An apparatus for accurately spacing neighboring hip roof trusses during the erection process and for permanently bracing the same is comprised of a longitudinal member terminating at each end in truss attachment means adapted for fastening to the horizontal top chord of adjacent hip trusses of different heights. An important characteristic of each embodiment of the subject invention is that a first attachment means is angled above the plane of the longitudinal member while the second attachment means is angled below the same plane, each depending from the longitudinal member at equal but opposite angles. Thusly oriented, each attachment means occupies a plane parallel to the other with the plane of the longitudinal member intersecting both. The slope of the longitudinal member between the parallel planes is predetermined to substantially correspond to the desired pitch of the roof.
BRACING AND SPACING APPARATUS FOR HIP TRUSSES

FIELD OF THE INVENTION

[0001] The subject invention relates generally to an apparatus for bracing roof trusses, and to a bracing apparatus for hip roof trusses in particular.

BACKGROUND OF THE INVENTION

[0002] Hip roofs (or “hipped roofs” as they are sometimes referred) have achieved considerable popularity among builders of residential homes and commercial buildings, particularly in areas like Northern Australia and the Gulf Coast of the Southeastern United States where such structures are exposed to high wind loadings. Because of their unique design characteristics, hipped roofs are capable of reducing or eliminating the airfoil effect of extreme high winds that blow over the roof often causing it to peel off the structure. Such a benefit makes them ideal for hurricane prone regions. The hip roof also exhibits increased survivability in torasic winds.

[0003] In general, a hip roof is a type of roof where all sides slope down to the walls, usually with a fairly gentle slope. Thus it is a house or building with no gables or other vertical sides to the roof. A square hip roof is shaped like a pyramid. Hip roofs on rectangular houses will have two triangular sides and two trapezoidal ones.

[0004] Hip roofs are more difficult to construct, requiring somewhat more complex systems of trusses as described herein. During the erection process, the trusses must be braced to ensure safety and performance. Temporary bracing is required during erection to enable the truss assembly to, among other things, withstand the gravity forces of its own weight, resist wind loads during construction, support temporary construction dead loads such as the weight of sheathing and roofing materials, keep the trusses plumb, and to assure accurate truss spacing.

[0005] In conventional practice, as trusses are continuously set in place, sufficient temporary bracing is applied to hold the trusses plumb, in alignment and secure until decking and/or sheathing can be installed. Temporary bracing is typically comprised of either 1” x 3” or 2” x 4” lumber nailed with two 3/8” double headed nails at every intersection with the braced members. Because the horizontal top chord of each hip truss in series is progressively higher than the proceeding one, temporary bracing of this sort may only be applied to the diagonal members of the top chord (there currently exists no bracing apparatus ideally suited to span and connect horizontal top chord members of adjacent hip trusses). Accordingly, because of the unique shape of hip trusses and their orientation relative to one another it is not practical to brace adjoining hip trusses at or in proximity to their center point which is the most logical point of placement of at least some bracing members.

[0006] Another problem associated with the construction of hip roofs is that once the temporary bracing is in place, it is often necessary to adjust the spacing of the trusses which requires full or partial detachment of the spacing strips. Moreover, it is necessary to remove the temporary bracing as sheathing is applied. Such a practice is dangerous because the removal of bracing can cause trusses to topple if a key connection is removed at the wrong time. Therefore, it becomes critical to achieve exact spacing of trusses as temporary bracing is applied, an objective which those skilled in the art recognize is difficult to accomplish because truss top chords are very susceptible to lateral buckling before they are braced or sheathed. In addition to the safety issue, removal of temporary bracing is time consuming and often damages the bracing boards so that they cannot be used again. Conventional employment of temporary bracing therefore results in wasted material.

[0007] In view of the shortcomings and limitations of the above described prior art, it is clear that a need exists for a bracing apparatus specifically suited for connection of adjoining hip trusses along the horizontal surface of the top chord. In an ideal situation, such a bracing apparatus for hip roof trusses could be installed as a permanent bracing member, rather than a temporary one, so as to eliminate the risks associated with their removal during the sheathing process. Permanent bracing would ensure that the trusses are integrated into the overall building structure to, among other things, prevent or reduce buckling of trusses loaded in compression, shear loads between adjacent trusses, transfer lateral forces to diaphragms, and restrain overall lateral displacements. Permanent bracing for hip roof trusses would also be more time and cost efficient.

