

Description

Title of the Invention

FITTING-TYPE ROOFING MATERIAL, CLEAT, AND FITTING-TYPE
ROOFING STRUCTURE

Technical Field

[0001]

The present invention relates to a fitting-type roofing material that has been improved to realize easily and reliably roofing a cleat which is connected to the roofing material and fixes the roofing material, and a fitting-type roofing structure using the roofing material and the cleat.

Background Art

[0002]

Conventionally, a construction method as shown in Fig 1(a) or 1(b) has been known as a roofing method. First, each of cleats 31 is attached, at fixed intervals, to a roof beam b through a fixing bracket f which has a trapezoidal gate shape. Next, a scooping-side connector element 2 is fitted to a first fixing portion 32 of the cleat 31 which is one of the first fixing portion 32 and a second fixing portion 33. The scooping-side connector element 2 is provided on one side edge portion in the widthwise direction of a roofing material 1 which is constituted of a metal

plate. The first fixing portion 32 and the second fixing portion 33 are provided on both side portions of the cleat 31 in a lateral direction corresponding to the widthwise direction of the roofing material 1 (a horizontal direction in the drawing). Further, two projecting portions 5 and 6 are overlapped on the scooping-side connector element 2 and the second fixing portion 33 of the cleat 31 to connect to each other. The projecting portions 5 and 6 are coupled to each other through a center recessed portion 4 of a capping-side connector element 3 which is provided on the other side edge portion of the other neighboring roofing material 1 in the widthwise direction. As described above, these roofing materials 1 are sequentially joined to each other in the widthwise direction to complete roofing in a boltless state (fitting type) (patent document 1).

[0003]

The roofing material 1 shown in Figs. 1(a) and 1(b) includes a fitting jaw portion 9, an inclined inner side 11, and a hooking side 12 at the scooping-side connector element 2 thereof. The fitting jaw portion 9 is a bent portion which is extended from one edge of a center roofing material main plate portion 7 in the widthwise direction through a raised portion 8. The widthwise direction corresponds to the widthwise direction of the roofing material 1. The inclined inner side 11 and the hooking side 12 are subsequently extended from the fitting jaw portion 9 through a horizontal top 10. Further, the projecting portion 5 includes

a fitting jaw portion 14, a lowered inner side 16, and an inclined inner side 17. The projecting portion 5 is one of the two projecting portions 5 and 6 in the capping-side connector element 3 of the roofing material 1. The projecting portion 5 is nearer to the roofing material main plate portion 7. The fitting jaw portion 14 is a bent portion which is extended from the other edge of the roofing material main plate portion 7 in the above-mentioned widthwise direction through a raised portion 13. The lowered inner side 16 and the inclined inner side 17 are subsequently extended from the fitting jaw portion 14 through a horizontal top 15. Further, the projecting portion 6 farther from the roofing material main plate portion 7 includes an inclined inner side 18, a raised inner side 19 which is slightly inclined inward, a fitting jaw portion 21, and a hooking side 22. The inclined inner side 18 and the raised inner side 19 are subsequently extended from the center recessed portion 4. The fitting jaw portion 21 is a bent portion which is extended from the raised inner side 19 through a horizontal top 20. The hooking side 22 is extended from the fitting jaw portion 21.

[0004]

The cleat 31 shown in Fig. 1(a) differs from the cleat 31 shown in Fig. 1(b). At the cleat 31 shown in Fig. 1(a), the first and the second fixing portions 32 and 33 include jaw portions 35 and 36, and horizontal tops 37 and 38, and have inverse L-shapes, respectively. The jaw portions 35 and 36 are bent and formed along

both edges of a center cleat main plate 34 in the above-mentioned lateral direction. The horizontal tops 37 and 38 are extended from the jaw portions 35 and 36. An anti-rotation rib 39 is inward projected at the jaw portion 36 of the second fixing portion 33.

[0005]

Thus, the inclined inner side 11 and the hooking side 12 of the scooping-side connector element 2 of the roofing material 1 are placed on the top 38 and the anti-rotation rib 39 of the second fixing portion 33 at the cleat 31 shown in Fig. 1(a). Further, the fitting jaw portion 9 of the scooping-side connector element 2 of the roofing material 1 is hooked and fitted to the jaw portion 36 of the second fixing portion 33. Thus, the scooping-side connector element 2 of the roofing material 1 is fitted on the second fixing portion 33. At the cleat 31, the fitting jaw portion 14 of the projecting portion 5 is fitted to the jaw portion 35 of the first fixing portion 31, and also the lowered inner side 16 of the projecting portion 5 is hooked and fitted to the top 37 of the first fixing portion 31. Thus, the projecting portion 5 of the capping-side connector element 3 of the roofing material 1 is fitted on the first fixing portion 31, and further, the raised inner side 19 of the projecting portion 6 is hooked and fitted to the inclined inner side 11 of the scooping-side connector element 2 which is fitted on the second fixing portion 32. Further, the fitting jaw portion 21 of the projecting portion 6 is hooked and fitted to the fitting jaw

portion 9 of the scooping-side connector element 2. This fits the projecting portion 6 of the capping-side connector element 3 of the roofing material 1 to the second fixing portion 33 through the scooping-side connector element 2.

[0006]

Further, at the cleat 31 shown in Fig. 1(b), the first and the second fixing portions 32 and 33 include inclined sides 40 and 41, and raised sides 42 and 43, respectively. The inclined sides 40 and 41 and the raised sides 42 and 43 are subsequently extended laterally from both edges of a center cleat main plate 34 in the above-mentioned lateral direction, respectively. Further, the first fixing portion 32 includes a horizontal top 44 and a hooking side 45 which is inclined downward. The horizontal top 44 and the hooking side 45 are subsequently extended from the raised side 42. Further, the second fixing portion 33 includes a hooking side 46 which is extended from the raised side 43 and is inclined downward.

[0007]

Thus, at the cleat 31 shown in Fig. 1(b), the inclined inner side 11 and the hooking side 12 of the scooping-side connector element 2 of the roofing material 1 are hooked and fitted to the raised side 43 of the second fixing portion 33, and further, the fitting jaw portion 9 of the scooping-side connector element 2 of the roofing material 1 is hooked and fitted to the hooking side 46 of the second fixing portion 33. This fits the scooping-side

connector element 2 of the roofing material 1 on the second fixing portion 33. Further, at the cleat 31, the fitting jaw portion 14 of the projecting portion 5 is hooked and fitted to the hooking side 45 of the first fixing portion 32, and the lowered inner side 16 of the projecting portion 5 is hooked and fitted to the raised side 42 of the first fixing portion 32. This fits the projecting portion 5 of the capping-side connector element 3 of the roofing material 1 on the first fixing portion 32, and further, hooks and fits the raised inner side 19 of the projecting portion 6 to the inclined inner side 11 of the scooping-side connector element 2 which is fitted on the second fixing portion 33. Further, the fitting jaw portion 21 of the projecting portion 6 is hooked and fitted to the fitting jaw portion 9 of the scooping-side connector element 2. Thus, the projecting portion 6 of the capping-side connector element 3 of the roofing material 1 is fitted on the second fixing portion 33 through the scooping-side connector element 2.

