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Hay et al.

(54) **ROOFING TILE CLIP AND INSTALLATION METHOD**

(75) Inventors: **Gregory Malcolm Hay**, Taren Point NSW (AU); **Grant Ison**, Sylvania (AU)

Correspondence Address:
DESIGN IP, P.C.
5100 W. TILGHMAN STREET, SUITE 205
ALLENTOWN, PA 18104 (US)

(73) Assignees: **HAYCOLM ENTERPRISES PTY LIMITED**, Gladesville NSW (AU); **GLOBAL ROOFING TECHNOLOGIES PTY LTD.**, Taren Point NSW (AU)

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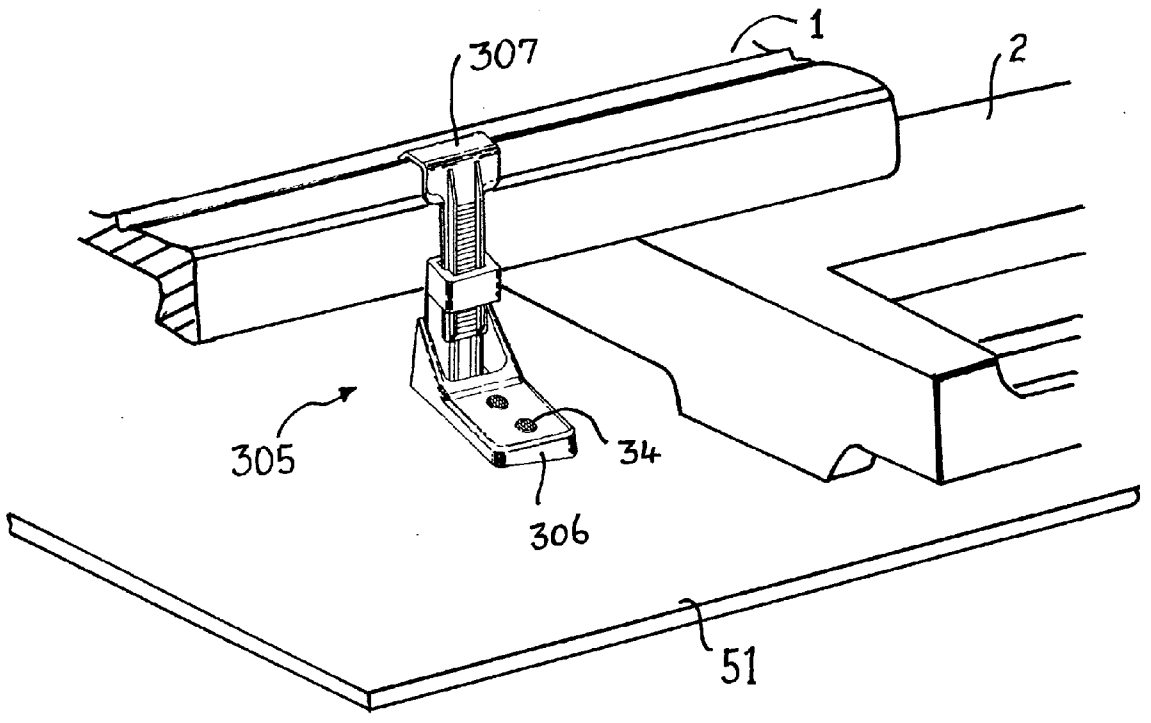
(57) **ABSTRACT**

A roof clip (**205**, **305**) for roof tiles (**1**, **2**) is disclosed in which a fastener (**4**) having a shank (**24**) which passes into a timber batten (**3**), or timber deck (**51**) is used to anchor the clip. The fastener is preferably preassembled with the clip to form an assembly able to be handled by the tile installer. The shank **24** passes through a base (**206**) the length of which pre-sets the distance between the batten and hook (**107**, **207**). The distance between the hook and base is adjustable by means of a ratchet mechanism (**229**, **329**). Consequently one clip can be used with a wide range of tiles. Tilers walking on rooves are less likely to break tiles held with such clips because the ratchet mechanism gives under the weight of the tiler so the clip does not form a rigid point about which the tile breaks.



