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Notching Tool

THIS INVENTION relates to a notching tool suitable for forming notches in sheet material, and in particular to a notching tool suitable for forming notches in ridge- or hip-capping during roof construction.

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A major problem which arises when fitting ridge- or hip-capping to a roof structure is the need to cut notches in the ridge- or hip-capping to match the profile of the rolled section iron or aluminium roofing sheets. Previously, these notches have been marked or scribed on the capping in situ (or elsewhere) and then laboriously cut by hand using a pair of shaped snips or shears while the capping is loosely held in position. Not only is this method extremely labour intensive, but a poor match is usually achieved between the notches cut in the capping and the respective ribs on the roof sheeting.

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It is an object of the present invention to enable the provision of a notching tool whereby the above disadvantages may be overcome, or at least mitigated.

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According to a first aspect of the present invention there is provided a notching tool suitable for notching sheet material, which notching tool comprises a base member, a notching head mounted on the base member, the notching head comprising a die member and a punch member adapted to cooperate with the die member, and means for effecting cooperation between the die member and the punch member, wherein the base member comprises a pair of spaced apart, substantially parallel, support members for accomm-

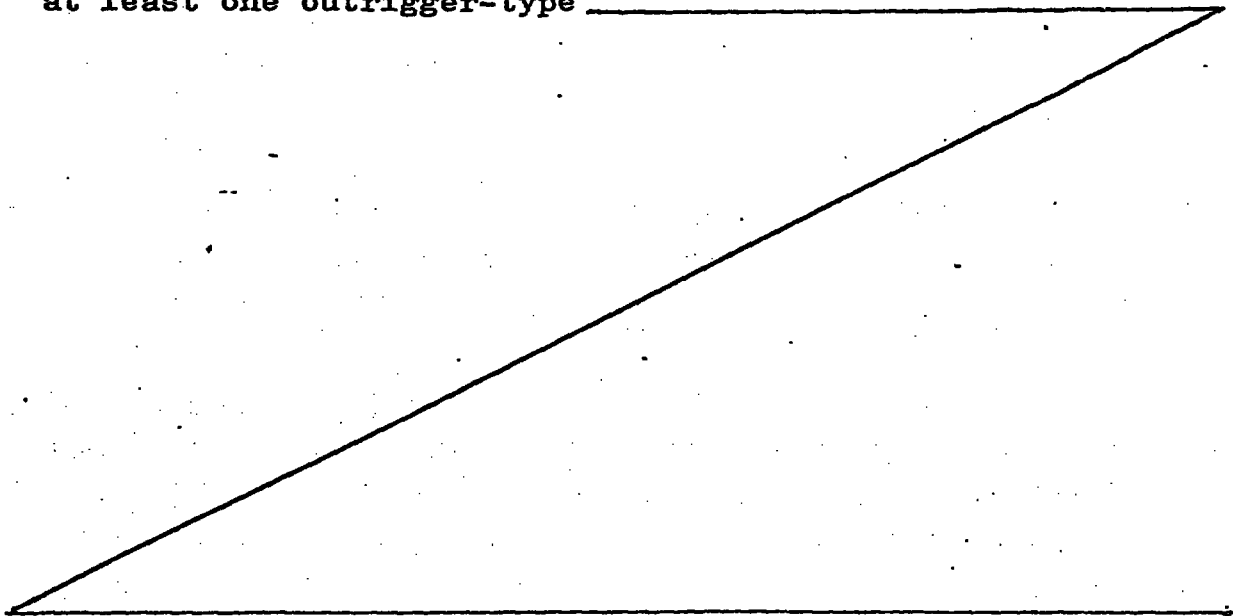
odating therebetween a rib or protrusion on a first member and means for interconnecting the support members, such that the notch formed in the sheet material in use is to cooperate with the rib or protrusion on the first member.