SUMMARY OF THE INVENTION

[0008] The subject invention rather broadly provides an apparatus for accurately spacing hip roof trusses during the erection process and for permanently bracing adjoining hip roof trusses. More particularly, the instant apparatus is designed to interconnect at predetermined distances the horizontal top chord members of adjacent hip trusses for proper spacing and support purposes. A preferred and basic embodiment of the subject apparatus is comprised of a longitudinal member terminating at each end in truss attachment means adapted for fastening to the horizontal top chord of adjacent hip trusses of different heights. An important characteristic of each embodiment of the subject invention is that a first attachment means is angled above the plane of the longitudinal member while the second attachment means is angled below the same plane, each depending from the longitudinal member at equal but opposite angles. Thusly oriented, each attachment means occupies a plane parallel to the other with the planes of the longitudinal member intersecting both. The slope of the longitudinal member between the parallel planes is predetermined to substantially correspond to the desired pitch of the roof. The span component of this slope will always be equal to the desired distance between hip trusses so that when the apparatus is employed proper hip truss spacing is ensured. Similarly, the rise component of the slope of the apparatus (or the distance between planes of the attachment means) will always be equal to the difference in height between top chords of adjacent hip trusses. The unique construction of the subject apparatus therefore allows it to serve as a template for proper orientation of neighboring hip trusses relative to one another with each attachment means coming into abutting (coplanar) engagement with the top surface of each horizontal top chord member for permanent fastening.

[0009] There has thus been outlined, rather broadly, the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. Therefore, it is to be understood that the invention is not limited to the specific details and arrangement of the components set forth in the following description or illustrated in the drawings. The invention is capable of other embodiments and of being practiced and carried out in various ways. Also, it is to be understood
that the phraseology and terminology employed herein are for the purpose of description and should not be regarded as limiting. As such, those skilled in the art will appreciate that the conception, upon which this disclosure is based, may readily be utilized as a basis for the designing of other structures, methods and systems for carrying out the several purposes of the present invention. It is important, therefore, that the claims be regarded as including such equivalent constructions insofar as they do not depart from the spirit and scope of the present invention.

Further, the purpose of the foregoing abstract is to enable the U.S. Patent and Trademark Office and the public generally, and especially the scientists, engineers and practitioners in the art who are not familiar with patent or legal terms or phraseology, to determine quickly from a cursory inspection of the nature and essence of the technical disclosure of the application. The abstract is neither intended to define the invention of the application, which is measured by the claims, nor is it intended to be limiting as to the scope of the invention in any way.

It is, therefore, a primary object of the subject invention to provide a means for eliminating the need for temporary bracing of hip trusses during the erection process by providing an apparatus designed to interconnect at predetermined distances the horizontal top chord members of adjacent hip trusses for proper spacing and support purposes which said apparatus may be left permanently in place.

It is also a primary object of the subject invention to provide a permanent hip truss bracing and spacing apparatus that ensures safety and performance.

Another primary object of the subject invention is to provide a permanent hip truss bracing and spacing apparatus that enhances the truss assembly’s ability to, among other things, withstand the gravity forces of its own weight, resist wind loads during construction, support temporary construction dead loads such as the weight of sheathing and roofing materials, and keep the trusses plumb.

Yet another object of the subject invention is to provide a permanent hip truss bracing and spacing apparatus designed prevent or reduce buckling of trusses loaded in compression, share loads between adjacent trusses, transfer lateral forces to diaphragms, and restrain overall lateral displacements.

Still another object of the subject invention is to provide a permanent hip truss bracing and spacing apparatus that is simple in design, comprised of a limited number of components and therefore capable of rapid construction and installation at relatively low costs.

These together with other objects of the invention, along with the various features and characteristics thereof which characterize the invention, are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its advantages and the specific objects attained by its uses, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated a preferred embodiment of the invention.