Prior Art Documents

Patent Document

[0008]

Patent Document 1 Japanese Patent Application Laid-Open No.

2009-84926

Summary of the Invention

Problems that the Invention is to Solve

[0009]

However, in a case where the cleat 31 shown in Fig. 1(a) is used, when the projecting portion 5 nearer to the main plate 7 of the roofing material 1 is fitted on the first fixing portion 32 of the cleat 31, the lowered inner side 16 of the projecting portion 5 of the roofing material 1 slidably contacts with the edge of the top 37 of the first fixing portion 32. Thus, there is a disadvantage in that the reverse side of the roofing material 1 is possibly scratched. Further, there is a disadvantage in that, when a heat insulator is extensively provided on the reverse side of the roofing material 1, the heat insulator is possibly caught by the edge of the top 37 and peeled off. Further, the jaw portions 35 and 36 of the cleat 31 are formed by bending plates so that the radii of curvature cannot be small enough. Accordingly, there is a disadvantage in that the fitting jaw portions 9 and 14 of the roofing material 1 are easily disengaged from the jaw portions 35 and 36. In particular, the disadvantage is conspicuous when a heat insulator is extensively provided on the reverse side of the roofing material 1.

[0010]

Further, each of the tops 37 and 38 of the first and second fixing portions 32 and 33 has a wide flat surface which is throughout the length of the cleat 31 in a depth direction. The depth direction corresponds to the longitudinal direction of the

roofing material 1 (a direction orthogonal to the paper surface in the drawing). Each of the downward exterior surfaces of the jaw portions 35 and 36 also has a relatively wide flat surface. Accordingly, when a heat insulator is extensively provided on the reverse side of the roofing material 1, the contact pressure applied from the tops 37 and 38 and the downward exterior surfaces of the jaw portions 35 and 36 of the first and second fixing portions 32 and 33 to the heat insulator becomes low. Thus, the insufficiently compressed insulator has an influence on the fitting condition between the roofing material 1 and the cleat 31. Accordingly, there is a disadvantage in that it is necessary to adjust the height where the cleat 31 is to be set. Also, there is a disadvantage in that it is necessary to change the height where the cleat 31 is to be set, depending on the presence or absence of the heat insulator.

[0011]

In addition to the foregoing, at the cleat 31 shown in Fig. 1(a), the jaw portions 35 and 36 are raised from the cleat main plate portion 34 at a low angle, and further, the cleat main plate portion 34 is flat. Accordingly, the pressure applied downward to fit the roofing material 1 easily folds the jaw portions 35 and 36. Accordingly, an upward flange is provided by welding or the like from both edges of the cleat main plate portion 34 in the above-mentioned depth direction to the jaw portions 35 and 36 in order to reinforce the cleat main plate portion 34 and the

jaw portions 35 and 36. Accordingly, there is a disadvantage in that the number of man-hours and the cost needed to produce the cleat are increased.

[0012]

On the other hand, in a case where the cleat 31 shown in Fig. 1(b) is used, the fitting jaw portions 9 and 14 of the roofing material 1 are fitted on the long edge surfaces which are throughout the lengths of the edges of the hooking sides 45 and 46 of the cleat 31 in the above-mentioned depth direction. Accordingly, when a heat insulator is extensively provided on the reverse side of the roofing material 1, the above-mentioned fitting lowers the contact pressure applied to the heat insulator, and it is difficult to dig the edges of the hooking sides 45 and 46 into the heat insulator. Accordingly, there is a disadvantage in that the fitting jaw portions 9 and 14 of the roofing material 1 are easily disengaged from the hooking sides 45 and 46 of the cleat 31.

[0013]

Further, the top 44 of the first fixing portion 32 has a flat wide area which is throughout the length in the above-mentioned depth direction, and the edge of the hooking side 45 also has a long edge surface which is throughout the length in the above-mentioned depth direction. Accordingly, when a heat insulator is extensively provided on the reverse side of the roofing material 1, the contact pressure applied from the top 44

of the first fixing portion 32 and the edge surface of the hooking side 45 to the heat insulator becomes low, and it is difficult to dig the top and the edge surface into the heat insulator. Accordingly, the heat insulator has an influence on the fitting condition between the roofing material 1 and the cleat 31. Thus, there is a disadvantage in that it is necessary to adjust the height where the cleat 31 is to be set. Also, there is a disadvantage in that it is necessary to change the height where the cleat 31 is to be set, depending on the presence or absence of the heat insulator.

[0014]

In light of the foregoing, the present invention is aimed to provide a fitting-type roofing material, a cleat, and a fitting-type roofing structure in which, when a fitting-type roofing materials are constructed, the reverse side of the roofing material is not scratched, the heat insulator is not peeled, the fitting jaw portion of the roofing material is not easily disengaged from the cleat, the fitting condition between the roofing material and the cleat is not easily affected by the heat insulator, and the height where the cleat is to be set can be maintained constant regardless of the presence or absence of the heat insulator.

[0015]

Further, the present invention is aimed to provide a cleat of which fixing portion is not easily folded even though the

downward pressure is applied to fit the roofing material, and also for which the number of man-hours and the cost of production do not mount.

Means for Solving the Problems

[0016]

The present inventors have made intensive studies to solve the above-described problems in the related art and to achieve the above object and, as a result, have made the present invention having the following configuration. That is, according to the present invention, there is provided a fitting-type roofing material comprising a scooping-side connector element and a capping-side connector element which are bent and formed along both widthwise direction edges of a rectangular roofing material main plate portion, wherein,

the scooping-side connector element comprises: a scooping-side raised portion which is formed at a position extended from the roofing material main plate portion; a scooping-side fitting jaw portion which is formed at a position extended from the scooping-side raised portion, a scooping-side inclined outer side which is raised at a position extended from the fitting jaw portion; a scooping-side top which bulges approximately horizontally from an upper edge of the inclined outer side; a scooping-side inclined inner side which is formed downward from the scooping-side top; and a scooping-side hooking

side which is formed at a position extended from the scooping-side inclined inner side,