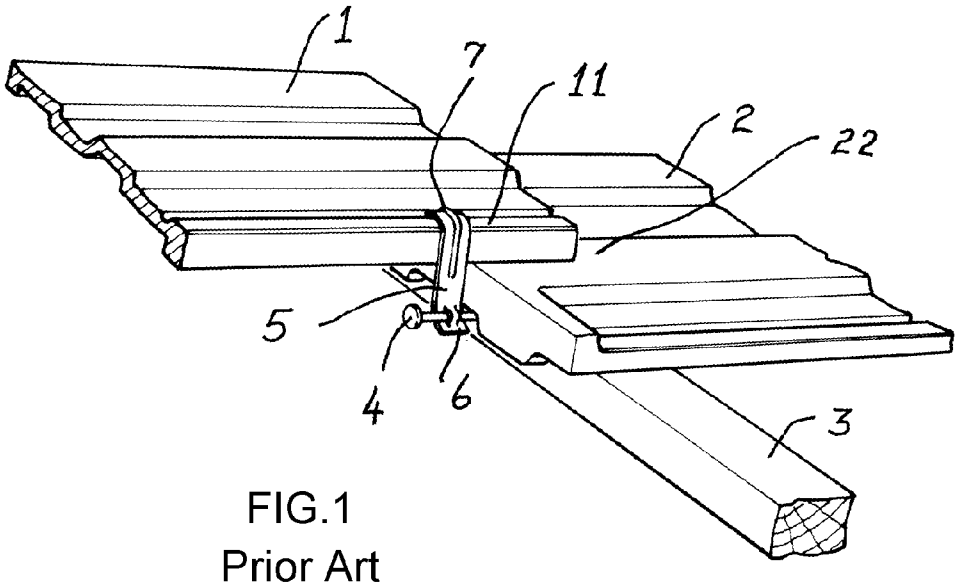


FIG.1
Prior Art

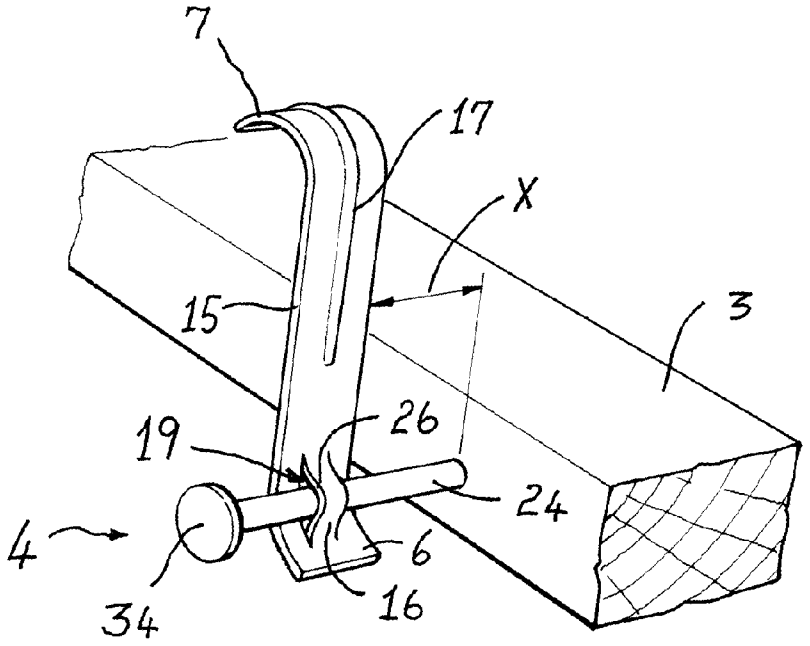


FIG. 2
Prior Art

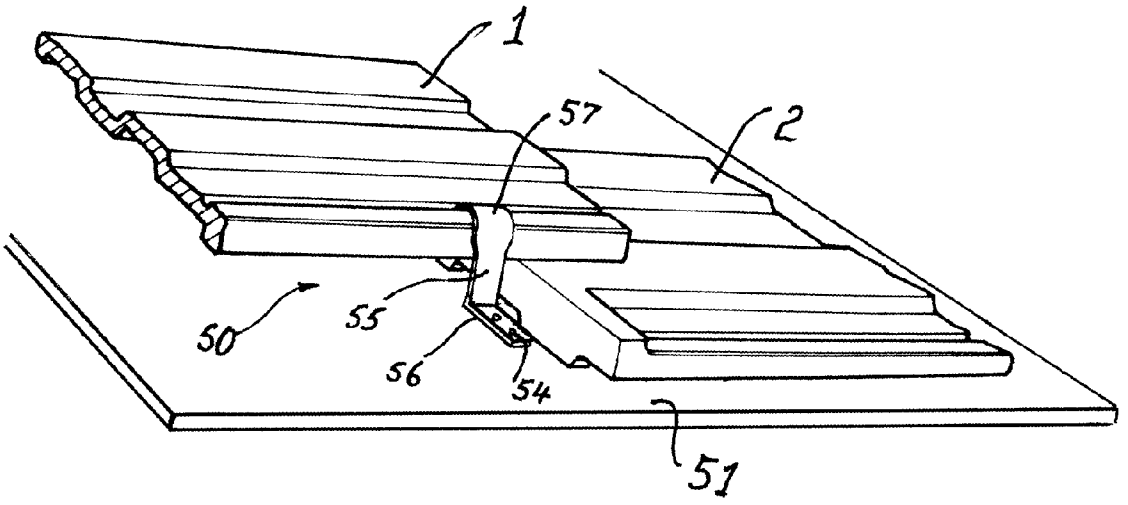


FIG. 3
Prior Art

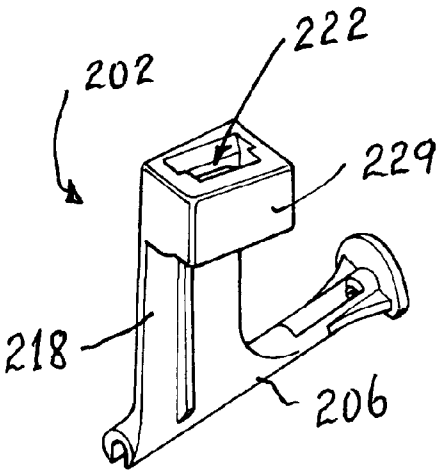


FIG. 4

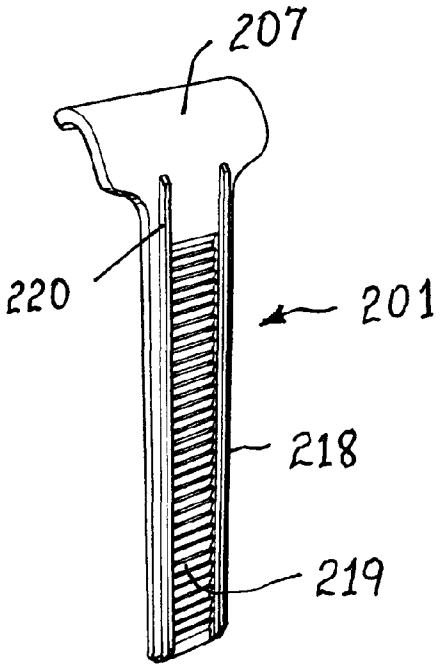


