A connector 10 for effecting a connection between an eaves beam 20 and a rafter 16 having an opening extending along the length thereof and bearing on the beam 20. The connector 10 has an elongate central section 11 with a first end portion 13 turned back to overlie the central portion but spaced therefrom, so that the first end portion 13 is engageable in the rafter opening. A second end portion 14 projects from the other end of the central section 11 to project at an angle thereto but on the side thereof opposite to the first end portion 13. The second end portion 14 is receivable in a hole formed in the eaves beam 20 and a nut 28 is threaded on to that second end portion 14 so as to hold the connector 10 to the eaves beam 20 and thus to hold the rafter 16 at the required position.
ROOFING CONNECTOR

This invention relates to a connector for effecting a connection between an eaves beam and a rafter, for example in the construction of a conservatory roof.

A common construction for a conservatory roof utilises a plurality of interconnected extruded sections typically of aluminium alloy or of high molecular weight polyvinylchloride (µPVC). Typically, there will be an eaves beam extending around the upper periphery of the walls of the conservatory, a ridge beam at a higher level than the eaves beam, and a plurality of rafters extending between the eaves beam and the ridge beam, to support the roof panels. In the case of a pitch roof, the ridge beam is disposed centrally of the conservatory above the level of the eaves beam, with rafters to both sides of the ridge beam. With a lean-to design, the ridge beam is similar to that of a pitch roof but is secured to a wall of a building from which the conservatory projects, the rafters being provided on one side only of the ridge beam.

Each rafter is supported at its lower end on the eaves beam, though the rafter usually overhangs the eaves beam to some extent. Each rafter is secured to the eaves beam and is held against lateral movement along the length thereof, irrespective of whether the conservatory has a pitch roof or is of a lean-to design. Typically again, the rafters are of an extruded form, having a hollow cross-section and various connecting brackets have been designed to fit to the rafter as well as to the eaves beam, to secure the rafters in the required position. Generally, holes have to be drilled through the various components in order that the brackets may be secured in the required position, for example using self-tapping screws. It is also known to drill vertically through a rafter and
the supporting eaves beam, and to use long screws extending through the drilled holes, to secure a rafter where required. In either case, trim panels have to be provided in order to conceal the fixing screws and brackets (if used), so as to make the overall construction aesthetically pleasing.

In my co-pending UK Patent Publication No. 2399356A, I have described and claimed a rafter/eaves beam connecting technique which has the advantage that the final assembly may be undertaken from ground level or using only a low height hop-up, since access to the upper surface of the rafter is not required. However, the preparatory work on the rafter requires the provision of a hole through the rafter at exactly the required position and also the fixing of a bolt to that rafter using a suitable clip. It is an aim of the present invention to provide an even yet simpler connection technique, using a specially designed connector, in order to obviate the preparatory work on the rafter whilst still permitting the connection of the rafter to the eaves beam from below the rafter.

According to one aspect of this invention, there is provided connector for effecting a connection between an eaves beam and a rafter bearing on the beam and extending upwardly therefrom, the rafter having an internal opening extending from at least one end along the length thereof, which connector has an elongate central section, a first end portion extending from one end of the central section and being turned back to overlie the central section but spaced therefrom, and a second end portion projecting at an angle from the other end of the central section from the side thereof opposed to the first end portion, whereby in use a connection may be made between a rafter and an eaves beam by forming a downwardly-extending hole in the eaves beam at the required location of the rafter, fitting said one end portion of the connector into
the opening in the rafter from the lower end thereof so that the central section lies alongside the underside of the rafter, and locating the second end portion in the hole formed in the eaves beam.

As will be appreciated, the connector is expressly designed and specifically adapted to permit the direct connection thereof to a rafter without the need to drill one or more holes in the rafter. The first end portion of the connector is engaged into the internal opening extending along the length of the rafter, but from the lower end of that rafter. As such, the only preparatory work required on the rafter is the cutting of the extrusion to the required length; immediately thereafter, the first end portion of the connector may be engaged directly with the rafter into the internal opening and with the central section of the connector extending along but below the lower surface of that rafter. The eaves beam is drilled at the required centres for the rafters, with a hole of a sufficient size to accommodate the second end portion of the connector. Then, the rafter may simply be fitted to the eaves beam by entering the second end portion of the connector into the hole so as to project downwardly therefrom.

Most preferably, the second end portion of the connector is provided with means to permit the connector to be secured to the eaves beam. For example, the second end portion may be screw-threaded whereby a nut, such as a simple wing nut, may be received thereon and tightened, after the second end portion has been fitted into the drilled hole in the eaves beam.

The second end portion preferably extends at substantially 90° to the length of the central section. Further, the central section and the first and second end portions all preferably lie in a common plane.
In an embodiment of connector of this invention, it is formed from round metal stock, by suitable bending and forming operations.

According to a second aspect of this invention, there is provided a connection between an eaves beam and a rafter bearing on the beam and extending upwardly therefrom, the rafter having an internal opening extending along the length thereof from at least one end and the eaves beam having a hole formed in an upper surface thereof at the required location of the rafter, in which connection there is provided a connector of this invention as described above, the first end portion of the connector being received in the opening in the rafter from the lower end thereof with the central section lying alongside the underside of the rafter, and the second end portion projecting at an angle from the underside of the rafter is received in and extends through the hole formed in the upper surface of the eaves beam.