According to a second aspect of the present invention there is provided a method of notching sheet material, wherein the notch is to cooperate with a rib or protrusion on a first member, which method comprises supporting a notching head by means of a base member on which the notching head is mounted, the base member comprising a pair of spaced apart, substantially parallel, support members and means for interconnecting the support members and the notching head comprising a die member and a punch member adapted to cooperate with the die member, placing the base member on a first member so that a rib or protrusion on the first member is accommodated between the said support members and effecting cooperation between the die member and the punch member to form a notch in a sheet material. Preferably the spacing between the support members is adjustable. In certain embodiments, at least one outrigger-type

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support member may be provided on the base member to prevent the tool from tipping during use.

5 Preferably, cutting plates of the die member and the punch member are detachably mounted on the notching head to enable them to be changed or replaced. Preferably a number of sets of cutting plates are provided for the tool, each cutting plate pair being suitably profiled to correspond to the profile of a particular rib or protrusion on, for example, ribbed roofing sheets enabling the tool to be used for a wide range of notch profiles. The
10 cutting plates may be reversible (that is, they may have cutting edges on both sides) so they may be used, for example, to cut the notches along each side of a hip-capping to co-operate with the profile of the ribs of a particular ribbed roofing sheet.

15 Preferably one of the die and punch member pair is fixed and the other is pivotally mounted on the notching head, to co-operate with the fixed member to provide a shearing-type cutting action between the die and punch member, to form the notches in the sheet.

20 The notching head may be pivotally and/or rotatably mounted on the base member to enable the fixed die or punch member to engage and support the portion of the sheet to be notched as the notch is formed.

25 Preferably, adjustable guide means are provided on the notching head to permit angular alignment between the edge of the sheet to be notched and the aperture in the die member, or to enable adjustment of the depth of the notch cut by the tool.

30 The operating means may include a manually-operable lever or a hydraulic or pneumatic cylinder connected to the movable die or punch member.

~~According to a second aspect of the present invention there is provided a method of notching sheet material, which comprises forming a
35 notch in a sheet material using a notching tool in accordance with the first aspect.~~

The present invention enables the provision of a notching tool which is particularly suitable for cutting notches in ridge - or hip-capping or the like preformed sheet sections.

5 The present invention further enables the provision of a notching tool with which it is possible to cut a variety of notch profiles.

10 The present invention further enables the provision of a notching tool which can be positively located in use to ensure that the notches are aligned with the ribs on roof sheeting when the notching tool is used to notch ridge - or hip-capping.

15 The present invention further enables the provision of a notching tool which may be simple and inexpensive to manufacture, and which is relatively simple and quick to use.

For a better understanding of the present invention, and to show how the same may be put into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

20 FIGURE 1 shows a perspective view of a hand-operated notching tool according to a first embodiment of the present invention, during use for forming a notch in the ridge-capping of a roof structure,

25 FIGURE 2 shows a side perspective view of the notching tool shown in Figure 1,

FIGURE 3 shows a front perspective view of the notching tool shown in Figure 1,

30 FIGURE 4 shows a top perspective view of the notching tool shown in Figure 1, during use for forming a notch in the hip-capping of a roof structure, and

35 FIGURE 5 shows a side perspective view of a power-operated notching tool according to a second embodiment of the present invention.

Referring to Figure 1, a roof structure 10 has a series of rolled section aluminium roof sheets 11 laid side-by-side (in overlapping relationship) along each side of a ridge, the ridge to be covered by a ridge-capping 12, of preformed aluminium sheeting, having substantially vertical sides 13. To enable the ridge capping to sealably cover the ridge, notches 14 are formed at spaced intervals along the sides 13 to engage, and co-operate with, the spaced ribs 15 of the roofing sheets. The notching tool 16, of Figures 1 to 4, has a pair of spaced, substantially parallel, feet 17 connected by a cross-bar 18. Each foot 17 has a substantially horizontal web 19 and a substantially vertical flange 20. The distance between the feet 17 is substantially equal to the width of the roofing sheet ribs 15 at their bases.

A pair of support flanges 21 is provided on the underside of a base plate 22 and is secured to the flanges 20 on the feet 17 by suitable fasteners 23. As shown in Figure 2, the base plate 22 is angularly inclined to the feet 17 so that it is substantially horizontal when the tool is supported on the roofing sheets 11. (If preferred the base plate 22 may be mounted for angular pivotal movement relative to the feet 17 to accommodate different angles of roof pitch.