FIG. 5

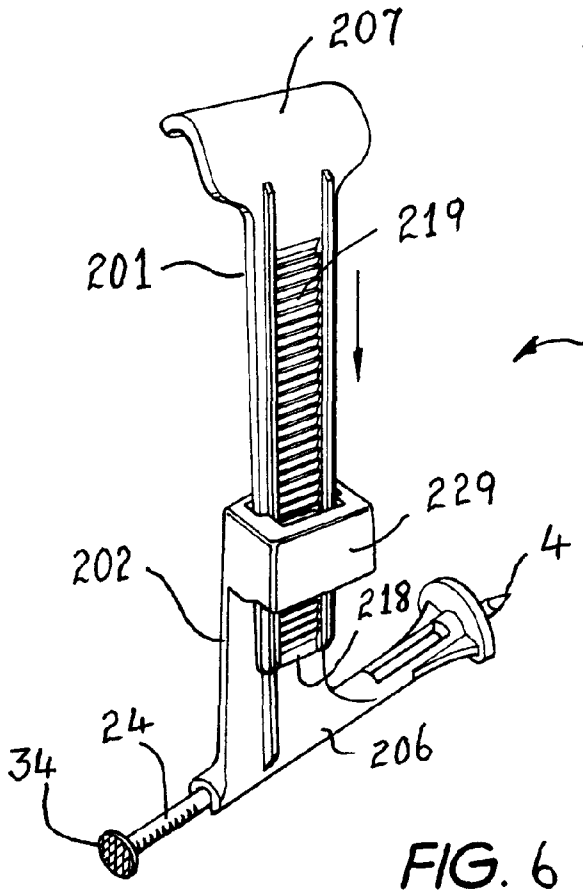


FIG. 6

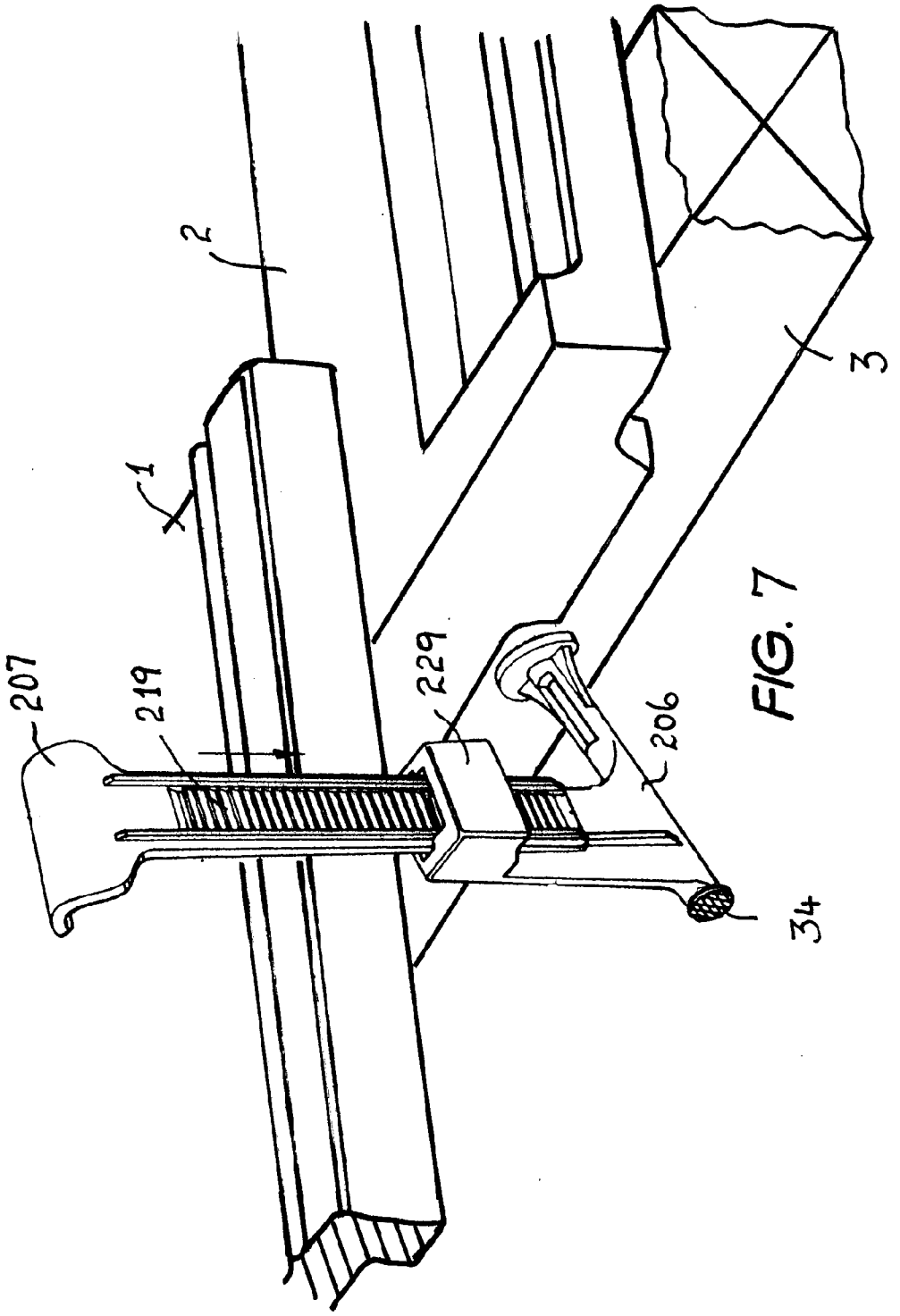


FIG. 7

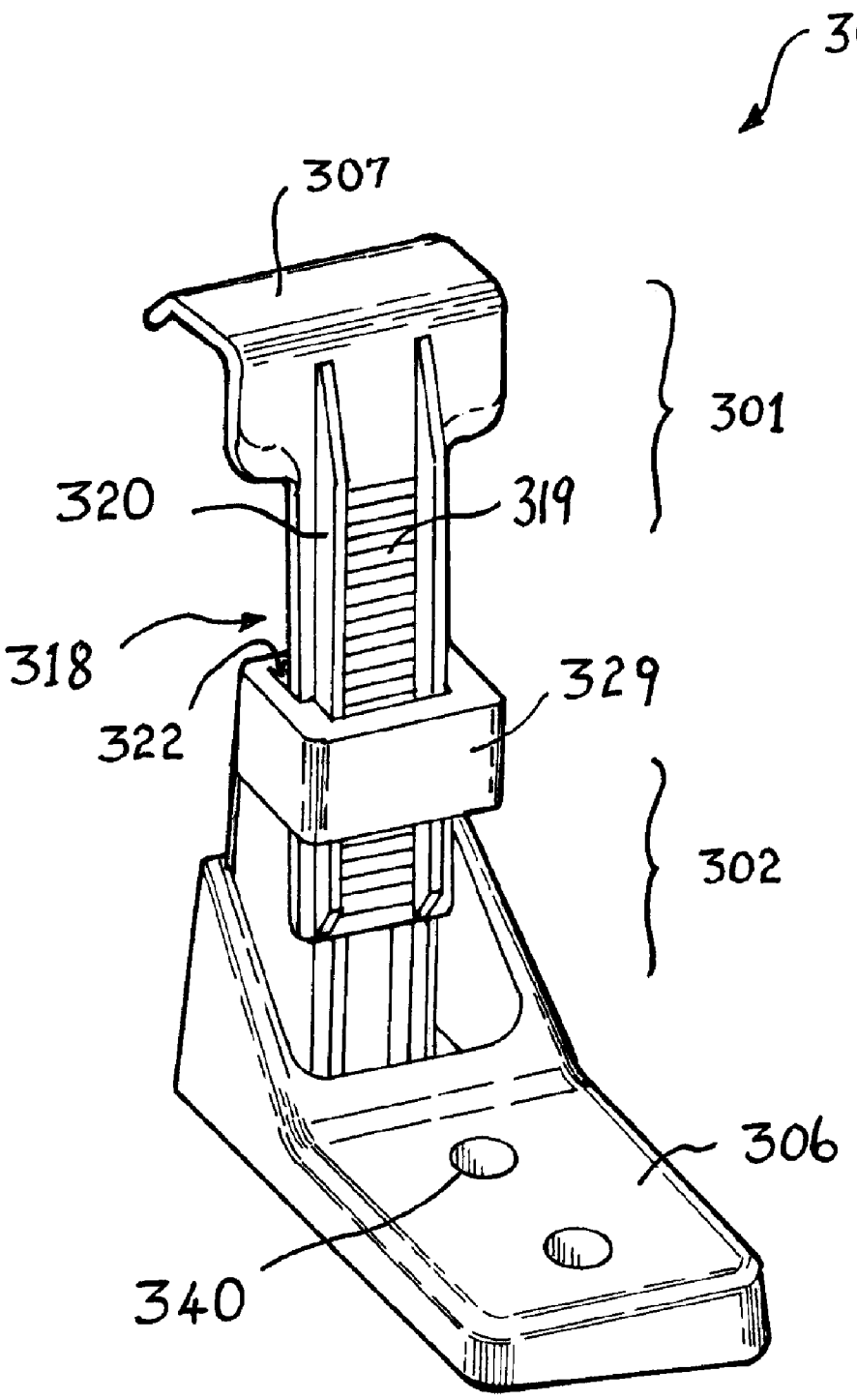


FIG. 8

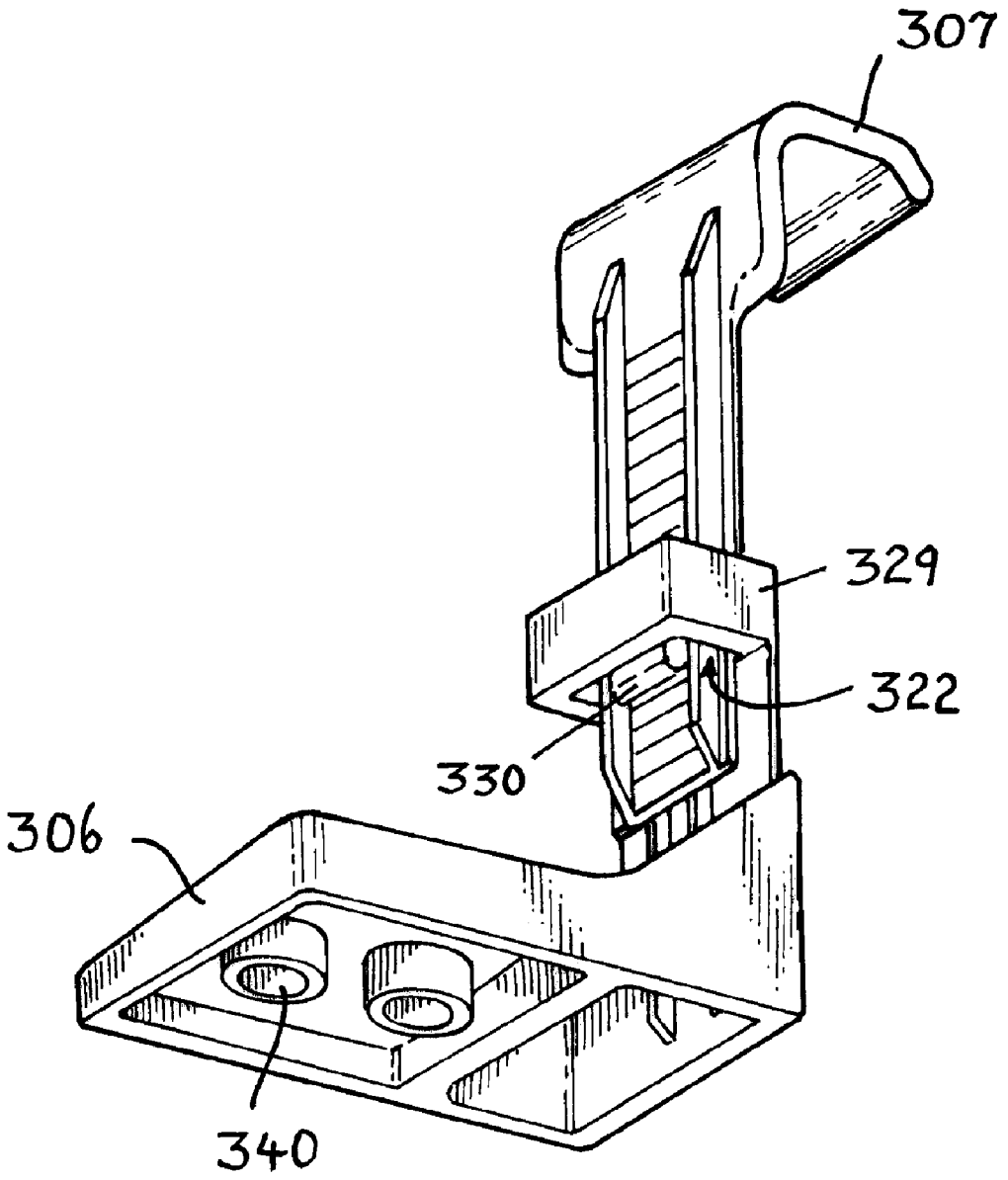


FIG. 9

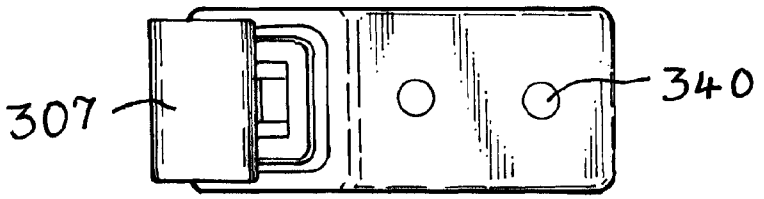


