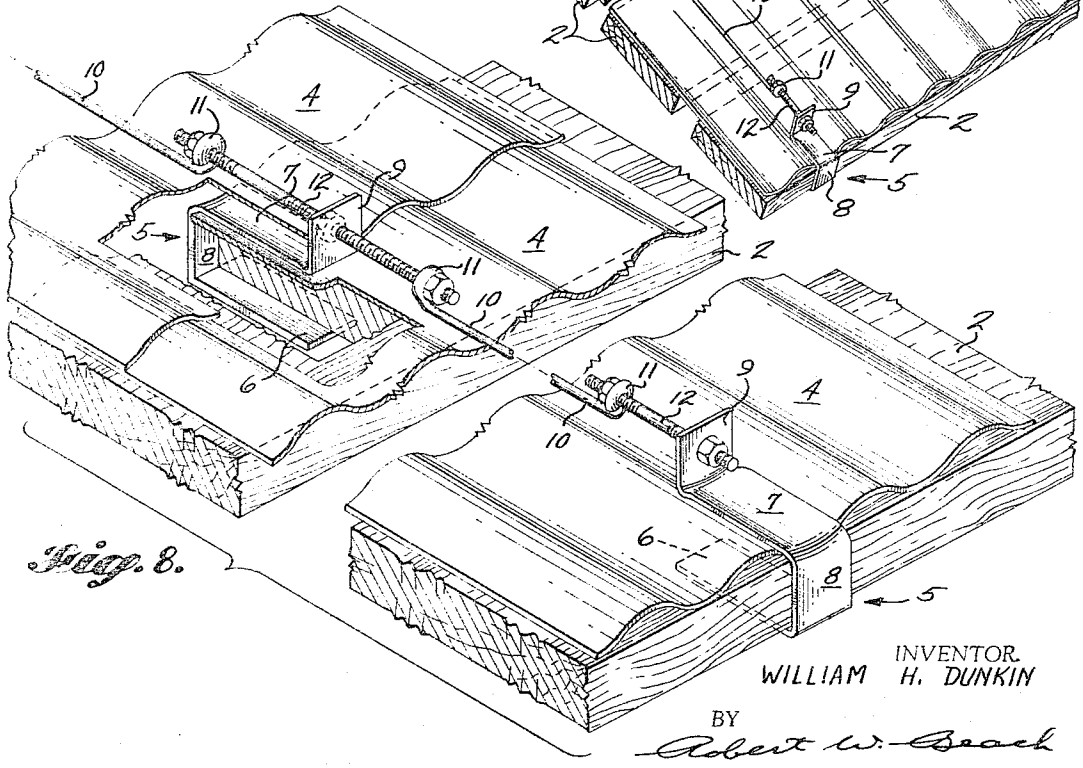


Fig. 8.

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EXTERIOR ANCHORING APPARATUS FOR SURFACE SHEET

Filed Sept. 3, 1965 3 Sheets-Sheet 3

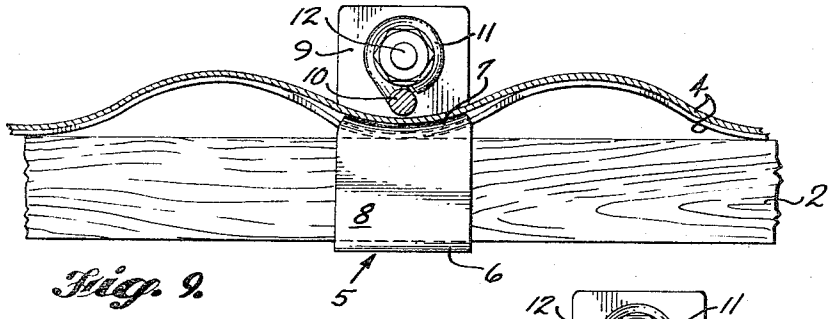


Fig. 9.