The notching head 24 has a foot plate 25 pivotally mounted on the base plate 22 about a vertical axis. A curved slot 26 is formed in the foot plate to receive the shank 27 of a bolt 28 fixed in the base plate 22. A nut 29, having a handle 30, is screw-threadably mounted on the shank 27 and may be selectively loosened or tightened to enable the foot plate 25 to be rotated and locked relative to the base plate 22, to enable the notching head 24 to be rotated relative to the feet 17.

A rectangular substantially vertical die support frame 31 is mounted on the foot plate 25 and has an aperture 32 therethrough. A die plate 33, having a profiled notching aperture 34 surrounded by a hardened cutting edge 35, is releasably mounted on the support frame 31 by suitable fasteners 36.

As shown in Figure 3, the notching aperture 34 has a profile corresponding to the profile of the roofing sheet ribs 15. A pair of gussets

37 is provided to support and strengthen the die support frame 31. The axis of rotation of the foot plate 25 is centred on the die plate 31.

5 A pair of flanges 38 extend forwardly of the die support frame 31 and are interconnected by a substantially horizontal transverse bolt 39.

10 A punch 40 has a tubular body 41 rotatably mounted on the bolt 39 between the flanges. A backing plate 42 is fixed to the body 41 and supports a removable punch plate 43 secured by suitable fasteners 44. The punch plate 43 has a profile corresponding to the notching aperture 34 of the die plate 33 and has cutting edges around its sides to generate a shearing-type cutting action between the die and punch plate 33, 43.

15 An elongated handle 45 is fixed to the back of the punch 40 and extends rearwardly through the apertures 32, 34 to a grip 46 at its free end. An upstanding leg 47 on the handle engages the rear face of the die support frame 31 to limit the upward stroke of the handle, while a toe 48 on the underside of the handle engages the foot plate 25 to limit the downward stroke.

20 A pair of support guides 49 are provided forwardly of the die plate 33 and have guide plates 50 supported on shanks 51 slidably mounted in the flanges 38. Set-screws 52 in the flanges 38 enable the guides 49 to be adjusted and set relative of the die plate 33.

25 The operation of the tool 16 to cut notches 14 in the ridge-capping 12 will now be described.

30 The ridge-capping 12 is laid along the ridge and loosely held in position. The appropriate die and punch plates 33, 43 are fitted to the tool to correspond to the profile of the ribs 15 and the foot plate 25, and adjusted and set relative to the base plate 22 so that the die plate 33 is at a normal to the longitudinal axis of the feet 17. The support guides 49 are adjusted and set relative to the flanges 38 to select the required height of
35 the notches 12 to be cut.

The tool 16 is placed on one of the roofing sheets 11 with one of the ribs 15 engaged between the vertical flanges 20 of the feet 17.

The handle 45 is raised until the upstanding leg 47 engages the die support frame 31, tipping the punch 40 forwardly (as shown in Figure 2).

The ridge-capping is raised and the tool is moved along the rib until the die plate 33 engages the outer face of the side 13 of the capping (the punch 40 now lies inside the capping). The capping is lowered until the bottom edge of the capping is supported by the support guides 49.

The operator pushes the handle 45 downwardly to move the punch 40 towards the die plate 33. As the punch plate 43 progressively enters the die plate 33, commencing at each side of the punch plate at the bottom edge of the capping, a shear-type cutting action is produced between the cutting edges of the plates. When the handle 45 is pushed to the lower limit of its stroke (that is, the toe 48 engages the foot plate 25), the punch plate 43 fully enters the notching aperture 34 in the die plate 33 and the notch 14 is formed in the capping 12.

The handle 45 and the capping 12 are both raised and the tool 16 is removed.

The tool is then engaged on the next rib along the roofing sheet 11 and the operation is repeated until the notches 14 have been formed along both sides of the capping 12.

The capping 12 is then laid in position, each notch co-operating with a respective rib 15 on a roofing sheet, and the capping is fixed in position by known fastening methods.