FIG. 10

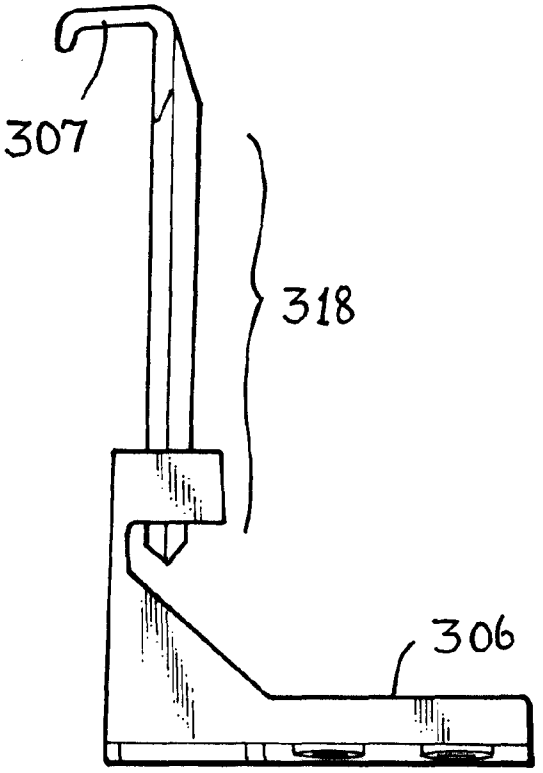


FIG. 11

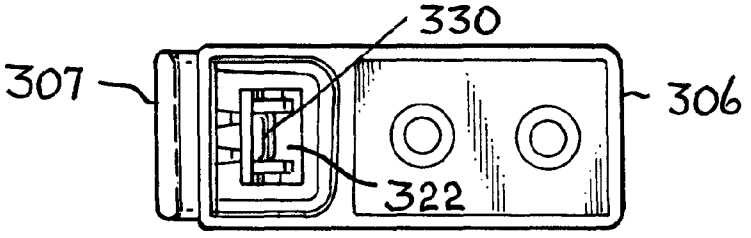


FIG. 12

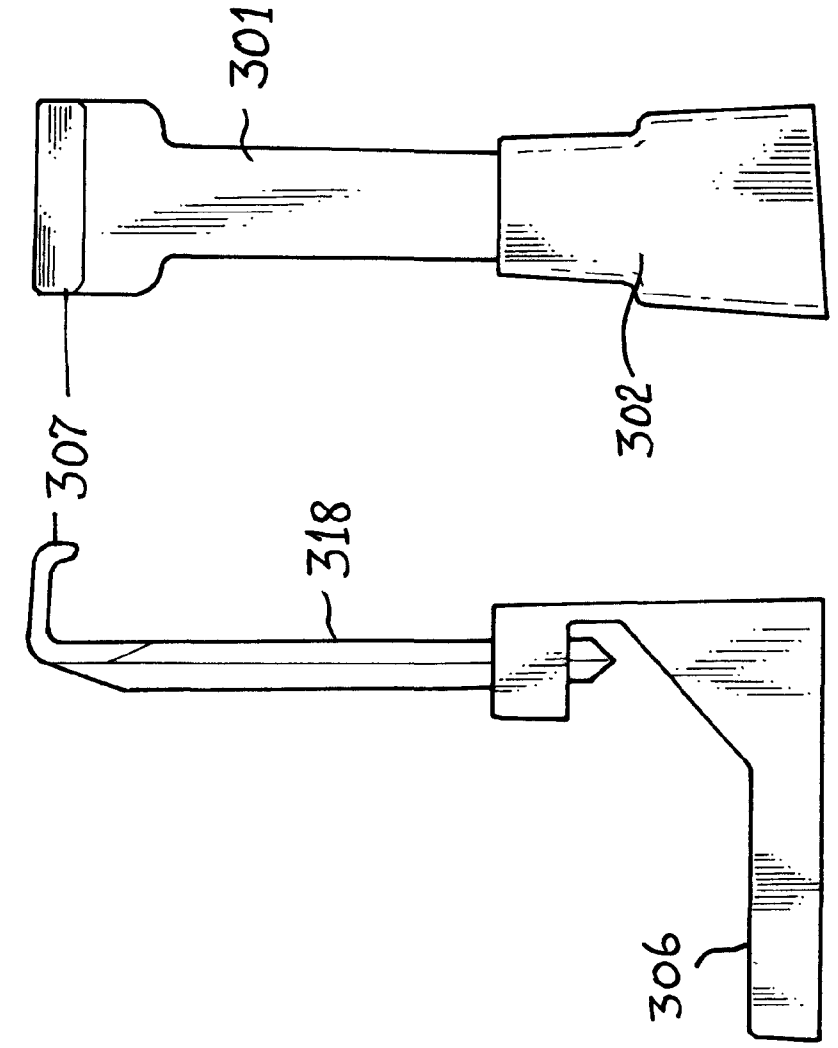


FIG. 15

FIG. 14

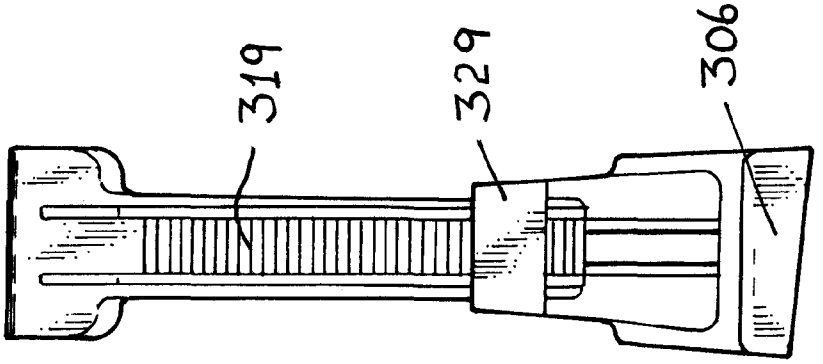


FIG. 13

