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Simmons

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[54] **STRUCTURAL FRAMING SYSTEM AND METHOD OF ASSEMBLY**

[76] Inventor: **David G. Simmons**, 9417 S. Broadway, St. Louis, Mo. 63125

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Related U.S. Application Data

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[51] **Int. Cl.**[7] **E04B 1/19**

[52] **U.S. Cl.** **52/92.1**; 52/92.2; 52/481.1; 52/94; 52/650.1

[58] **Field of Search** 52/92.1, 92.2, 52/94, 95, 633, 650.1, 653.2, 481.1, 731.5, 730.1

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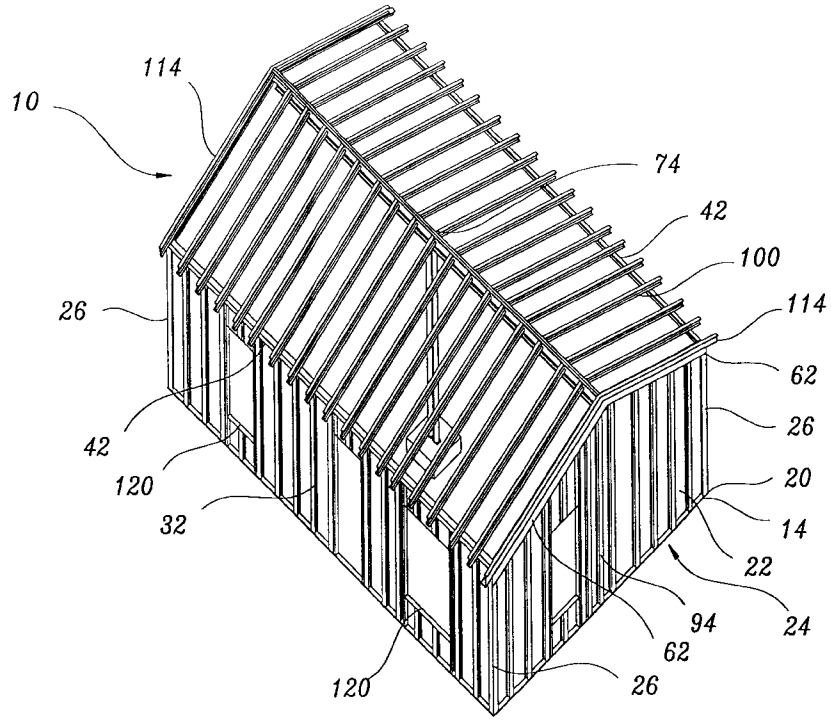
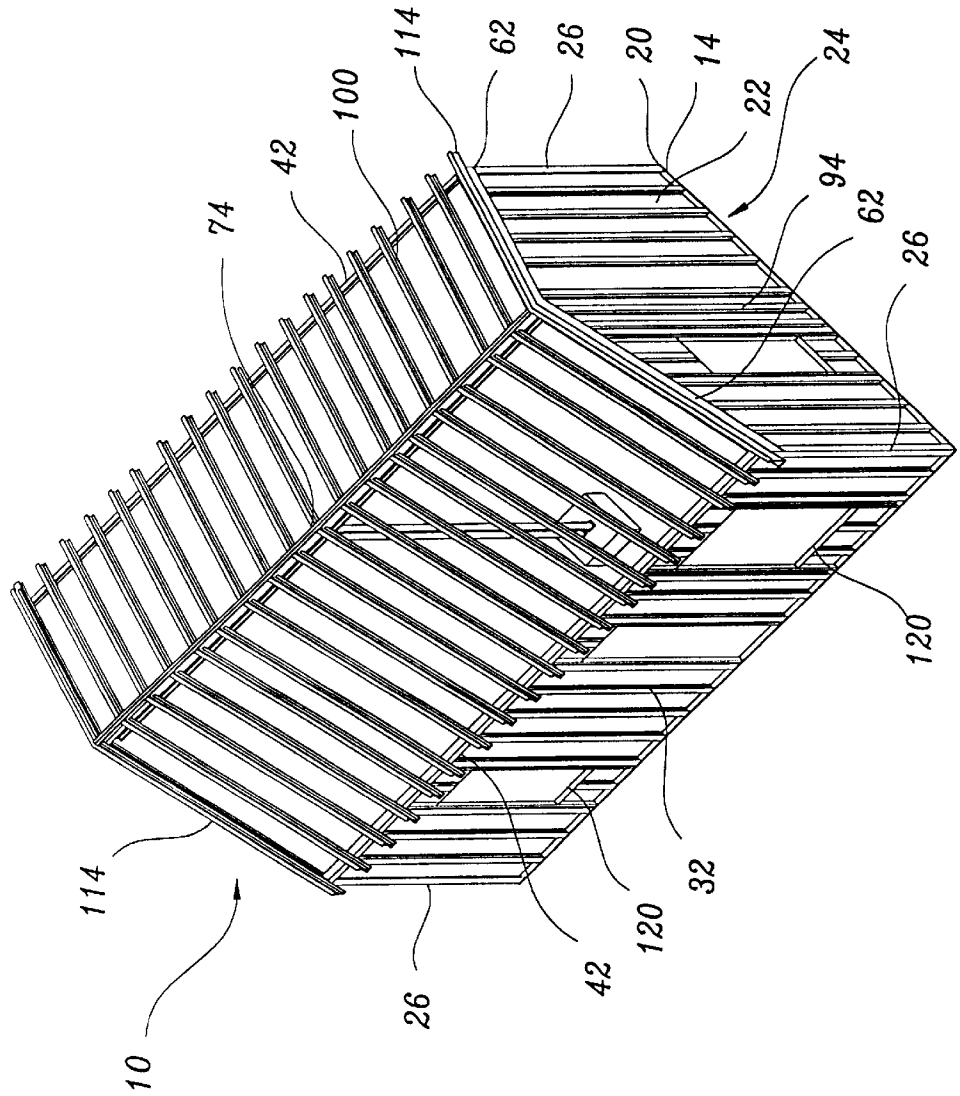
Assistant Examiner—Phi Dieu Tran A
Attorney, Agent, or Firm—Kevin L. Klug