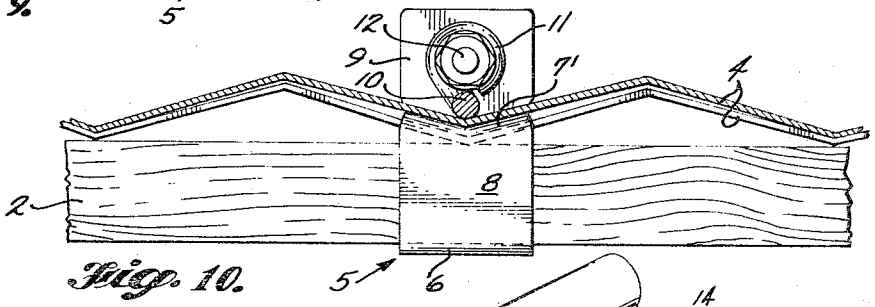


Fig. 10.

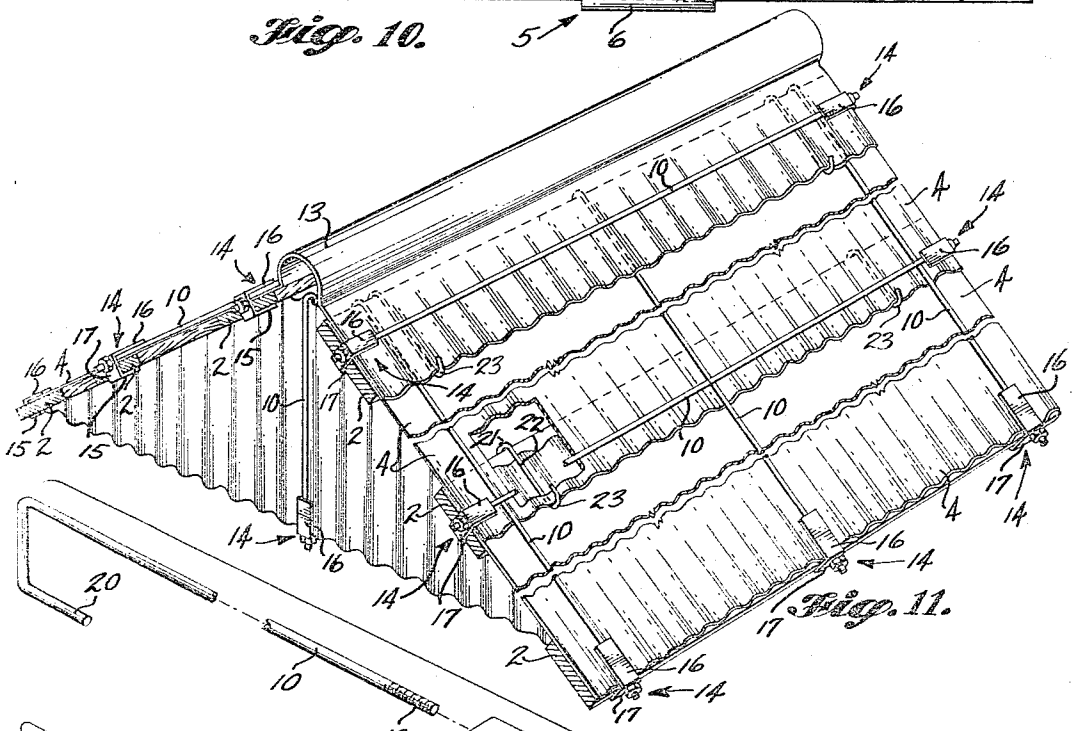


Fig. 11.

Fig. 12.

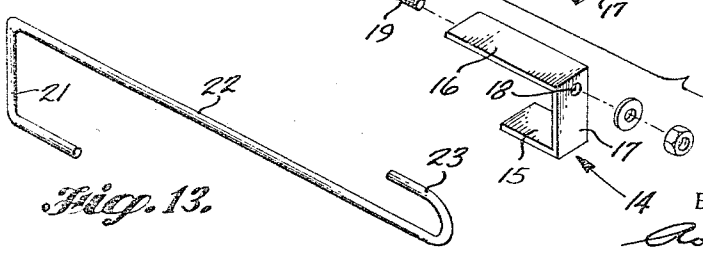


Fig. 13.