Figure 4 shows a top perspective view of the tool 16 forming a notch in a hip-capping 12a.

The notches in the hip-capping 12a have a different profile to the notches 14 in the ridge-capping 12 due to the angular relationship between the capping 12a and the roofing sheets 11. The lower vertical side of the

notch is longer than the upper side and the top of the notch is inclined to the horizontal. Therefore, the die and punch plates 33, 43 are replaced by another pair of die and punch plates which have the appropriate profile for the notches in the hip-capping.

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Before the notches are cut, the notching head 24 is rotated relative to the base plate 22 so that the front face of the die plate will engage the side of the hip-capping. The angle of rotation between the foot plate 25 and the base plate 22 may be read off a scale (not shown) around the slot 26. 10 The support guide 49 which will support the higher end of the hip-capping is raised relative to the second guide 49.

To prevent the tool 16 from tipping over during the notching operation, an outrigger arm 53 is provided. At its inner end, the outrigger 15 arm has a downwardly directed pin (not shown) which engages in a hole 54 in the base plate. At the outer end, a rubber foot 55 is fitted to the outrigger arm to engage the supporting roofing sheet 11.

The operation for producing the notches along one side of the hip- 20 capping 12a is as hereinbefore described with respect to the ridge-capping 12.

To produce the notches along the other side of the hip-capping, the die and punch plates are reversed, the notching head 24 is swung in the other 25 direction relative to the base plate 22, and the outrigger arm 53 is fitted to the other side of the base plate 22.

The operation of forming notches is then repeated, as hereinbefore described.

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Figure 5 shows a power-operated tool 56 which has a base and foot plate assembly identical with the base and foot plate assembly of the tool 16 of Figures 1 and 4.

35 The punch 57 is fixed to the foot plate 25 and is fitted with a removably mounted punch plate 58 secured by fasteners 59. A support frame 60 is fixed on the foot plate 25 and has a pair of side flanges 61

interconnected by a transverse plate 62 having an aperture therethrough (not shown). The cylinder of a double-acting pneumatic ram 63, connected to a source of pressurized air by an air hose 64, is mounted on the transverse plate 62. A pair of extension flanges 65 extend forwardly of the side flanges 61 and are interconnected by a transverse bolt 66, which also passes through the punch 57.

A die support frame 67, of substantially inverted U-shape, has forwardly directed flanges 68 at the lower end of each leg 69 pivotally mounted on the bolt 66. A die plate 70, having a notching aperture corresponding to the profile of the punch plate 58, is releasably mounted on the front face of the die support frame 67 by fasteners (not shown).

Support guides 71 are adjustably mounted on the flanges 68 and are locked in position by set-screws 72. A bifurcated knuckle 73 on the rear of the die support frame 67 is connected to a similar knuckle 74 on the free end of the piston rod 63a of the pneumatic ram 63 via a link 75 fitted with pivot pins 76.

In operation, the feet 17 lie along each side of the ribs 15 and the rearward face of the punch plate 58 engages the side 13 of the ridge-capping 12 (or hip-capping 12a), the lower edge of the capping being supported by the support guides 71. The operator pulls the trigger 77 on the pneumatic ram 63 to cause the piston rod 63a to be extended, therefore urging the die plate 70 towards the punch plate 58 to create a shearing-type cutting action therebetween.

When the notch has been formed, the operator releases the trigger 77 to an intermediate position and the piston rod 63a (and die plate 70) are retracted. When the trigger is fully released, the cylinder is isolated from the airline 64 and is exhausted.

As hereinbefore described, the base plate 22 may be pivotally mounted relative to the feet 17 so that the die plate 33 of tool 16, or the punch plate 58 of tool 56, can support the side of the capping as the notch is formed.

In a further modification, the feet 17 may be adjustably secured to the base plate 22 so that the distance between the feet 17 may be adjusted to accommodate ribs 15 of different widths at their base.

5 The die and punch plates are provided in matched pairs to suit different rib or protrusion profiles, and as hereinbefore described, may be reversible.