the capping-side connector element is formed by consecutively connecting a capping-side raised portion which is formed at a position extended from the roofing material main plate portion, an approximately horizontal capping-side center recessed portion, and a capping-side first projecting portion and a capping-side second projecting portion which are positioned at both sides of the capping-side center recessed portion, the center recessed portion and the first projecting portion and the second projecting portion are formed at a position extended from the capping-side raised portion,

the first projecting portion comprises: a capping-side first fitting jaw portion which is formed at a position extended from the capping-side raised portion; a capping-side first top which bulges approximately horizontally at a position extended from the first fitting jaw portion; a capping-side first lowered side which is bent and formed from the edge of the top; and a capping-side first inclined side which is formed at a lower edge of the first lowered side,

the second projecting portion comprises: a capping-side second inclined side which is bent and formed from the center recessed portion; a capping-side second raised side which is raised from an upper edge of the inclined side; a capping-side second top which is bent and formed from an upper edge of the raised

side; a capping-side second fitting jaw portion which is bent and formed from an edge portion of the second top; and a capping-side hooking side which is folded back outward from a lower edge of the second fitting jaw portion, and

the capping-side first lowered side of the first projecting portion is slightly inclined from perpendicular to approach the center recessed portion side more closely toward a lower side of the first lowered side.

[0017]

Note that, in the roofing material according to the present invention, the capping-side second raised side of the second projecting portion of the capping-side connector element is slightly inclined from the perpendicular to approach the center recessed portion side more closely toward the lower side of the second raised side, the tip of the scooping-side hooking side of the scooping-side connector element is folded back, and heat insulators are attached to the reverse sides of the main plate portion, and the scooping-side connector element and the capping-side connector element which are formed along both edges of the main plate portion. This can provide a preferable solution.

[0018]

Next, according to the present invention, there is provided a cleat for connecting and fixing the fitting-type roofing materials, comprising:

a first fixing portion which is bent and formed along one edge of a rectangular cleat main plate portion in a widthwise direction corresponding to the widthwise direction of the roofing material main plate portion, and is fitted to the capping-side first projecting portion of the capping-side connector element of one of the roofing materials;

a second fixing portion which is bent and formed along the other edge in the widthwise direction of the cleat main plate portion, and on which the scooping-side connector element of the other of the roofing materials is fitted, and further on which the capping-side second projecting portion of the capping-side connector element of the one of the roofing materials is fitted;

wherein the first fixing portion and the second fixing portion are approximately symmetric to each other, and each of the first fixing portion and the second fixing portion has: an inclined side which is formed at a position extended from a side of the cleat main plate portion; a raised side which is raised from an upper edge of the inclined side; a hooking side which is cut and raised from a center portion of the inclined side in a depth direction corresponding to a longitudinal direction of the roofing material main plate portion, and bulges obliquely downward and outward from the depth direction center portion of the raised side; a hooking horn which has a projection shape and bulges outward from an edge portion of the inclined side in the depth direction; a top which bulges approximately horizontally and

inward from an upper edge of the raised side, and

a center portion of the top in the depth direction is recessed downward.

[0019]

Note that, the cleat according to the present invention comprises a flange which is folded downward and formed from both edge portions of the cleat main plate portion in the depth direction to both edge portions of the inclined sides of the first fixing portion and the second fixing portion in the depth direction, the hooking horn is formed at a position extended from the flange, the cleat has a rib which is formed to have a protrusion shape and to extend from the cleat main plate portion to the inclined sides of the first fixing portion and the second fixing portion, and the cleat includes a fixing bracket which supports the cleat main plate portion and has a trapezoidal gate shape. This can provide a preferable solution.

[0020]

Next, according to the present invention, there is provided a fitting-type roofing structure including the fitting-type roofing material and the cleats which are fixed on a beam at fixed intervals,

wherein the capping-side first projecting portion of the capping-side connector element of one of the roofing materials is fitted on the first fixing portion of the cleat,

the scooping-side connector element of the other of the

roofing materials is fitted on the second fixing portion of the cleat, and the capping-side second projecting portion of the capping-side connector element of the one of the roofing materials is fitted on the scooping-side connector element to subsequently join fitting-type roofing materials next to each other in order to form a roof.

[0021]

Note that, in the fitting-type roofing structure according to the present invention, a gap is provided between the edge of the top of the first fixing portion of the cleat and the capping-side first lowered side of the capping-side first projecting portion of the capping-side connector element of the roofing material, and the joint portion between the scooping-side inclined inner side and the scooping-side hooking side of the scooping-side connector element of the roofing material is abutted on the inclined side of the second fixing portion of the cleat. This can provide a preferable solution.

Advantages of the Invention

[0022]

In the present invention which adopts the above-mentioned structure, the capping-side first lowered side of the first projecting portion in the capping-side connector element of the fitting-type roofing material is slightly inclined from the perpendicular to approach the center recessed portion more closely

toward the lower side of the first lowered side. Thus, in a construction of the fitting-type roofing materials, when fitted to the first fixing portion of the cleat, the edge of the top of the first fixing portion does not slidingly contact to the reverse surface of the capping-side first lowered side of the first projecting portion. Accordingly, the reverse side of the fitting-type roofing material is not scratched, and the heat insulator extensively provided on the reverse side is not peeled. [0023]

Further, in the present invention, the first fixing portion and the second fixing portion of the cleat are approximately symmetric to each other, and each of the first fixing portion and the second fixing portion includes a hooking side which has a short depth and a hooking horn which has a projection shape. The hooking side is cut and raised from the depth direction center portion of the inclined side which is formed at a position extended from an edge of the cleat main plate portion. The hooking side bulges partially obliquely downward and outward from the center portion of the whole raised side in the depth direction. The hooking horn bulges outward from both edge portions of the inclined side in the depth direction. Thus, in a construction of the fitting-type roofing materials, the fitting jaw portion of the scooping-side connector element and the fitting jaw portion of the first projecting portion of the capping-side connector element of the roofing material are hooked and fitted to the hooking side which

has a short depth and the hooking horn which has a projection shape. Thus, the fitting jaw portion of the scooping-side connector element of the roofing material is not easily disengaged from the cleat. Furthermore, the center portion of the top in the depth direction is recessed downward. The top bulges approximately horizontally and inward from the upper edge of the raised side which is raised from the upper edge of the inclined side. Thus, the top of the first projecting portion of the capping-side connector element and the top of the scooping-side connector element of the roofing material are hooked and fitted to only both depth direction edge portions of the top. Thus, combined with the fitting jaw portion of the roofing material which is hooked and fitted to the hooking side having a short depth, and the hooking horn having a projection shape, when the heat insulator is extensively provided on the reverse side of the roofing material, the area in which the hooking side having a short depth and the hooking horn having a projection shape are abutted on the heat insulator is narrow. Thus, the contact pressure applied to the heat insulator from them becomes high, and they easily dig into the heat insulator. Accordingly, the fitting condition between the roofing material and the cleat is not easily affected by the heat insulator, and the height where the cleat is to be set can be maintained constant regardless of the presence or absence of the heat insulator.