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EXTERIOR ANCHORING APPARATUS FOR SURFACE SHEET

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Filed Sept. 3, 1965, Ser. No. 484,991
5 Claims. (Cl. 52—23)

This application is a continuation-in-part of my United States patent application Ser. No. 298,731 filed July 30, 1963, now abandoned, for Attaching Metal V Crimp and Corrugated or Fiber Glass Sheets to the Roof or Sides of a Building. This invention relates to anchoring apparatus for securing surfacing sheets to sheathing such as on the roof or wall of a building. It is particularly adapted to use in connection with corrugated or V-crimp surfacing sheets.

The principal object is to provide apparatus for anchoring such sheet surfacing material securely to sheathing without the use of fastening elements such as nails which would penetrate the sheet material and thus provide a hole through which water might flow, causing a roof leak.

A further object is to provide such anchoring apparatus for sheet material which can be adapted for use on roofs or walls of any size or shape, and which will anchor surfacing sheets of any size or shape securely against displacement or being lifted by wind, yet which will not interfere with water runoff.

Another object is to provide such anchoring apparatus, the application of which can be varied for different climates so that the roofing or wall sheets can be secured at locations spaced more closely or widely, as may be desired.

It is also an object to provide such sheet-anchoring apparatus which is easy and quick to apply and to remove, and which is economical and durable.

In general, the surfacing sheet-anchoring apparatus is composed of hooks which engage the sheathing and edges of the surfacing sheets at spaced locations along the surfacing sheet edges. Such hooks may clamp the sheet edges to the sheathing at such locations. Hooks at diametrically opposite locations across the roof or wall are connected by tie members overlying the surface sheets, and preferably such tie members are arranged in crossing relationship to form a grid. Where the surfacing sheets are of corrugated or V-crimp structure it is preferred that one set of tie members be located in valleys of the sheet. Also, it is preferred that the tie members be tie rods and that the apparatus include tensioning means for such tie members such as bolts.

FIGURE 1 is an end elevation of a gable roof to which the surfacing sheet-anchoring apparatus of the present invention is applied, parts being broken away.

FIGURE 2 is a plan of a sheet-anchoring hook; FIGURE 3 is a side elevation of such hook and FIGURE 4 is a section through such hook taken on line 4—4 of FIGURE 3. FIGURE 5 is a top perspective of such hook connected to a tie member, parts being broken away.

FIGURE 6 is a section through an alternative form of hook corresponding to FIGURE 4.

FIGURE 7 is a top perspective of a gable roof to which the surfacing sheet-anchoring apparatus is applied, parts being broken away, and FIGURE 8 is a top perspective of a portion of such roof on an enlarged scale with parts broken away.

FIGURE 9 is an end elevation of a hook installation on an enlarged scale and FIGURE 10 is a similar view of an alternative type of hook.

FIGURE 11 is a top perspective of gable roof construction showing a somewhat modified form of surfacing sheet-anchoring apparatus.

FIGURE 12 is a top perspective of an alternate form of tie rod element of the surfacing sheet-anchoring apparatus showing parts in exploded relationship.

FIGURE 13 is a top perspective of an alternate type of hook component of the surfacing sheet-anchoring apparatus.

Both corrugated metal sheets and V-crimp sheets are frequently used as roofing material. Usually such sheets are of galvanized steel or aluminum, but fiber glass reinforced resin sheet, particularly of the corrugated type, also is used. In many instances such sheet material is used both as roof surfacing and as sidewall surfacing overlying sheathing. Conventionally such sheet material is secured to the sheathing by nails driven through the surfacing sheet into the sheathing. Such nails are usually driven through a valley of the sheet rather than through a ridge in order to bind the sheet firmly to the backing. Such method of securing sheet always creates the danger of the roof or sidewall leaking by passage of water through the nail holes, even though a packing washer is used between the sheet and the nail head.