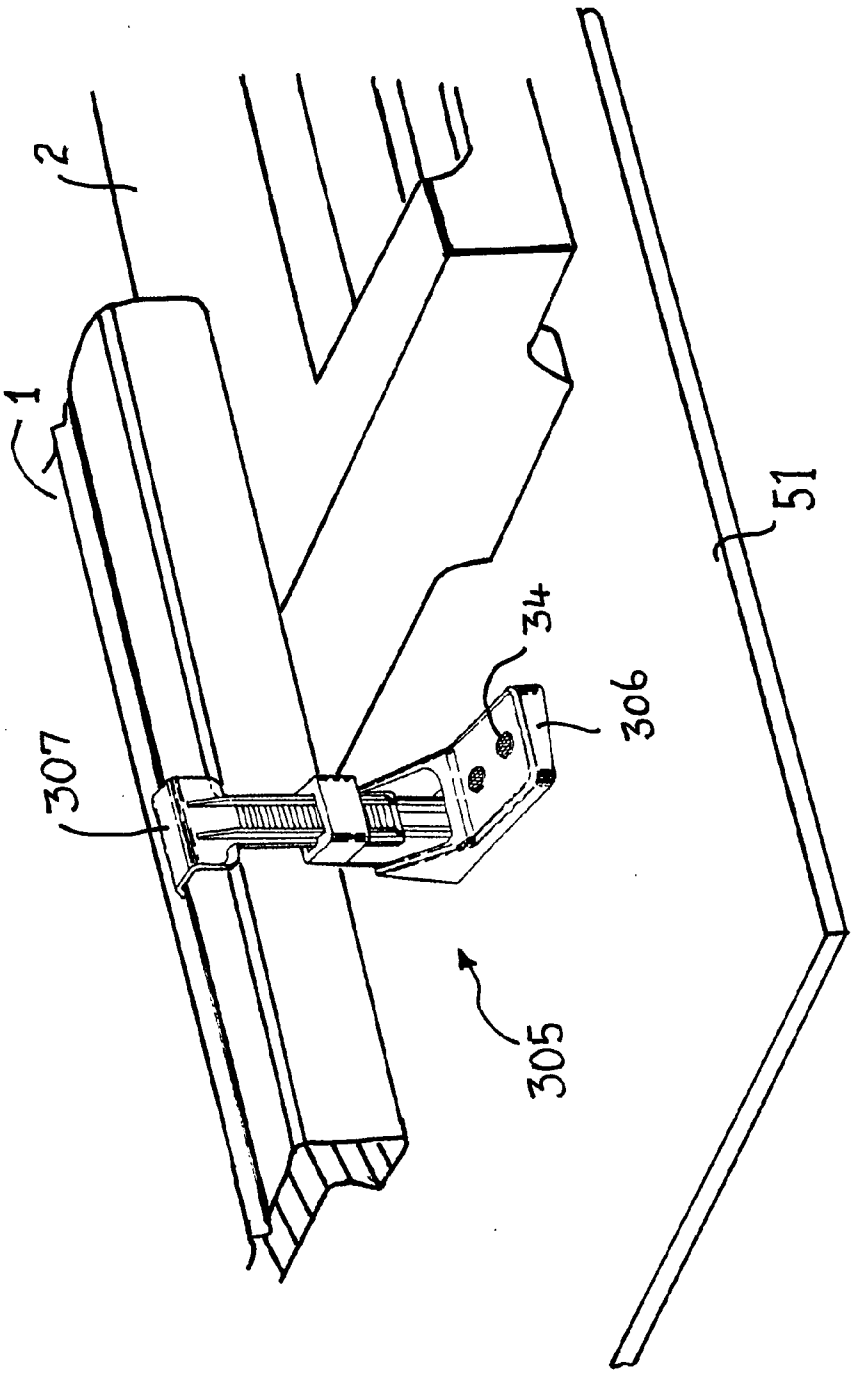


FIG. 16

ROOFING TILE CLIP AND INSTALLATION METHOD

FIELD OF THE INVENTION

[0001] The present invention relates to roofing tile clips, and in particular, to roofing tile clips for tile roofs constructed in cyclone prone areas.