[0024]

Further, in the present invention, the scooping-side hooking side is folded back outward. This can prevent rainwater from slightly penetrating from the scooping-side fitting jaw portion, or prevent dew condensation water which generates on the reverse side of a capping-side second projecting portion from dropping into the room side.

Further, in the present invention, the cleat includes a flange which is folded downward and formed from both edge portions of the cleat main plate portion in the depth direction to both edge portions of the inclined sides of the first fixing portion and the second fixing portion in the depth direction, and also has a rib which is formed to have a groove shape and to extend from the cleat main plate portion to the inclined sides of the first fixing portion and the second fixing portion. Thus, even though a downward pressure is applied to fit the roofing materials, the fixing parts are not easily folded. Furthermore, the cleat can be produced while keeping the number of man-hours and the cost low.

Brief Description of the Drawings

[0025]

Figs. 1(a) and 1(b) are schematic explanatory diagrams for showing conventional fitting-type roofing structures, respectively.

Fig. 2 is a schematic explanatory diagram for showing a

fitting-type roofing material according to an embodiment of the present invention.

Fig. 3 is a perspective view for showing a fitting-type roofing structure according to an embodiment of the present invention.

Fig. 4 is a schematic explanatory diagram for showing the fitting-type roofing structure according to the above-mentioned embodiment.

Figs. 5(a), 5(b) and 5(c) are an elevation view, a side view, and a plan view for showing a cleat according to an embodiment of the present invention.

Figs. 6(a) and 6(b) are cross-sectional views taken along line A-A and line B-B of Fig. 5(c) showing the cleat according to the above-mentioned embodiment, respectively.

Fig. 7 is a perspective view for showing the cleat according to the above-mentioned embodiment.

Figs. 8(a), 8(b) and 8(c) are schematic explanatory diagrams for showing a construction method of the fitting-type roofing structure according to the above-mentioned embodiment.

Embodiments for Carrying Out the Invention

[0026]

The embodiments of the present invention will be described below in detail based on the drawings. A roofing material 1 according to an embodiment of the present invention is constituted

of a metal plate and includes a scooping-side connector element 2 and a capping-side connector element 3 as shown in Fig.2. The scooping-side connector element 2 and the capping-side connector element 3 are formed into a recessed shape and a projecting shape along both side edge portions in the widthwise direction of the roofing material 1, respectively. The capping-side connector element 3 has two projecting portions 5 and 6. The projecting portions 5 and 6 are coupled to each other through a capping-side center recessed portion 4 which is a bottom portion. As for the roofing materials 1, the scooping-side connector element 2 of a roofing material 1 is fitted on a cleat 31 according to an embodiment of the present invention described below, and further, the two projecting portions 5 and 6 of the capping-side connector element 3 of another roofing material 1 are fitted on the cleat 31 and the scooping-side connector element 2. In this manner, the roofing materials 1 are subsequently joined to each other in the widthwise direction for constructing roofing by a boltless construction method as shown in Fig. 3. Note that the roofing material 1, the cleat 31 and the roofing structure of the present embodiment are explained mainly based on a cross-sectional shape of the roofing material 1.

[0027]

First, the scooping-side connector element 2 is formed along one edge of a roofing material main plate portion 7. The scooping-side connector element 2 is a portion provided at a

position extended from a scooping-side raised portion 8 which is bent outward and formed at a position extended from the roofing material main plate portion 7 and is raised obliquely in the upward direction. The structure of the scooping-side connector element 2 comprises a scooping-side fitting jaw portion 9, a scooping-side top 10, a scooping-side inclined inner side 11, and a scooping-side hooking side 12. The scooping-side fitting jaw portion 9 comprises a projecting portion which bulges toward the roofing material main plate portion 7 side at the position extended from the scooping-side raised portion 8. The scooping-side top 10 bulges approximately horizontally and outward from the extending upper edge of the fitting jaw portion 9. The scooping-side inclined inner side 11 is bent obliquely downward to the main plate side from the edge of the top 10. The scooping-side hooking side 12 is bent and formed to open outward at the position extended from the inclined inner side 11. Here, the tip of the scooping-side hooking side 12 is folded back outward to reinforce the scooping-side hooking side 12.

Further, the angle of the scooping-side hooking side 12 folded back outward is preferably within a range of 15 to 45° in consideration of the prevention of a slight penetration of rainwater from the scooping-side fitting jaw portion 9, or a drop of dew condensation water which generates on the reverse side of a capping-side second projecting portion 6 into the room side. Note that the water trapped at the fold back portion of the

scooping-side hooking side 12 is discharged to the edge of the eaves due to the roof inclination.

[0028]

On the other hand, the capping-side connector element 3 has a capping-side center recessed portion 4 and two fitting projecting portions. The capping-side connector element 3 is formed along the other edge of the roofing material main plate portion 7. The capping-side center recessed portion 4 and the two projecting portions are formed at a position extended from a capping-side raised portion 13. The capping-side raised portion 13 is bent outward and formed at a position extended from the roofing material main plate portion 7, and is raised obliquely in the upward direction. The two projecting portions comprise a capping-side first projecting portion 5 and a capping-side second projecting portion 6 which are on both sides of the capping-side center recessed portion 4 and sandwich the capping-side center recessed portion 4.

[0029]

First, the above-mentioned first projecting portion 5 comprises a capping-side first fitting jaw portion 14, a first capping-side top 15, a capping-side first lowered side 16, and a capping-side first inclined side 17. The capping-side first fitting jaw portion 14 comprises a projecting portion which is placed at a position extended from the capping-side raised portion 13, and bulges toward the roofing material main plate portion 7

side. The first capping-side top 15 bulges approximately horizontally and outward from a position extended from the first fitting jaw portion 14. The capping-side first lowered side 16 is bent and formed downward from the free edge portion of the top 15. The capping-side first inclined side 17 is formed obliquely downward and outward from the lower edge of the first lowered side. Here, the capping-side first lowered side 16 is slightly inclined from the perpendicular to approach the capping-side center recessed portion 4 side more closely toward the lower side of the first lowered side 16. If the inclination angle of the capping-side first lowered side 16 from the perpendicular is large in some degree, the inclination angle has a little influence on the rotation of the scooping-side inclined inner side 11. Thus, the inclination angle of the capping-side first lowered side 16 from the perpendicular is preferably from the perpendicular to about 10° for construction. A range where the heat insulator is not cut basically serves as a guide for the inclination angle.