Wind tends to drive under the edges of such surfacing sheets, which works the nails to loosen them so that the packing washer is not pressed tightly against the sheet. Also, temperature and humidity changes can cause the packing washer and the sheathing to expand and contract, which has a tendency to loosen the nails. For these reasons it is virtually impossible to maintain a leakproof roof for any extended period. An attempt may be made to secure the roofing more tightly against wind by using more nails, but increasing the number of nails also increases the number of holes through which water can flow. By use of the present invention surfacing sheets can be secured in place at as closely spaced locations as desired without puncturing the sheet material, and consequently without any risk of causing leaks.

In general, the present invention utilizes two expedients for securing surfacing sheet material to sheathing underlying it, by binding the surfacing sheet material to the sheathing at spaced locations along the horizontal edges of the sheet material, whether used on a roof or on a sidewall, and at selected locations along the sloping edges of a roof or the upright edges of a sidewall. Second, the portions of such sheets between their edges are prevented from buckling upward appreciably by ties extending between opposite edges of the sheets and such ties preferably are arranged in crossing relationship in the form of a grid to provide mutual support.

Conventional roof construction is shown in FIGURE 1 as including rafters 1 to which are secured sheathing boards 2. Usually these boards are of 1" x 4" or 1" x 6" stock, and are laid with spaces 3 between the edges of adjacent boards. Such spaces are at least an inch in width and may be considerably greater. In conventional construction surfacing sheets 4 are nailed to the sheathing boards 2. In wall construction the frame members 1 are the studs and the sheathing boards are nailed to them in the same manner as in roof construction so that the sheathing boards extend horizontally. The lengths of the surfacing sheets and the ridges and valleys of the corrugations or crimps then extend transversely of the sheathing boards in both roof construction and sidewall construction so that the ridges and valleys of the roof slope of the roof and in the sidewall the ridges and valleys are vertical.

If a slope of the roof is long or if the height of a wall is great, it is necessary to use several courses of sheets. The lower edge of each course must overlap the upper edge of the next lower course to an extent sufficient to prevent snow from blowing up under the lower edge of a course and over the upper edge of the next lower course to make a snow leak. Such overlap should therefore be at least a couple of inches. A greater lap is re-

quired if the lower edge of an upper course is not held down securely. In using corrugated surfacing sheets, therefore, it is not practical to secure such sheets by nailing through only portions of such sheets over which the lower ends of upper sheets lie, as is the practice in laying shingles. To anchor the upper and lower edges of such surfacing sheets to the sheathing boards hooks **5** are hooked over the sheet edge and an underlying sheathing board **2** at intervals along such edges. In order to enable the sheet edges to be anchored securely in this fashion it is desirable for the sheathing boards to be located so that the upper end of each sheet is located flush with the upper edge of a sheathing board, and the lower end of the lowest surfacing sheet course is flush with the lower edge of the lowest sheathing board, as shown at the right of FIGURE 1.

The hooks **5** are of special construction, as shown in FIGURES 2 to 5. The end portion **6** of the hook which engages beneath the sheathing is flat and of a length to provide a good grip on the sheathing. The opposite side **7** of the hook preferably is curved transversely of its length with a curvature substantially complemental to the exterior curvature of the corrugated sheet valley with which the hook is to be used. If the hook is to be used with V-crimp sheet material, as shown in FIGURE 10. The hook side **7** should be of complemental V-groove shape like the hook side **7'** in FIGURE 6. The length of such hook side should be equal to the overlap of the lower edge of an upper course over the upper edge of a lower course.

The side or end portion **6** of the hook and the side **7** or **7'** of the hook are joined by a web portion **8** of an extent between such portions equal to the combined thickness of a sheathing board and of a sheet to be clamped to such sheathing board, which will be slightly more than ¾ of an inch, as shown in FIGURE 1. When the clamp is fitted over the edge of a sheathing board and the overlying end of a surface sheet, therefore, the clamp hook will hold the sheet edge snugly against the sheathing board edge. To facilitate putting the hook in place, and subsequently securing such hook in place a lug **9** is provided upstanding from the end of the hook side **7** opposite the hook web **8**.