BACKGROUND ART

[0002] In one form a conventional tiled roof, the roof is supported by rafters which run down the slope of the roof from a ridge line to an eave. Running substantially horizontally across the rafters are a plurality of lightweight timber bearers called battens which are spaced apart at a distance which approximately corresponds to the length of each tile. The battens can be fabricated from either softwood or hardwood. The tiles are placed on the battens with a higher part of each tile underlying a lower part of an adjacent tile. Such tiles are typically terracotta or concrete and are relatively heavy. Thus in those areas where high winds are not to be anticipated, the tiles are either maintained in position by their own weight, or tied to the batten by small gauge soft wire. However, in those areas subject to cyclones (or hurricanes or typhoons as the storms are known in the northern hemisphere) batten clips are used to secure the tiles to the battens and so enable the tiles to resist updrafts created by cyclonic storms which would otherwise dislodge the tiles.

[0003] In another type of conventional typed roof the rafters are covered by a sheet layer such as plywood which forms a deck. This is then covered with a waterproof membrane or layer of some kind Tiles are then laid on the deck either with or without battens being laid. Battens are laid as above mainly on steeper rooves having a deck. Such tiles are held in place against high winds by means of a metal deck clip.

[0004] Australian Patent Specification No. 76700/74 (which substantially corresponds to U.S. Pat. No. 4,182,090) and Australian Design Registration No. 65856 disclose one form of prior art batten clip. Such clips have hitherto been fabricated from galvanised sheet steel and suffer from a number of inherent disadvantages to be described hereafter in more detail.

[0005] The genesis of the present invention is a desire to provide an alternative clip, and a method of installing same, which at least ameliorates some of the above mentioned disadvantages.

SUMMARY OF INVENTION

[0006] In accordance with a first aspect of the present invention there is disclosed a roofing tile clip fabricated in two parts, one of said parts comprising an elongated strip having a plurality of teeth extending from one side thereof and terminating in a hook shaped to engage with the side edge of a substantially planar roofing tile, the other of said parts comprising a generally tubular body having a longitudinal axis and an opening therethrough substantially aligned with said axis and shaped to receive said strip, said tubular body having a ratchet mechanism arranged to co-operate with said teeth and permit movement of said hook towards, but not away from, said tubular body, and said other part including an elongate base which extends generally at right angles to said longitudinal axis, said base including at least one bore therethrough shaped to received a fastener for said clip, and said base having an abutment surface substantially perpendicular to said bore which, after installation, bears against a support surface, and through which said fastener can extend.

[0007] In accordance with a second aspect of the present invention there is disclosed a method of installing on a sloping first tile of a roof, a roofing clip as described above, said method comprising the steps of:

[0008] (i) bringing said abutment surface of said base into contact with said support surface,

[0009] (ii) driving a fastener through said base and into said support surface to secure said other part thereto, and

[0010] (iii) after carrying out steps (i) and (ii) bringing said hook into contact with said tile whilst simultaneously passing at least some of said teeth through said ratchet mechanism.

BRIEF DESCRIPTION OF DRAWINGS

[0011] Two embodiments of the present invention will now be described with reference to the drawings in which:

[0012] FIG. **1** is a perspective view of the prior art batten clip installed;

[0013] FIG. **2** is an enlarged view of FIG. **1** without the tiles being illustrated and showing the detail of the construction of the clip;

[0014] FIG. **3** is a front perspective view of a prior art deck clip;

[0015] FIG. **4** is a front perspective view of the lower portion of a two part clip of a first embodiment;

[0016] FIG. **5** is a rear perspective view of the upper portion of the two part clip of the first embodiment;

[0017] FIG. **6** is a front perspective view of the assembled clip of the first embodiment;

[0018] FIG. **7** is a perspective view similar to FIG. **1** and showing the batten clip of the first embodiment installed and being set;

[0019] FIG. **8** is a perspective view from above of an assembled two part deck clip of a second embodiment;

[0020] FIG. **9** is a perspective view from below of the clip of FIG. **8**;

[0021] FIG. **10** is a plan view of the clip of FIG. **8**;

[0022] FIG. **11** is a left side elevation of the clip of FIG. **8**;

[0023] FIG. **12** is an inverted plan view of the clip of FIG. **8**;

[0024] FIG. **13** is a front view of the clip of FIG. **8**;

[0025] FIG. **14** is a right side elevation of the clip of FIG. **8**;

[0026] FIG. **15** is a rear view of the clip of FIG. **8**; and

[0027] FIG. **16** is a cut-away perspective view of a roof deck showing the clip of FIGS. **8-15** installed and in a battenless arrangement.

DETAILED DESCRIPTION

[0028] As seen in FIG. **1**, two tiles **1**, **2** are arranged in adjacent courses with the tile **1** being in a course above the tile **2** so that water is shed from tile **1** onto tile **2**. A higher part **11** of tile **1** overlies a lower part **22** of tile **2** to provide the desired overlap of the tiles. Only the batten **3** supporting tile **2** is illustrated in FIG. **1**. A nail **4** which passes through the lower end **6** of a prior art metal batten clip **5** is partially driven into the batten **3**. The upper end **7** of the clip **5** is formed into a hook which engages with the tile **1**. This is the clip disclosed in U.S. Pat. No. 4,182,090 (Aarons).

[0029] As seen in FIG. **2**, the clip **5** is fabricated from galvanised sheet steel, such as that sold under the trade name GALVABOND with the clip **5** being formed by pressing or cutting from a large galvanised sheet. Accordingly, the edges

15 of the clip **5** are not galvanised but are unprotected steel. Preferably the hook **7** and upper portion of the clip **5** are provided with a pressed stiffening rib **17**. At the lower end **6** a loop **16** is formed by shearing a medial strip so as to form an eye shaped opening **19** through which the shank **24** of the nail **4** can pass. It will be appreciated from FIG. **2** that the edges **26** of the loop **16** which are formed during the shearing of the clip **5** are also constituted by unprotected steel.

[0030] It will also be apparent from FIGS. **1** and **2**, that the clip **5** is essentially in contact with the tile **2** which overhangs the batten **3** and thus the edge of the clip **5** is spaced from the batten **3** a distance X indicated in FIG. **2**.

[0031] The abovementioned arrangement suffers from several disadvantages. Firstly, it is prohibitively expensive to manufacture the clip **5** from a rust resistant material such as stainless steel, and thus galvanised sheet steel must be used. However, the edges **15** and **26** of the clip **5** are prone to rusting which is a particular problem in cyclone prone areas since these are located in the tropics and near tropical seas.

[0032] Secondly, ideally the nail **4** should be galvanised in order to protect the nail **4** from rust. However, the sharp edges **26** of the loop **16** in practice strip any galvanising material on the shank **24** of the nail **4**. As a consequence, it is the practice not to use the expensive galvanised nails but to instead use normal mild steel nails since a galvanised nail with the galvanising partly stripped away offers no practical protection.

[0033] Thirdly, the nail **4** is only partially driven into the batten **3** and this requires the exercise of some skill and judgement on behalf of the installer. In particular, if the nail **4** is not driven a sufficient distance into the batten **3**, the nail **4** will not adequately secure the clip **5** to the batten **3**. Conversely, if the nail **4** is driven too far into the batten **3**, the head **4** can distort the lower end **6** of the clip **5**, thereby damaging the clip and lessening its holding ability.