[0030]

The second projecting portion 6 is coupled to the first projecting portion 5 through the capping-side center recessed portion 4, and has a cross-sectional shape exhibiting a recessed portion as a whole. The capping-side center recessed portion 4 is placed at a position extended from the capping-side first inclined side 17, and bulges approximately horizontally and outward. The second projecting portion 6 comprises a

capping-side second inclined side 18, a capping-side second raised side 19, a capping-side second top 20, a capping-side second fitting jaw portion 21, and a capping-side hooking side 22. The capping-side second inclined side 18 is formed outward and obliquely upward from the capping-side center recessed portion 4 of the capping-side connector element 3. The capping-side second raised side 19 is raised from the upper edge of the inclined side 18. The capping-side second top 20 is bent and formed from the upper edge of the capping-side second raised side 19, and bulges approximately horizontally and outward. The capping-side second fitting jaw portion 21 is formed and bulges outward and downward from the free edge portion of the second top 20. The capping-side hooking side 22 is folded back outward and formed from the lower edge of the fitting jaw portion 21. Here, the capping-side second raised side 19 is slightly inclined from the perpendicular to approach the center recessed portion 4 side more closely toward the lower side of the second raised side 19. The capping-side second raised side 19 plays a role as a wall to stop the rotation of the scooping-side inclined inner side 11. Accordingly, the inclination angle of the capping-side second raised side 19 from the perpendicular is preferably as small as possible. A range of the angle where the capping-side second raised side 19 is engaged into the scooping-side inclined inner side 11 basically serves as a guide. The angle is preferably from the perpendicular to about 10° for construction.

[0031]

Note that, in the present embodiment, a scooping-side inclined outer side 74 is formed at the upper portion extended from the scooping-side fitting jaw portion 9. The scooping-side inclined outer side 74 is raised outward and obliquely upward, and the upper edge of the inclined outer side 74 is connected with a scooping-side top 10. Further, in the present embodiment, each of the scooping-side raised portion 8 and the capping-side raised portion 13 is provided with at least one bent portion. For example, large bent portions can be provided near the center portions of the raised portions 8 and 13. As shown in Fig. 2, reinforcing ribs comprising bent portions 70, 71, 72, and 73 can be provided. Thus, the rigidity of the roofing material 1 increased by this effectively prevents a noise of the plate which generates when the plate expands and contracts due to heat expansion.

[0032]

Further, in the present embodiment, a heat insulator h is attached on the reverse sides of the roofing material main plate portion 7, the scooping-side connector element 2 and the capping-side connector element 3. The scooping-side connector element 2 and the capping-side connector element 3 are formed along both edges of the roofing material main plate portion 7. The heat insulator h is attached, for example, within a range from the scooping-side hooking side 12 to the capping-side second inclined side 18. Note that attaching the heat insulator h increases the

heat insulation of the roofing material 1 and prevents solar radiation heat. This can contribute to improved indoor environment and saved energy. Further, this can prevent dew condensation and noise.

[0033]

The fitting-type roofing materials 1 according to the present embodiment comprising the above-mentioned structure are constructed by engaging the scooping-side connector element 2 and the capping-side connector element 3 with the cleat 31 according to an embodiment of the present invention. The scooping-side connector element 2 and the capping-side connector element 3 are formed in the longitudinal direction (depth direction) of both edge portions of the roofing materials 1 and have streak shapes. The cleats 31 are fixed and supported, respectively, by a plurality of fixing brackets f which is fixed on a roof beam b with bolts or weld at fixed intervals. Thus, a roofing material 1 and the other roofing material 1 next to each other are joined to each other one after another in the widthwise direction (lateral direction) and are used for constructing roofing shown in Fig. 3.

[0034]

Note that, as shown in Fig. 4, the cleat 31 according to the above-mentioned embodiment is removably fastened to the fixing bracket f which has a trapezoidal gate shape, for example, with bolts and nuts in the example shown in the drawing. The cleat

31 includes a first fixing portion 32 and a second fixing portion 33 at positions in relative to the scooping-side connector element 3 (See Fig.1) and the capping-side connector element 4 of the roofing material 1 (See Fig.1). The first fixing portion 32 and the second fixing portion 33 are projected outward from both widthwise edge portions of the main plate 34 in relative to the above-mentioned fitting jaws 9, 14, and 21.

[0035]

To form the fitting-type roofing structure according to an embodiment of the present invention, the first projecting portion 5 (See Fig.1) of the capping-side connector element 3 of a roofing material 1 is connected to the first fixing portion 32 of the above-mentioned cleat 31. The second fixing portion 33 of the cleat 31 are overlaid with and connected to the scooping-side connector element 2 (See Fig.1) of the other roofing material 1 and the second projecting portion 6 of the capping-side connector element 3 of the previous roofing material 1 which caps the connector element 2. Thus, the fitting structure of the roofing materials is constructed.

[0036]

The fitting-type roofing structure according to the embodiment which uses the cleat 31 shown in Fig. 4 will be described below. The cleat 31 is produced by pressing a metal plate. As shown in detail in Figs. 5 to 7, the cleat 31 has the first fixing portion 32 and the second fixing portion 33 which are bent and

formed at the portions extended from both widthwise direction edges of the cleat main plate 34. Here, the first fixing portion 32 and the second fixing portion 33 are approximately symmetric to each other and each of them has an approximate inverse L-shape. The first fixing portion 32 and the second fixing portion 33 have bracket inclined sides 50 and 51, raised sides 52 and 53, hooking sides 54 and 55, and tops 56 and 57, respectively. Each of the bracket inclined sides 50 and 51 is formed to bulge obliquely outward from the edge of the cleat main plate 34. The raised sides 52 and 53 are raised inward and upward from the upper edges of the bracket inclined sides 50 and 51. The hooking sides 54 and 55 are cut and raised from the center portions of the inclined sides 50 and 51 in the depth direction (a direction orthogonal to the paper surface in Fig. 4) corresponding to the longitudinal direction of the main plate portion 7 of the roofing material 1, bulge obliquely downward and outward from the center portions of the raised sides 52 and 53 in the above-mentioned depth direction, and have convex curve shapes. The tops 56 and 57 bulge approximately horizontally and inward from the upper edges of the raised sides 52 and 53. The center portions of the tops 56 and 57 in the above-mentioned depth direction are recessed downward. Note that the inward- bulging length of the top 56 of the first fixing portion 32 of the cleat 31 is shorter than the top 37 of the first fixing portion 32 of the cleat 31 shown in Fig. 1(a).