10 While the tools have been described and illustrated for forming notches in ridge - or hip-capping, they may be used to form notches in other sheet-metal or sheet plastics or the like material components or structures, and the die and punch plates may be replaced, for example, by co-operating circular, square, rectangular or other shaped die and punch pairs to produce cuts, slots or apertures in such sheet materials.

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CLAIMS

1. A notching tool suitable for notching sheet material,
5 which notching tool comprises a base member, a notching head mounted on the base member, the notching head comprising a die member and a punch member adapted to cooperate with the die member, and means for effecting cooperation between the die member and the punch member, wherein the
10 base member comprises a pair of spaced apart, substantially parallel, support members for accommodating therebetween a rib or protrusion on a first member and means for interconnecting the support members, such that the notch formed in the sheet material in use is to cooperate
15 with the rib or protrusion on the first member.
2. A notching tool according to Claim 1, wherein the spacing between the support members is adjustable.
- 20 3. A notching tool according to Claim 1 or 2, wherein the notching head comprises a plate member having either the die member or the punch member mounted thereon.
4. A notching tool according to any one of the preceding
25 claims, wherein, in use, the cutting profiles of the die member and the punch member correspond to the profile of the rib or protrusion on the first member.
5. A notching tool according to any one of the preceding
30 claims, wherein one of the die member and the punch member is pivotally movable relative to the other of the die member and the punch member to provide a shearing-cutting action therewith.
- 35 6. A notching tool according to any one of the preceding claims, wherein the means for effecting cooperation between the die member and the punch member comprises a hyd-



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raulic or pneumatic ram.

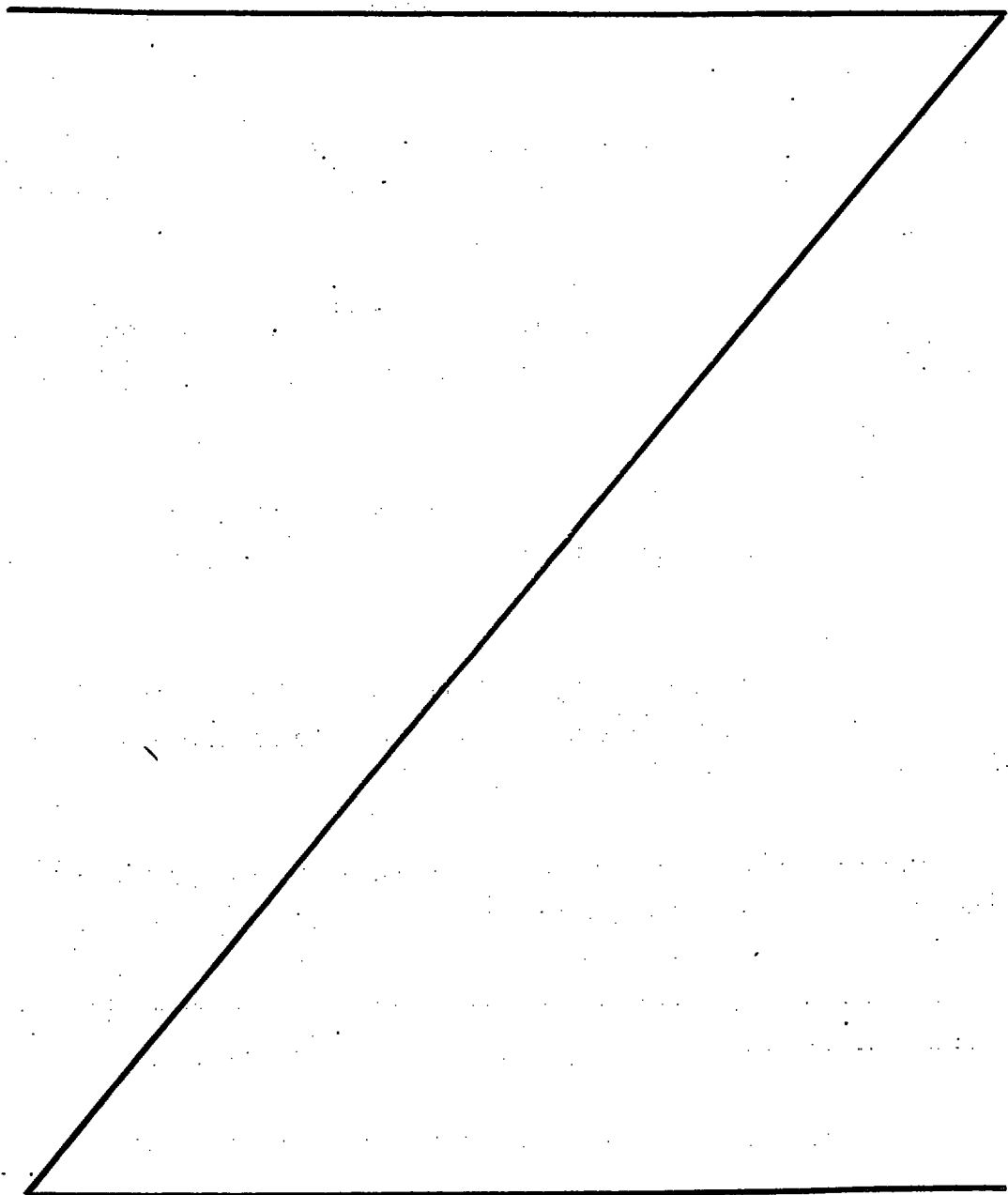
7. A notching tool according to Claim 6, wherein the hydraulic or pneumatic ram is double-acting.