[0034] The tiler or roofer does not know exactly how hard to drive in the nail because the nail is never driven fully home. If the nail is driven in too far, of the clip will be bent, thereby distorting the entire device and resulting in the hook **7** being dislodged from the tile. Alternatively, if the nail is not driven in far enough, the head of the nail does not abut the clip **5**. In this position, if the wind should lift the tile **1**, the hook **7** will tend to move towards the tile **2** and the loop **16** will tend to slide towards the head **34** of the nail **4**. As a consequence, an increased bending moment is applied to the nail, which then results in the shank **24** of the nail **4** bending upwardly. As a consequence of this bending, the original tension in the clip **5** caused by the placement of the nail **4** is lost and the hook **7** will work loose from the tile **1**.

[0035] As seen in FIG. **3** a prior art mental deck clip **50** is illustrated. The clip **50** is also formed from strip sheet metal and has a hook **57**, a body **55** and a foot **56**. The foot **56** includes two apertures **54** intended to each receive a corresponding nail. The floor **56** lies flat on the deck **51** which although sloping, does not slope at an angle equal to the slope of the tile **1**. This is because the tile **1** overlies the tile **2**. As a consequence of this geometric arrangement the contact between the hook **57** and the tile **1** is an edge contact—not a broad surface contact. In particular, as seen in FIG. **3** it is the right hand edge of the hook **57** which comes into contact with the tile **1**. This edge contact applies large forces to the edge of the hook **57** and can result in plastic (and therefore permanent) deformation of the hook **57**.

[0036] Furthermore, the clip **50** has a fixed hook height. As a consequence each different type of tile requires a corresponding special clip so that a large inventory of different clips **50** must be maintained to suit each corresponding different tile type. Also somewhat paradoxically, new tile designs are designed to use one of the existing ranges of clips **50**, so the fixed hook height is a restraining parameter which inhibits the design of the new tiles and tiles of different styles.

[0037] Both the prior art clips **5** and **50** attempt to hold the tiles **1**, **2** rigidly in place. However, the rafters of the roof do not form an entirely uniform surface. Battens where present are only rough sawn and are not formed from dressed timber, the plywood of roof decks is not of exactly uniform thickness, and so on. All of these dimensional tolerances result in a roof surface which is slightly undulating. Once the tiles are laid and the clips **5**, **50** installed, the clips **5**, **50** are covered from view by overlapping portions of adjacent tiles. As a consequence a person, such as a tiler, waking on the tiles after the clips **5**, **50** are installed, by treading on the tile upper surface can bring the lower surface of that tile into contact with the top of the rigid hook **7**, **57**. Thus the trod on tile is sandwiched between the tiler's foot and the hook **7**, **57**. Often times this compressive force is enough to break a tile.

[0038] In this connection it should be noted that the sloping tiles **1**, **2** are the only tiles upon which a tiler, or other person on a roof, walks. Such a person never walks on the ridge tiles at the intersection of two opposed roof surfaces. This is because the ridge tile is very narrow and to walk along ridge tiles is akin to walking along a tightrope (and thus extremely dangerous). Instead a person walking along a ridge puts one foot on the sloping tiles adjacent one side of the ridge and the other foot on the sloping tiles adjacent the other side of the ridge. Thus the ridge tiles are straddled rather than walked on. As a consequence of this universal practice, ridge tiles have different requirements from those of sloping tiles.

[0039] Turning now to FIGS. **4-7**, a first embodiment of the present invention will now be described. The tiles **1** and **2**, the batten **3** and the nail **4** are as before. The clip **205** of the first embodiment is fabricated in two pieces by injection moulding utilising plastics material. A plastics material such as glass filled nylon is advantageous because the material has a "memory" and will return to its original dimensions if stretched or extended.

[0040] The clip **205** is formed from an upper portion **201** illustrated in FIG. **5** and a lower portion **202** illustrated in FIG. **4**. The upper portion **201** includes a hook **207** from which extends an upper strap **218** which is provided with a plurality of saw tooth serrations **219** which are located between a pair of stiffening ribs **220**. The lower portion **202** includes a base **206** from which extends a lower strap **218** which terminates in a ratchet housing **229** having a through aperture **222**.

[0041] As seen in FIG. **6**, the upper strap **218** is able to be passed downwardly through the through aperture **222** in the ratchet housing **229** such that the serrations **219** engage with the ratchet mechanism and prevent upwards movement of the upper strap **218**. That is, the upper strap **218** (and hence the hook **207**) are only able to move downwardly in FIG. **6** and not upwardly, this direction of movement being indicated by an arrow in FIG. **6**.

[0042] Preferably, the nail **4** is supplied already at least partially inserted into the base **206** so that the clip **205** and nail **4** form an assembly which can be handled by the tile installer.

[0043] A major advantage of the clip **205** of the first embodiment is that the distance between the hook **207** and the base **206** is adjustable, thereby enabling the clip **205** to be used with a wide range of tile sizes, shapes and configura-

tions. Prior to installation, the hook **207** is spaced from the base **206** by a maximum extent. As seen in FIG. **7**, the nail **4** is driven home into the batten **3**, and then the hook **207** is pushed downwardly in the direction of the arrow in FIGS. **6** and **7** so as to engage the hook **207** with the tile **1**.

[0044] A clip substantially in accordance with that illustrated in FIGS. **4-7** was used to fabricate a test roof five ridge tiles in length and four rows of tiles in width with a pitch of 18°, rafters at 600 mm intervals and terra cotta roof tiles. The test roof was tested in accordance with Australian and New Zealand standard AS/NZS 2050-2002 (Tests for Roof Tiles) by CSIRO MANUFACTURING & INFRASTRUCTURE TECHNOLOGY, North Ryde, Sydney, Australia. The clips were found to have an average tensile strength of approximately 180 Newtons. The test roof passed all cyclic pressure tests (8,000 cycles at 1.48 kPa to 1 cycle at 3.70 kPa). After completion of the tests the load on the roof was increased to 4.05 kPa at which point the perimeter seal (rather than the tiles or clips) failed. These test results substantially exceed loadings likely to be experienced during cyclonic (hurricane) storm events.

[0045] In the event of a cyclone, the weakest member in the assembly is the nail **4** which is liable to be bent upwardly, thereby releasing the tile **1** slightly and allowing the tile **1** to move upwardly to a small extent, often sufficient to relieve the momentary high stress at the peak of the storm. Thereafter the tiles can be re-seated and the hook **207** fully re-engaged with the tile **1** merely by pushing the hook **207** downwardly so as to further engage the strap **218** with the ratchet housing **229**. Thus the now slightly bent nail **4** can be retained, without removal or straightening, for further service. Indeed the nail **4** may be strengthened by work hardening as a result of the deformation brought about by the slight bending.

[0046] Furthermore, in those instances where the battens are fabricated from hardwood, it is difficult to engage the batten with sufficient force if using something (such as a wire) other than a metal fastener. Thus clips which do not incorporate a metal fastener with a shank which penetrates the batten, are contra-indicated.

[0047] An important consequence of the base **206** extending at right angles to the strap **218** and having a free end which abuts the batten, is that the length of the base **206** determines the set out of the strap **218** from the batten **3**. Consequently, the tiler does not need to estimate the amount of force required to position the clip **205** as is the case with the prior art clip **5** of FIG. **2** (where the distance X is determined in large part by the intensity with which the wail **4** is stuck). Instead the tiler merely drives the nail **4** home so as to bring the head **34** into contact with the base **206** as seen in FIG. **7**.