[0037]

Further, the cleat 31 includes inward flanges 58 and 59, and a downward flange 61. The inward flanges 58 and 59 are bent and formed from both edges of the raised sides 52 and 53 in the above-mentioned depth direction. The downward flange 61 is bent and formed from both edges of the cleat main plate portion 34 in the above-mentioned depth direction toward both edges of the inclined sides 50 and 51 of the first fixing portion 32 and the second fixing portion 33 in the above-mentioned depth direction. Hooking horns 62 and 63 are formed at a position extended from the downward flange 61. The hooking horns 62 and 63 bulge outward from both edges of the inclined sides 50 and 51 in the above-mentioned depth direction, and have projection shapes.

[0038]

The first projecting portion 5 of the capping-side connector element 3 (See Fig.1) of a roofing material 1 (See Fig.1) is fitted on the first fixing portion 32 of the cleat 31. Further, the scooping-side connector element 2 of the other roofing material 1 is fitted on the second fixing portion 33, and also the second projecting portion 6 (See Fig.1) of the capping-side connector element 3 of the previous roofing material 1 is fitted on the second fixing portion 33 while the second projecting portion 6 caps the connector element 2 (See Fig.1). This forms the fitting structure shown in Fig. 4. The roofing materials 1 are supported from below by bracket tops 56 and 57 at the upper edges of the cleat 31, and the fitting jaw portions 9, 14, and 21 of the scooping-side

connector element 2 and the capping-side connector element 3 of the roofing materials 1 are fitted on the hooking sides 54 and 55 and the hooking horns 62 and 63. This firmly fixes the roofing materials 1 to effectively prevent, through the cleat 31, rainwater from penetrating.

[0039]

Note that, at the cleat 31 shown in Fig. 4, the joint portion between the scooping-side inclined inner side 11 and the scooping-side hooking side 12 of the scooping-side connector element 2 (See Fig.1) of the roofing material 1 (See Fig.1) is abutted on the inclined side 51 of the second fixing portion 33. The abutment prevents the downward rotation of the scooping-side connector element 2 of the roofing material 1 when the pressure is applied to the roofing material main plate portion 7 of the roofing material 1 from below and the pressure lifts the roofing material main plate portion 7.

[0040]

Further, as described above, the inward flanges 58 and 59 are bent and formed on both edges of the raised sides 52 and 53 in the above-mentioned depth direction at the cleat 31. The downward flange 61 is bent and formed from both edges of the cleat main plate portion 34 in the above-mentioned depth direction to both edges of the inclined sides 50 and 51 of the first fixing portion 32 and the second fixing portion 33 in the above-mentioned depth direction, and four ribs 60 are formed into a protrusion

shape and are extended from the cleat main plate portion 34 to the inclined sides 50 and 51 of the first fixing portion 32 and the second fixing portion 33. The flanges 58, 59, and 61, and ribs 60 reinforce the cleat 31 and can prevent the first fixing portion 32 and the second fixing portion 33 from being folded by the pressure when the roofing materials 1 are connected to the cleat 31. Further, the flanges 58, 59, and 61, and ribs 60 can be formed by pressing a plate so that the cleat 31 can be produced while keeping the number of man-hours and the cost low.

[0041]

As shown in Figs. 3 and 4, the roofing material 1 (See Fig.1) according to the present embodiment is provided with two fitting projecting portions or, namely, the first projecting portion 5 (See Fig.1) and the second projecting portion 6 (See Fig.1) through the center recessed portion 4 at the capping-side connector element 3 (See Fig.1) of the roofing material 1. The first projecting portion 5 firmly fits the roofing material 1 to the cleat 31. The second projecting portion 6 firmly connects the cleat 31 to the scooping-side connector element 2 (See Fig.1) of the other roofing material 1. Thus, each of the first projecting portion 5 and the second projecting portion 6 of the capping-side connector element 3 has a single jaw structure (a structure fitted with one jaw), and can be easily fitted to the cleat 31 and the scooping-side connector element 2 with a small pressure (elastic force).

[0042]

Further, in the fitting-type roofing structure according to the present embodiment, the capping-side second raised side 19 at a position extended from the center recessed portion 4, and the inclined inner side 11 of the scooping-side connector element 2 (See Fig.1) are subsequently formed side by side in the longitudinal direction of the roofing material 1 (See Fig.1). Thus, the capping-side second raised side 19 of the capping-side connector element 3 (See Fig.1) and the inclined inner side 11 of the scooping-side connector element 2 exert the support reaction force (wall reaction force) to support the pressure applied to the main plate portions 7 of the roofing materials 1 from the side. This prevents the roofing materials 1 from floating and rotating even though a large negative pressure is applied to the roofing materials 1 due to a strong wind, a typhoon or the like. Thus, the fitting condition can always be maintained constant.

[0043]

Further, when the scooping-side connector element 2 of a roofing material 1 is overlaid with the capping-side connector element 3 of the other roofing material 1, the raised side 19 of the capping-side connector element 3 is engaged to support the inclined inner side 11 of the scooping-side connector element 2 from the side. Thus, the raised side 19 plays a role as a support wall. Accordingly, even at the part which is not fitted to the

cleat 31, the scooping-side connector element 2 is prevented from being folded by the fitting pressure by the capping-side connector element 3, and rotating or being recessed.

[0044]

Further, at the roofing material 1 according to the present embodiment, the inclined inner side 11 of the scooping-side connector element 2 is inclined to the fitting jaw portion 9 side. Thus, the scooping-side connector element 2 which is fitted to the second fixing portion 33 does not easily slip down. Further, when the scooping-side fitting jaw portion 9 is fitted to the capping-side second fitting jaw portion 21, the raised side 19 of the capping-side connector element 3 is easily slid down along the inclined inner side 11 of the scooping-side connector element 2.

[0045]

Further, at the roofing material 1 according to the present embodiment, the scooping-side connector element 2 is provided with the inclined outer side 74 to have a recess. Thus, a gap is formed between the scooping-side connector element 2 and the capping-side connector element 3. The gap is an air space which can prevent a water immersion from the gap between the capping-side hooking side 22 and the scooping-side raised portion 8 due to capillary action.

[0046]

Further, at the roofing material 1 according to the present

embodiment, the hooking side 12 of the scooping-side connector element 2 is formed to open outward. Thus, the scooping-side connector element 2 is easily slid down onto the second fixing portion 33 of the cleat 31. Further, in the similar manner, the capping-side connector element 3 is provided with the inclined sides 17 and 18 to open the lower portions of the first projecting portion 5 and the second projecting portion 6. Thus, the capping-side connector element 3 can easily be slid down onto the cleat 31 and the scooping-side connector element 2.