A third aspect of this invention provides method of effecting a connection between an eaves beam and a rafter which is to bear on the beam and extend upwardly therefrom and using a connector of this invention as described above and wherein the rafter has an internal opening extending along the length thereof from at least one end, which method comprises:

- cutting the rafter to the required length;
- engaging the first end portion of the connector in the opening in the rafter from the lower end thereof with the central section lying alongside the underside of the rafter;
- forming a hole in an upper surface of the eaves beam at the required position along the length thereof for the rafter; and
fitting the rafter to the eaves beam so that the second end portion of
the connector is received in and extends through the hole formed in the eaves
beam.

By way of example only, one specific embodiment of connector of this
invention and of a connection between a rafter and an eaves beam will now be
described with reference to the accompanying drawings, in which:-

Figure 1 is a side view of the embodiment of connector of this invention
in wire-frame depiction;

Figure 2 is a sectional view through an eaves beam supporting a rafter
secured in position by means of the connector of Figure 1;

Figure 3 is a diagrammatic isometric view, partly cut away, showing the
connections between two rafters and an eaves beam, using connectors as
shown in Figure 1;

Figure 4 is a further isometric view of the assembly of Figure 3, but taken
from below;

Figure 5 shows the connector of Figure 1 with a moulded glazing clip
provided on the U-shaped part of the connector; and

Figure 6 shows the use of the moulding glazing clip to hold glazing
panels in position on the rafters.

Referring initially to Figure 1, there is shown an embodiment of connector
10 of this invention, expressly configured and arranged for effecting a
connection between an eaves beam and a rafter bearing on the beam as will be
described hereinafter, in a conservatory roof construction utilising extruded
aluminium alloy sections. The connector is formed from a length of round metal
stock, typically of about 8mm diameter. The connector comprises a linear
central section 11 at one end of which the material is formed into a U-shape 12 so as to provide a first end portion 13 extending parallel to, overlying but spaced from the central section 11. At the other end of the central section, the material is turned through a right angle, so as to provide a second end portion 14, the central section and the first and second end portions all lying in a common plane. The second end portion is screw-threaded at 15.

The connector 10 described above may be used with a variety of different designs of rafter and eaves beam, though one embodiment of suitable designs of rafter and eaves beam are shown in Figures 2 to 4. The rafter 16 comprises an aluminium alloy extrusion having a profile which defines various flanks 17 and surfaces 18 to ensure the rafter has sufficient strength, and is able to support sheets of glazing material such as glass or double or triple walled polycarbonate sheets. The rafter 16 includes an opening 19 extending along the length thereof, of generally circular configuration and of a size that is not smaller than the diameter of the connector 10.

The eaves beam 20 has a main hollow section 21 having a lower surface adapted to be mounted to the upper surface of a conservatory wall, the main hollow section supporting a secondary section 22 upstanding from the main section. That secondary section includes supports 23 for a rafter and a flank 24 projecting upwardly and inwardly, with respect to the main section 21. As best seen in Figure 2, when the rafter 16 bears on the supports 23 of the eaves beam, the rafter is more or less parallel to the flank 24.

Also shown in Figure 2 is a gutter assembly 25 including a gutter clip 26 connected to the main section 21 of the eaves beam and a gutter section 27
supported by the gutter clip and extending parallel to the length of the eaves beam 20.

In constructing a conservatory roof, the eaves beam is provided along the top of a side wall, for example above the windows. The rafters 16 are cut to the required length to extend between a ridge beam and the eaves beam, but so as to project beyond the eaves beam, when installed. A connector 10 is hooked into the lower end of the rafter so that the first end portion 13 is received in the opening 19 of the rafter, with the central section 11 disposed against the underside of the rafter. A hole is drilled in the flank 24 of the secondary section 22 at the location where the rafter is to be provided and then the second end portion 14 of the connector is fitted into that hole so that the free end of that second end portion is disposed below the flank. Simultaneously, the upper end of the rafter is connected to the ridge beam. The connection at the lower end of the rafter is completed by threading a wing nut 28 on to the second end portion and tightening that wing nut to the flank 24.

After all the rafters have been installed, glazing panels 30 (Figure 3) are installed between the rafters, supported on the side flanks thereof, suitable sealing strips 31 being provided to prevent the ingress of moisture. The glazing panels 30 are held down by cap strips 32, one for each rafter and press-fitted into engagement with a slot formed in the upper part of the rafter. Each cap strip has a pair of arms 33 terminating in a sealing member 34, to effect a seal against the upper surface of the respective glazing panel. After installation of all of the glazing panels, the assembly is completed by fitting trim panels (not shown) to the main section 21 of the eaves beam, so as to conceal the projecting parts of the second end portions 14 of the connectors 10 and also the
wing nuts 28 engaged therewith. Further trim panels may be secured to the other components, such as the undersides of the rafters, in a manner known in the art.