Detailed Description of the Preferred Embodiment

In order that the construction and benefits of the subject invention may be fully appreciated it is first necessary to understand the environment within which it is installed, namely a framed hip roof system. Reference first being made to FIG. 1, a typical hip roof end is built up of flat top hip trusses 100 arranged in a stepped up sequence beginning with a hip girder 102 and terminating in a common truss 104 the apex 106 of which serves as the peak of the hip. The truncated girder truss 102 is there to give extra strength to the hip area. They are usually double the thickness of the ordinary trusses (two trusses of the same thickness nailed together). A plurality of hip jack trusses 108 complete the framing system some of which are attached to hip girder 102 while others are attached to diagonal hip rafter 110 as shown. Note that the hip rafters 110 form the “hip” of the roof.

Referring next to FIG. 2, a typical hip truss 100 is comprised of a horizontal top chord member 112 disposed between two diagonal rafters 114 each of which is attached at its opposite end to a common horizontal beam 116. Webbing members 118 add additional support to the structure. As best observed upon viewing FIG. 3, the height “h” of top chord 112 of each hip truss 100 increases incrementally between hip girder 102 and the first common truss 104. Because the top surface 120 of each top chord 112 of each hip truss 100 occupies a different plane, and because conventional metal truss bracing and spacing devices designed to connect trusses having a top surface in a common plane, they cannot be utilized in such an application. The subject apparatus is specifically designed to bridge the gap between adjacent top chord members of different heights.

Reference now being made to FIG. 4, a preferred embodiment of the subject bracing and spacing apparatus for hip roof trusses, denoted generally by reference numeral 10, is comprised of a longitudinal member 12 having a first end 14, a second end 16, a first side 18 and a second side 20, a first truss attachment assembly joined to the first end 14 and a second truss attachment assembly joined to the second end 16, whereby the first truss attachment assembly is angled above the plane of the longitudinal member 12 and the second truss attachment assembly is angled below the plane P1 of the longitudinal member 12.

The first attachment assembly is comprised of at least one attachment tab 22 joined to first end 14 along juncture 24 and bent at first angle 𝜃ABC above the plane P1 of longitudinal member 12, as observed in FIG. 5. Similarly, the second attachment assembly is comprised of at least one attachment tab 26 joined to second end 16 along juncture 28 and bent at second angle 𝜃DEF below the plane P1 of longitudinal member 12. 𝜃ABC and 𝜃DEF are always less than 90° and are always equal but opposite relative to the plane P1 (or longitudinal axis) of longitudinal member 12. Accordingly, attachment tabs 22 and 26 occupy parallel planes P2 and P3, respectively. When installed, the slope of longitudinal member 12 between parallel planes P2 and P3 is predeter-
mined to substantially (but not necessarily exactly) correspond to the desired pitch of the roof. The span component S of this slope will always be equal to the desired distance between hip trusses (commonly 24") so that when the apparatus is installed, proper hip truss spacing is achieved (See, FIG. 3). Similarly, the rise component R of the slope of longitudinal member 12 (or the distance between planes P2 and P3) will always be equal to the difference in height (Ah) between top chords 102 of adjacent hip trusses 100.

[0029] This, for example, when the hip roof is to have a 4:12 pitch, and it is known that the trusses will be laid out 24" OC, then a corresponding set of "4:12 braces" of the subject apparatus may be employed. The slope of the longitudinal member 12 will be substantially 4:12 and its length predetermined to yield a truss-to-truss distance of 22½ inches when installed over adjacent hip trusses 100. The unique construction of the subject apparatus therefore allows it to serve as a template for proper spacing and orientation of neighboring hip trusses relative to one another with each attachment tab 22 and 26 coming into abutting (coplanar) engagement with the top surface 120 of each horizontal top chord member 112 for permanent fastening (FIG. 6).