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8. A notching tool according to Claim 6 or 7 when dependent on Claim 5, wherein a piston rod of the hydraulic or pneumatic ram is operatively connectable to the pivotally movable one of the die member and the punch member.

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9. A notching tool according to any one of the preceding claims, wherein each of the die member and the punch member comprises a cutting plate detachably mounted in a holder.

5 10. A notching tool according to Claim 9, wherein each cutting plate is provided with cutting edges on both faces thereof.

10 11. A notching tool according to any one of the preceding claims, wherein the notching head is pivotally mounted on the base member.

12. A notching tool according to Claim 11, which further comprises means for fixing the orientation of the notching head relative to the base member.

15 13. A notching tool according to Claim 11 or 12, which further comprises means for indicating the orientation of the notching head relative to the base member.

20 14. A notching tool according to any one of the preceding claims, wherein the base member is provided with means for preventing tipping of the notching tool during use.

25 15. A notching tool according to any one of the preceding claims, wherein the notching head comprises guide means for supporting the sheet material in use.

30 16. A notching tool according to Claim 15, wherein the position of the guide means is adjustable to enable adjustment of the depth of a notch to be cut.

17. A notching tool, substantially as hereinbefore described with reference to, and as shown in Figures 1 to 4 of the accompanying drawings.

35 18. A notching tool, substantially as hereinbefore described with reference to, and as shown in, Figure 5 of the accompanying drawings.



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19. A method of notching sheet material, wherein the notch is to cooperate with a rib or protrusion on a first member, which method comprises supporting a notching head by means of a base member on which the notching head is mounted, the base member comprising a pair of spaced apart, substantially parallel, support members and means for interconnecting the support members and the notching head comprising a die member and a punch member adapted to cooperate with the die member, placing the base member on a first member so that a rib or protrusion on the first member is accommodated between the said support members and effecting cooperation between the die member and the punch member to form a notch in a sheet material.

20. A method according to Claim 19, wherein the cutting profiles of the die member and the punch member correspond to the profile of the rib or protrusion on the first member.

21. A method of forming a notch in ridge-capping for a roof structure, substantially as hereinbefore described with reference to Figures 1 to 3 of the accompanying drawings.

22. A method of forming a notch in ridge-capping for a roof structure, substantially as hereinbefore described with reference to Figure 5 of the accompanying drawings.

23. A method of forming a notch in hip-capping for a roof structure, substantially as hereinbefore described with reference to Figures 2 to 4 of the accompanying drawings.

24. A method of forming a notch in hip-capping for a roof structure, substantially as hereinbefore described with reference to Figure 5 of the accompanying drawings.

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