[0047]

Next, a method for constructing a roof as shown in Fig. 3 by connecting the roofing materials 1 according to the present embodiment on the cleat 31 according to the present embodiment shown in Fig. 4 will be described based on Fig. 8. In a first process, as shown in Fig. 8(a), the scooping-side connector element 2 of a fitting-type roofing material 1 is placed on the second fixing portion 33 of the cleat 31. Next, the scooping-side hooking side 12 is slid down while turned. Then, the roofing material main plate portion is rotated in a widthwise direction (right and left direction), and the top portion of the scooping-side connector element 2 is pushed, for example, with his or her foot, as shown with an arrow (1) in the same drawing. At the roofing material 1, the roofing material main plate portion 7 (See Fig.4) is maintained approximately horizontal, and the scooping-side fitting jaw portion 9 is securely connected to the

hooking side 55 and the hooking horn 63 of the cleat 31 to prevent rainwater and a wind from penetrating.

[0048]

In a second process, as shown with arrows (2) and (3) in Fig. 8(a), the other roofing material 1 is placed to position the first projecting portion 5 and the second projecting portion 6 of the capping-side connector element 3 on the first fixing portion 32 and the second fixing portion 33 of the cleat 31 after the first process. Next, the capping-side first projecting portion 5 of the roofing material 1 is pushed down and is engaged onto the first fixing portion 32 of the cleat 31. At the same time, as shown with an arrow (4) in Fig. 8(b), the capping-side first fitting jaw portion 14 is fitted on the hooking side 54 and the hooking horn 62 of the cleat 31. The roofing material 1 is continuously turned until the scooping-side connector element 2 of the previous roofing material 1 is overlaid with the capping-side second projecting portion 6 of the roofing material 1. The connector element 2 has been fitted on the second fixing portion 33 of the cleat 31 in the first process.

[0049]

Next, in a third process, as shown with an arrow (5) in Fig. 8(b), the outside capping-side second fitting jaw portion 21 of the capping-side second projecting portion 9 is pushed down. The capping-side second projecting portion 9 is placed at the scooping-side connector element 2 side or, namely, the second

fixing portion 33 side of the cleat 31. Thus, as shown with an arrow (6) in Fig. 8(c), the capping-side fitting jaw portion 21 is fitted on the scooping-side fitting jaw portion 9, and the hooking side 55 and the hooking horn 63 of the cleat 31. To construct roofing, the cleat 31 is overlaid with and connected to the scooping-side connector element 2 and the capping-side connector element 3 of the roofing materials 1 and 1next to each other.

[0050]

Thus, in the fitting-type roofing structure according to the present embodiment, the scooping-side connector element 2 is not dented by the fitting pressure of the capping-side connector element 3. Accordingly, an easy and reliable roofing can be realized with a small pressure.

[0051]

Furthermore, in the fitting-type roofing structure according to the present embodiment, the capping-side first lowered side 16 of the first projecting portion 5 in the capping-side connector element 3 of the roofing material 1 according to the present embodiment is slightly inclined from the perpendicular so that the capping-side first lowered side 16 approaches the center recessed portion 4 more closely toward the lower side. Further, the bulging length of the top 56 of the first fixing portion 32 of the cleat 31 is shortened. Thus, in a construction of the roofing materials 1, when the cleat 31 is

fitted to the first fixing portion 32, the edge of the top 56 of the first fixing portion 32 does not contact to the reverse surface of the capping-side first lowered side 16 of the first projecting portion 5 while sliding. Thus, the reverse side of the roofing material 1 is not scratched, and the heat insulator h extensively provided on the reverse side is not peeled.

[0052]

Further, in the fitting-type roofing structure according to the present embodiment, the first fixing portion 32 and the second fixing portion 33 of the cleat 31 according to the present embodiment are approximately symmetric to each other. Further, the first fixing portion 32 and the second fixing portion 33 include hooking sides 54 and 55, and hooking horns 62 and 63, respectively. The hooking sides 54 and 55 are cut and raised from the center portions of the inclined sides 50 and 51 in the depth direction, partially bulge obliquely downward and outward from the center portions of the whole raised sides 52 and 53 in the above-mentioned depth direction, and have short depths. The inclined sides 50 and 51 are formed at a position extended from the edge of the cleat main plate portion 34. The hooking horns 62 and 63 bulge outward from both edges of the inclined sides 50 and 51 in the above-mentioned depth direction, and have projection shapes. Thus, in a construction of the fitting-type roofing materials 1, the fitting jaw portion 9 of the scooping-side connector element 2 and the fitting jaw portion 14 of the first

projecting portion 5 of the capping-side connector element 3 of the roofing material 1 are hooked and fitted to the hooking sides 54 and 55 which have short depths, and the hooking horns 62 and 63 which have projection shapes. Accordingly, the fitting jaw portion 9 of the scooping-side connector element 2 of the roofing material 1 is not easily disengaged from the cleat 31.

Furthermore, the center portion of the tops 56 and 57 in the depth direction is recessed downward. The tops 56 and 57 bulge approximately horizontally and inward from the upper edges of the raised sides 52 and 53 which are raised from the upper edges of the inclined sides 50 and 51. Thus, the top 15 of the first projecting portion 5 of the capping-side connector element 3 of the roofing material 1 and the top 10 of the scooping-side connector element 2 are hooked and fitted to only both edge portions of the tops 56 and 57 in the depth direction. Thus, combined with the fitting jaw portions 9 and 14 of the roofing material 1 which are hooked and fitted to the hooking sides 54 and 55 having short depths, and the hooking horns 62 and 63 having projection shapes, when the heat insulator h is extensively provided on the reverse side of the roofing material 1, the area where the heat insulator h abutted on them is narrow, and the contact pressure applied to the heat insulator h from them becomes high. Accordingly, they easily dig into the heat insulator h. Thus, the fitting condition between the roofing material 1 and the cleat 31 is not easily affected by the heat insulator h, and

the height where the cleat 31 is to be set can be maintained constant regardless of the presence or absence of the heat insulator h.

[0053]

Although described above based on the examples shown in the drawings, the present invention is not limited to the above-mentioned examples, and can appropriately be changed within the scope of the description in claim for patent. For example, the raised side 19 of the second projecting portion 6 of the capping-side connector element 3 of the roofing material 1 can be raised approximately vertically. Further, the main plate portion 34 and the inclined sides 50 and 51 of the cleat 31 can be flat without the ribs 60. Furthermore, the cleat 31 can include the fixing brackets f, integrally or with bolts and nuts or the like.

Industrial Applicability

[0054]

The present invention is applicable as roofing materials for ordinary residences, schools, garages, factories, warehouses, shops, assembly halls, gymnasiums and the like.