When the hooks **5** are applied to a roof or sidewall they should be arranged so that the hooks at opposite ends of any sheet are in registry with corresponding corrugation valleys. The hooks engaging opposite ends of each valley are then secured together by a tie, which preferably is in the form of a tie rod **10**, which may be formed with eyes **11** at its opposite ends. Such tie rods will be shorter than the length of a surfacing sheet by an amount equal to twice the length of a hook side **7** plus a short distance to be spanned by tightening bolts **12**. Such bolts extend through apertures in the lugs **9** of the hooks **5** and connect such lugs with the adjacent eyes of the tie rods. Preferably these eyes are bent at right angles to the shanks of the tie rods so that such shanks can be received in the valleys of corrugated or V-crimp sheets to assistant in keeping such valleys close to the sheathing under windy conditions.

In applying the surfacing sheet-anchoring apparatus shown in FIGURES 1 to 6, the framing rafters or studs **1** and sheathing **2** are assembled in conventional fashion. Next, the lower course of surfacing sheets is laid and hooks **5** are engaged with the upper and lower edges of such sheets and the underlying sheathing boards at desired intervals, as indicated in FIGURE 7. Through the holes in the upper and lower hook lugs **9** are extended headless bolts **12** with threads on opposite ends, although headed bolts can be used for the lower hooks, if desired. The eyes **11** of the tie rods **10** are then fitted over the bolt shanks and nuts are screwed onto such shanks until the upper and lower hooks **5** are held tightly in engagement with the sheathing board edges and the tie rod **10** is held under reasonable tension in its surfacing sheet valley, as shown in FIGURES 7, 8, 9 and 10.

The next higher course of surfacing sheets is then applied. The lower edges of such sheets will extend down over the sides **7** of the upper hooks and such edges will engage the lugs **9** of the upper hooks. Consequently the lower edges of the sheets of this course will overlap the upper edges of the sheets of the next lower course by the distance between the lugs **9** and webs **8** of the hooks automatically, which distance may, for example, be two inches. The upper ends of the surfacing sheets of this course will then be clamped to sheathing boards by hooks **5** in a similar manner, such hooks being located in troughs of the sheet material corresponding to the valleys which overlie the sides **7** of the hooks along the lower edge of such sheets. Bolts **12** are then inserted through apertures in the lugs of such upper hooks and the eyes **11** of tie rods **10** are placed over such bolts and the bolts of the lugs at the lower end of such sheets. The nuts on such bolts are tightened to hold the tie rods firmly in the valleys of the surfacing sheets and to draw the upper clamping hooks into close engagement with the edges of the sheathing boards and the upper ends of the surfacing sheets overlying such boards.

The procedure described above is repeated for each successive course of surfacing sheets up to the ridge of a gable roof. Such ridge can be covered by a ridgecap **13** of sheet material shown in FIGURES 1 and 7. The upper edges of the upper courses of surfacing sheets and the lower edges of the ridgecap should be disposed in overlapping relationship corresponding to the overlapping relationship between the upper sheet edges of one course and the lower sheet edges of the next higher course, as shown in FIGURE 1. The lower edge portions of such ridgecap can be held in place, as shown in FIGURES 1 and 7, by hooks **5** engaging the opposite gable ends of the roof, which hooks are connected by horizontal ties preferably in the form of tie rods **10**, as previously described. Such tie rods also can be tensioned by bolts **12** connecting the lug **9** of the clamp and the adjacent eye **11** of the tie rod. Such bolt can be threaded at opposite ends, or may have a head on one end and a nut on the other end. While the tie rod **10** used at this location can be of a length to span virtually the entire length of the roof such tie rod can be composed of a plurality of tie rod sections secured in end-to-end relationship. Such tie rods should be made available in lengths approximately six inches shorter than the lengths of the surface sheets customarily used.