[0048] Turning now to FIGS. **8-16**, a deck clip **305** of a third embodiment suitable for rooves having a deck **51** is illustrated. As before the clip **305** is formed from an upper portion **301** and a lower portion **302**. The upper portion **301** includes a hook **307**, teeth **319** and stiffening ribs **320**. The lower potion **302** includes a base **306** which extends at right angles from the adjustable strap **318** which interconnects the hook **307** and base **306**. The strap **318** includes a ratchet housing **329** having a through aperture **322**.

[0049] As best seen in FIGS. **9** and **12**, the ratchet housing **329** preferably includes a release tab **330**. This enables a screw driver or like implement to be inserted from below into the aperture **322** and thereby release the ratchet pawl (not illustrated). This may be necessary during roof repairs, for example.

[0050] The strap **318** is preferably a slightly loose fit within the aperture **322** and so can be worked slightly to the left or right as seen in FIG. **16**. This better enables the desired surface contact between the hook **307** and the tile **1** to be achieved. This loose fit does not in anyway diminish the inability of the strap **318** to be moved upwardly away from the base **306**.

[0051] As best seen in FIG. **8** the base **306** has a pair of apertures **340** each of which is intended to receive a corresponding nail **4** by means of which the clip **305** is secured to the deck **51** as seen in FIG. **16** (only the heads **34** of the nails **4** being visible). In addition, the base **306** is tapered so as to allow for the difference in slope between the tile **1** and the deck **51** as explained above in relation to FIG. **3**. This means that the hook **307** fits in an entire surface contact with the tile **1**, not an edge contact as explained above in relation to FIG. **3**.

[0052] It will be appreciated from the above that in the first embodiment of FIGS. **4-7**, the hook **207** is substantially parallel to the base **306** whilst for the second embodiment of FIGS. **8-16** the hook **307** is substantially perpendicular to the base **306**.

[0053] The above described and illustrated embodiments provide a number of substantial advantages over the prior art.

[0054] Firstly, the clips **205** and **305** are easily installed since the hook **207**, **307** is pushed downwardly to engage the tile **1** after the clip **205**, **305** has been secured to the batten **3** or deck **51** respectively. Conversely in the prior art the hook is engaged with the tile and then the nail(s) is/are driven home.

[0055] Secondly, the clip **205** allows the nail **4** to be driven fully home since the spacing between the hook **207** and the batten **3** is determined by the specific length of the base **206**, and not by the force (or cumulative force) applied to the nail. Thus the overall installation is much easier.

[0056] Thirdly, since the distance between the hook **207**, **307** and the base **206**, **306** is adjustable, the one roofing clip can be used for a wide variety of tiles and in a wide variety of installations. Thus the prior art problems of the large inventory of different types of clip and a stultifying effect on tile design and innovation are overcome.

[0057] Furthermore, the prior art problem of sloping tiles breaking if persons walk on them is also overcome. This is because the hook **207**, **307** instead of being rigidly secured to the batten or roof deck (and thereby forming a potential tile fracture site) has a certain amount of "give". This is inherent in the ratchet mechanism **229**, **329** which allows the hook **207**, **307** to depress when a vertically downward force (or force component) is applied to it. Tilers are audibly reminded of this advantage when walking on sloping tiles secured with the roof clips of the present invention since the sound of the ratchet mechanism tightening by a notch or two can be heard (rather than the sharp snap of terra cotta tiles breaking). It is therefore advantageous after the initial installation for the tile which overlies each clip to be trodden on by the tiler as a means of further tightening the installation.

[0058] This is to be contracted with the disclosure of U.S. Pat. No. 4,047,353 (Aarons) which relates to ridge caps which are normally secured by mortar. The use of mortar teaches away from the present invention since sloping tiles are not secured by mortar, thus the problem solved by the U.S. Pat. No. 4,047,353 specification doe not arise with sloping tiles. Still further, the mortar is of little use against high winds since it is incapable of providing any tensile strength (only compressive strength). Furthermore, the clips of this US patent are

not concealed by adjacent tiles but are instead visible after installation (see FIGS. **4** and **5** in this connection). This lack of concealment is not relevant for the crest of the ridge since such a crest is not normally visible from ground level. However, such visible clips are entirely inappropriate for sloping tiles on aesthetic grounds. A further contra-indication is the use of a plastic washer **54** (see FIGS. **2** and **5**) to act as a water barrier. For sloping tiles such a water barrier would add substantially to the cost of a roof because of the large number of sloping tiles in any roof compared with the relatively small number of ridge tiles.

[0059] The foregoing describes only two embodiments of the present invention and modifications, obvious to those skilled in the roofing arts, can be made thereto without departing from the scope of the present invention. For example, a threaded fastener such as a self tapping screw is able to be used in place of the nail **4**.

[0060] The term "comprising" (and its grammatical variations) as used herein is used in the inclusive sense of "including" or "having" and not in the exclusive sense of "consisting only of".

1. A roofing tile clip fabricated in two parts, one of said parts comprising an elongated strip having a plurality of teeth extending from one side thereof and terminating in a hook shaped to engage with the side edge of a substantially planar roofing tile, the other of said parts comprising a generally tubular body having a longitudinal axis and an opening therethrough substantially aligned with said axis and shaped to receive said strip, said tubular body having a ratchet mechanism arranged to co-operate with said teeth and permit movement of said hook towards, but not away from, said tubular body, and said other part including an elongate base which extends generally at right angles to said longitudinal axis, said base including at least one bore therethrough shaped to received a fastener for said clip, and said base having an abutment surface substantially perpendicular to said bore which, after installation, bears against a support surface, and through which said fastener can extend.

2. The clip as claimed in claim **1** wherein said elongate base is substantially tubular.

3. The clip as claimed in claim **2** wherein said elongate base is substantially parallel to said hook.

4. The clip as claimed in claim **1** wherein said base is tapered.

5. The clip as claimed in claim **4** wherein said base is substantially perpendicular to said hook.

6. The clip as claimed in claim **1** wherein said teeth extend between a pair of elongate substantially parallel stiffening ribs.

7. The clip as claimed in claim **1** wherein said ratchet mechanism is releasable.

8. A method of installing on a sloping first tile of a roof, a roofing tile clip as claim in claim **1**, said method comprising the steps of:

a. bringing said abutment surface of said base into contact with said support surface,

b. driving a fastener through said base and into said support surface to secure said other part thereto, and

c. after carrying out steps (i) and (ii) bringing said hook into contact with said tile whilst simultaneously passing at least some of said teeth through said ratchet mechanism.

9. The method as claimed in claim **8** including the further steps of:

(iv) partially covering said first tile with a second adjacent sloping tile, said second tile obscuring said hook and clip from view, and

(v) treading on said second tile to pass at least one further tooth through said ratchet mechanism.

10. The method as claimed in claim **8** wherein said support surface comprises a batten.

11. The method as claimed in claim **8** wherein said support surface comprises a deck.

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