Referring now to Figures 5 and 6, there is shown a glazing clip 36 engaged with the U-shaped end 12 of a connector 10 as described above. This glazing clip has a central portion 37 defining an opening through which the first end portion 13 of the connector passes, until the central portion abuts the U-shaped end 12 of the connector. In this position, the U-shaped end is received in a slot 38 in the central portion, so that the clip is held against rotation about the axis of the first end portion 13. Projecting laterally to each side of the central portion is a pair of wings 39, against which glazing panels may engage when the clip is in use with a connector, to hold a rafter to an eaves beam.

Figure 6 shows a connector being used to hold a rafter 16 to an eaves beam 20 in the manner described above with reference to Figures 1 to 4, but before assembly, a glazing clip 36 has been engaged with the connector 10. On fitting the glazing panels 30 to the rafters, the lower lateral corners of the panels will engage the wings of the glazing clips on the connectors whereby those clips will prevent the glazing panels sliding or creeping over time down the rafters. By using the glazing clips 36, the other more usual methods employed in the conservatory roof building art to retain each glazing panel in the required position may be eliminated.
CLAIMS

1. A connector for effecting a connection between an eaves beam and a rafter bearing on the beam and extending upwardly therefrom, the rafter having an internal opening extending from at least one end along the length thereof, which connector has an elongate central section, a first end portion extending from one end of the central section and being turned back to overlie the central section but spaced therefrom, and a second end portion projecting at an angle from the other end of the central section from the side thereof opposed to the first end portion, whereby in use a connection may be made between a rafter and an eaves beam by forming a downwardly-extending hole in the eaves beam at the required location of the rafter, fitting said one end portion of the connector into the opening in the rafter from the lower end thereof so that the central section lies alongside the underside of the rafter, and locating the second end portion in the hole formed in the eaves beam.

2. A connector as claimed in claim 1, wherein the second end portion of the connector is provided with fastening means to secure the second end portion in the hole in the eaves beam.

3. A connector as claimed in claim 2, wherein the second end portion is screw-threaded whereby a nut may be received thereon.

4. A connector as claimed in any of the preceding claims, wherein the second end portion extends at substantially 90° to the length of the central section.

5. A connector as claimed in any of the preceding claims, wherein the central section and the first and second end portions all lie in a common plane.
6. A connector as claimed in any of the preceding claims, wherein the first end portion is joined to the central section by a substantially U-shaped part of the connector, whereby the first end portion extends parallel to but spaced from the central section.

7. A connector as claimed in any of the preceding claims, wherein the central section and the first and second end portions are all of circular cross-section.

8. A connector as claimed in claim 7, wherein the central section and the first and second end portions are produced by forming a common piece of rod of circular cross section.

9. A connector as claimed in any of the preceding claims in combination with a glazing clip having lateral extensions from a central region thereof, which clip is fitted to the region of the connector between the central section and the first end portion.

10. A connector as claimed in claim 9, wherein the glazing clip has a hole formed through the central region in which hole is received the first end portion.

11. A connector as claimed in claim 6 and claim 10, wherein the central region includes a slot in which is received a the U-shaped part thereby to prevent the clip from turning with respect to the length of the first end portion.

12. A connector as claimed in claim 1 for effecting a connection between an eaves beam and a rafter bearing on the beam and extending upwardly therefrom substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

13. A connection between an eaves beam and a rafter bearing on the beam and extending upwardly therefrom, the rafter having an internal opening
extending along the length thereof from at least one end and the eaves beam having a hole formed in an upper surface thereof, in which connection there is provided a connector having an elongate central section, a first end portion extending from one end of the central section and being turned back to overlie the central section but spaced therefrom such that the first end portion is received in the opening in the rafter from the lower end thereof with the central section lying alongside the underside of the rafter, and a second end portion projecting at an angle from the other end of the central section from the side thereof opposed to the first end portion, which second end portion extends through the hole formed in the upper surface of the eaves beam.

14. A connection as claimed in claim 13, wherein the connector comprises a connector as claimed in any of claims 2 to 12.

15. A method of effecting a connection between an eaves beam and a rafter which is to bear on the beam and extend upwardly therefrom and using a connector as claimed in any of claims 1 to 12 and wherein the rafter has an internal opening extending along the length thereof from at least one end, which method comprises:

- cutting the rafter to the required length;
- engaging the first end portion of the connector in the opening in the rafter from the lower end thereof with the central section lying alongside the underside of the rafter;
- forming a hole in an upper surface of the eaves beam at the required position along the length thereof for the rafter; and
9. fitting the rafter to the eaves beam so that the second end portion of
the connector is received in and extends through the hole formed in the eaves
beam.

16. A method as claimed in claim 15, wherein a glazing clip is fitted to the
region of the connector between the central section and the first end portion,
which clip has lateral extensions against which glazing panels may bear when
fitted to the rafter.
Application No: GB0502611.7
Claims searched: 1 - 16
Examiner: J D Cantrell
Date of search: 2 June 2006

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

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Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC:

E1D

Worldwide search of patent documents classified in the following areas of the IPC

E04B; E04D

The following online and other databases have been used in the preparation of this search report

ONLINE: EPDOC, WPI