Description of Reference Numerals and Signs

[0055]

1: roofing material

2: scooping-side connector element
3: capping-side connector element
4: capping-side center recessed portion
5: capping-side first projecting portion
6: capping-side second projecting portion
7: roofing material main plate portion
8: scooping-side raised portion
9: scooping-side fitting jaw portion
10: scooping-side top
11: scooping-side inclined inner side
12: scooping-side hooking side
13: capping-side raised portion
14: capping-side first fitting jaw portion
15: capping-side first top
16: capping-side first lowered side
17: capping-side first inclined side
18: capping-side second inclined side
19: capping-side second raised side
20: capping-side second top
21: capping-side second fitting jaw portion
22: capping-side hooking side
31: cleat
32: first fixing portion
33: second fixing portion
34: cleat main plate portion

35, 36: jaw portion
37, 38: top
39: anti-rotation rib
40, 41: inclined side
42, 43: raised side
44: top
45, 46: hooking side
50, 51: inclined side
52, 53: raised side
54, 55: hooking side
56, 57: top
58, 59: inward flange
60: rib
61: downward flange
62, 63: hooking horn
70, 71, 72, 73: bent portion
74: scooping-side inclined outer side
b: beam
f: fixing bracket
h: heat insulator

Claims

[Claim 1]

A fitting-type roofing material comprising a scooping-side connector element and a capping-side connector element which are bent and formed along both widthwise direction edges of a rectangular roofing material main plate portion, wherein,

the scooping-side connector element comprises: a scooping-side raised portion which is formed at a position extended from the roofing material main plate portion; a scooping-side fitting jaw portion which is formed at a position extended from the scooping-side raised portion; a scooping-side inclined outer side which is raised at a position extended from the fitting jaw portion; a scooping-side top which bulges approximately horizontally from an upper edge of the inclined outer side; a scooping-side inclined inner side which is formed downward from the scooping-side top; and a scooping-side hooking side which is formed at a position extended from the scooping-side inclined inner side,

the capping-side connector element is formed by consecutively connecting a capping-side raised portion which is formed at a position extended from the roofing material main plate portion, an approximately horizontal capping-side center recessed portion, and a capping-side first projecting portion and a capping-side second projecting portion which are positioned at both sides of the capping-side center recessed portion, the center

recessed portion and the first projecting portion and the second projecting portion are formed at a position extended from the capping-side raised portion,

the first projecting portion comprises: a capping-side first fitting jaw portion which is formed at a position extended from the capping-side raised portion; a capping-side first top which bulges approximately horizontally at a position extended from the first fitting jaw portion; a capping-side first lowered side which is bent and formed from the edge of the top; and a capping-side first inclined side which is formed at a lower edge of the first lowered side,

the second projecting portion comprises: a capping-side second inclined side which is bent and formed from the center recessed portion; a capping-side second raised side which is raised from an upper edge of the inclined side; a capping-side second top which is bent and formed from an upper edge of the raised side; a capping-side second fitting jaw portion which is bent and formed from an edge portion of the second top; and a capping-side hooking side which is folded back outward from a lower edge of the second fitting jaw portion, and

the capping-side first lowered side of the first projecting portion is slightly inclined from perpendicular to approach the center recessed portion side more closely toward a lower side of the first lowered side.

[Claim 2]

The fitting-type roofing material according to claim 1, wherein the capping-side second raised side of the second projecting portion of the capping-side connector element is slightly inclined from perpendicular to approach the center recessed portion side more closely toward a lower side of the second raised side.

[Claim 3]

The fitting-type roofing material according to claim 1 or 2, wherein a tip of the scooping-side hooking side of the scooping-side connector element is folded back.

[Claim 4]

The fitting-type roofing material according to any one of claims 1 to 3, wherein a heat insulator is attached on reverse sides of the roofing material main plate portion, and the scooping-side connector element and the capping-side connector element which are formed along both edges of the roofing material main plate portion.

[Claim 5]

A cleat for connecting and fixing the fitting-type roofing materials according to any one of claims 1 to 4 comprising:

a first fixing portion which is bent and formed along one

edge of a rectangular cleat main plate portion in a widthwise direction corresponding to the widthwise direction of the roofing material main plate portion, and is fitted to the capping-side first projecting portion of the capping-side connector element of one of the roofing materials;

a second fixing portion which is bent and formed along the other edge in the widthwise direction of the cleat main plate portion, and on which the scooping-side connector element of the other of the roofing materials is fitted, and further on which the capping-side second projecting portion of the capping-side connector element of the one of the roofing materials is fitted;

wherein the first fixing portion and the second fixing portion are approximately symmetric to each other, and each of the first fixing portion and the second fixing portion has: an inclined side which is formed at a position extended from a side of the cleat main plate portion; a raised side which is raised from an upper edge of the inclined side; a hooking side which is cut and raised from a center portion of the inclined side in a depth direction corresponding to a longitudinal direction of the roofing material main plate portion, and bulges obliquely downward and outward from the depth direction center portion of the raised side; a hooking horn which has a projection shape and bulges outward from an edge portion of the inclined side in the depth direction; a top which bulges approximately horizontally and inward from an upper edge of the raised side, and

a center portion of the top in the depth direction is recessed downward.

[Claim 6]

The cleat according to claim 5, further comprising a flange which is folded downward and formed from both edge portions of the cleat main plate portion in the depth direction to both edge portions of the inclined sides of the first fixing portion and the second fixing portion in the depth direction,

wherein the hooking horn is formed at a position extended from the flange.

[Claim 7]

The cleat according to claim 5 or 6, further having a rib which is formed to have a protrusion shape and to extend from the cleat main plate portion to the inclined sides of the first fixing portion and the second fixing portion.

[Claim 8]

The cleat according to any one of claims 5 to 7, further including a fixing bracket which supports the cleat main plate portion and has a trapezoidal gate shape.

[Claim 9]

A fitting-type roofing structure including the fitting-type

roofing material according to any one of claims 1 to 4 and the cleats according to any one of claims 5 to 8 which are fixed on a beam at fixed intervals,

wherein the capping-side first projecting portion of the capping-side connector element of one of the roofing materials is fitted on the first fixing portion of the cleat,

the scooping-side connector element of the other of the roofing materials is fitted on the second fixing portion of the cleat, and the capping-side second projecting portion of the capping-side connector element of the one of the roofing materials is fitted on the scooping-side connector element to subsequently join fitting-type roofing materials next to each other in order to form a roof.

[Claim 10]

The fitting-type roofing structure according to claim 9, wherein a gap is provided between an edge of the top of the first fixing portion of the cleat and the capping-side first lowered side of the capping-side first projecting portion of the capping-side connector element of the roofing material.

[Claim 11]

The fitting-type roofing structure according to claim 9 or 10, wherein a joint portion between the scooping-side inclined inner side and the scooping-side hooking side of the scooping-side

connector element of the roofing material is abutted on the inclined side of the second fixing portion of the cleat.