In order to deter buckling of the surfacing sheets at locations between the tie means received in valleys of such sheets horizontal ties can be extended over the surfacing sheets and the ties received in their valleys. Such horizontal ties again can be tie rods **10**, as shown in FIGURE 11. These tie rods extend between and connect hooks engaging the ends of the roof or wall structure sheathing. While, as discussed in connection with FIGURE 7, hooks **5**, as described above, can be used for this purpose it is preferred that a modified type of hook **14**, shown in FIGURES 11 and 12, be used. This hook has a flat end portion **15** for engagement with the under or inner side of a sheathing board and an outer and preferably longer end portion **16**, intended to overlap the edge portion of a surfacing sheet, as shown in FIGURE 11.

The web **17** connecting the hook end portions **15** and **16** is of a length equal to the sum of the thickness of a sheathing board, the overall thickness of a surfacing sheet and the thickness of the tie to be engaged with the hook. A hole **18** is then provided in such web adjacent to the outer end portion **16** of the hook so that the tie rod can extend beneath such outer end portion and through the web **17** to be anchored by a nut. Such tie rod must therefore have a threaded end **19** to pass through the hole **18** instead of having an eye on its end. The opposite end of such tie rod also can be threaded

to pass through the hole **18** of the opposite hook **14**, as shown in FIGURE 11, or the tie rod can be a hook bolt having a long shank and a hook **20** having a throat wide enough to embrace the sheathing and surfacing sheet at one edge of the roof.

In FIGURES 11 and 13 an optional component of the surfacing sheet-anchoring apparatus is shown in the form of a pothook. One end **21** of this pothook preferably is angular and has a throat of a width to fit snugly a sheathing board and an overlying edge of a surfacing sheet so as to clamp such surfacing sheet to the sheathing board edge. The shank **22** of the hook is of a length corresponding to the desired overlap of the lower edge of an upper course sheet over the upper edge of the next lower course sheet. The hook **23** at the end of the shank opposite the hook **20** has a throat of a width to receive in it a ridge of a corrugated or crimped sheet.

The manner in which such pothooks are used is shown in FIGURE 11. The square hook engages over the upper edge of a sheathing board and the hook shank **22** overlies the upper edge of a surfacing sheet in a lower course and underlies the lower edge of the surfacing sheet in the next upper course. Such lower edge then engages in the hook **23** both to prevent the sheet from sliding down and to assist in limiting lifting of the lower edge of the sheet. Such lower sheet edge is further restrained from being lifted by wind by a tie rod extending horizontally over the lower edge portion of the sheet, and the tie rods extending parallel to the ridges and valleys of the sheet, as shown in FIGURE 11. The tie rods are thus disposed in crossing relationship to form a grid overlying the entire surfacing sheet structure. In such grid the tie rods extending parallel to the ridges and valleys of the surfacing sheets can either be of the type disclosed in FIGURE 7, or of the type illustrated in FIGURE 12, which are shown in place in FIGURE 11.

It will be evident that the hook and tie surfacing sheet-anchoring apparatus described above can be removed as readily as it is installed. Use of such apparatus therefore facilitates repair of a roof by enabling only selected sheets to be replaced, for example. Also, since the sheets have not been damaged by nail holes they can be removed from one roof or wall and used again. Sheets which have been nailed in place are seldom suitable for further use because the holes in such sheets usually are enlarged in the process of removing the nails securing such sheets in place.

I claim as my invention:

1. Anchoring apparatus for surface sheets overlying sheathing, comprising hook means engaging an edge portion of a sheet and sheathing therebeneath, hold-down tie-rod means closely overlying such surface sheet and in engagement therewith, one of said means having an eye projecting above such surface sheet, bolt means connected to the other of said means and extending through said eye, and nut means securing said bolt means in said eye.

2. The anchoring apparatus defined in claim **1**, in which the hook means has the eye and the bolt means is connected to the tie-rod means.

3. The anchoring apparatus defined in claim **1**, in which both the hook means and the tie-rod means have eyes and the bolt means extend through both eyes and are connected thereto by nut means.

4. The anchoring apparatus defined in claim **2**, in which tie-rod means are provided at oppoiste sides of the hook means eye, and the bolt means extend through the hook means eye and are connected to both of the tie-rod means.

5. The anchoring apparatus defined in claim **1**, and additional tie-rod means transversely crossing said hold-down tie-rod means in overlying relationship.

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