[0030] Referring once again to FIG. 4, each first attachment tab 22 of the subject bracing and spacing apparatus 10 terminates in a downwardly depending exterior flange 30, normal to the plane of the attachment tab. Corresponding exterior flanges 32 depend from second attachment tab 26 in like orientation. The apparatus 10 further includes at least one interior flange 34 joined to first end 14 of longitudinal member 12 along juncture 24 and depending downwardly, normal to the plane of first attachment tab 22 and parallel to exterior flanges 30. Corresponding at least one interior flange 36 is joined to second end 16 along juncture 28 in like orientation relative to second attachment tab 26. Together, interior flange 34, first attachment tab 22 and exterior flanges 32 form a U-shaped sleeve sized to fit in slidable engagement over the top of top chord member 112. Similarly, interior flange 36, second attachment tab 26 and exterior flanges 30 form a like-sized U-shaped sleeve for the same purpose. It should be appreciated that the configuration of components of each attachment means may be altered provided that each embodiment possesses at least one first attachment tab 22 angled above the plane of longitudinal member 12 and at least one second attachment tab 26 angled below the same plane. Examples of such alternate arrangements are described in U.S. Pat. No. 4,246,736 issued to Kovar et al. and are incorporated herein by reference. Again, the critical feature of the subject apparatus 10 is that the attachment means be angled as described with respect to the plane of longitudinal member 12 which shall be of a specific length depending on the desired roof pitch.

[0031] The subject bracing and spacing apparatus 10 preferably but not essentially further includes second and third longitudinal members 38 and 40 attached to longitudinal member 12 along junctures 42 and 44, respectively. In the finished product, second and third longitudinal members are bent 90 degrees below the plane of first longitudinal member 12 thereby being situated perpendicular thereto. With reference being made to FIGS. 6 and 7 it may be observed that leading edge 46 and 46' of second and third longitudinal members 38 and 40, respectively, are angled away from flange 36 while trailing edge 48 and 48' are angled in the direction of flange 34. Thusly angled, leading edges 36 and 36' and trailing edges 38 and 38' lay flush against the vertical surfaces of top chords 112 when apparatus 10 is mounted thereto adding additional support and preventing adjacent hip trusses from moving closer together. It should further be appreciated that the angles from which leading and trailing edges 46 and 48, respectively, depend from juncture 42 are always equal such that leading and trailing edges 46 and 48 are parallel to one another. Similarly, the angles from which leading and trailing edges 46' and 48', respectively, depend from juncture 44 are always equal such that leading and trailing edges 46' and 48' are parallel to one another.

[0032] The bracing and spacing apparatus for hip roof trusses of the present invention is preferably but not essentially constructed of a single piece of sheet metal that may be cut, stamped, punched, embossed and bent into the desired shape. Alternatively, the apparatus may be constructed of other materials that may be cast, molded, welded or the like into the desired shape. Regardless of the material employed, it is important that the above predetermined angles of dependency of first and second attachment tabs 22 and 26 from longitudinal member 12 be maintained. Accordingly, the sheet metal or other material used should have a thickness and strength sufficient to resist bending during application and under intended use conditions.

[0033] Although the present invention has been described with reference to the particular embodiments herein set forth, it is understood that the present disclosure has been made only by way of example and that numerous changes in details of construction may be resorted to without departing from the spirit and scope of the invention. Thus, the scope of the invention should not be limited by the foregoing specifications, but rather only by the scope of the claims appended hereto.

What is claimed as being new, useful and desired to be protected by Letters Patent of the United States is as follows:

1. An apparatus for accurately spacing neighboring hip roof trusses during the erection process and for permanently bracing the same is comprised of:
   a) a longitudinal member having a first end, a second end, a first side and a second side;
   b) a first truss attachment assembly joined to said first end;
   c) a second truss attachment assembly joined to said second end;
   d) said first truss attachment assembly being angled above a plane of said longitudinal member and said second truss attachment assembly being angled below said plane of said longitudinal member.

2. An apparatus for accurately spacing neighboring hip roof trusses during the erection process and for permanently bracing the same is comprised of:
   a) a longitudinal member having a first end, a second end, a first side and a second side;
   b) a first truss attachment assembly joined to said first end at an angle above the plane of said longitudinal member;
   c) a second truss attachment assembly joined to said second end at an angle below the plane of said longitudinal member.