[57] **ABSTRACT**

A structural framing system having a plurality of elongated members which are capable of assembly with a minimum number of specialty tools and with minimal use of specialty labor and which provides superior strength. The structural framing system of the current invention with the unique cross sectional shape of its elongated members lends itself to manufacture from pultruded fiberglass material in a preferred embodiment. The present invention when manufactured in its preferred embodiment provides superior corrosion, fire and weather resistance while also providing a structural framing system which is light enough to be easily transportable.

18 Claims, 23 Drawing Sheets





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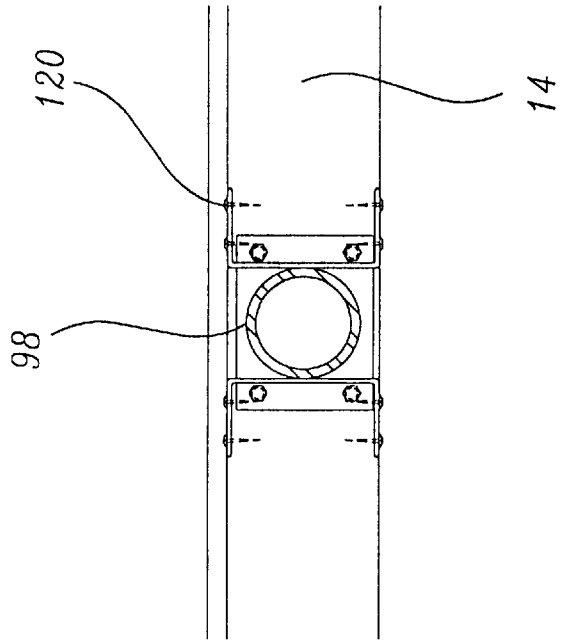

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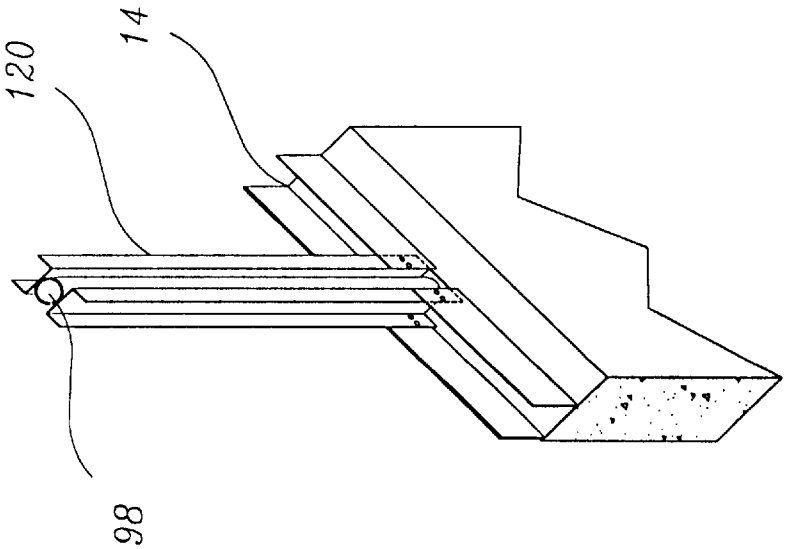

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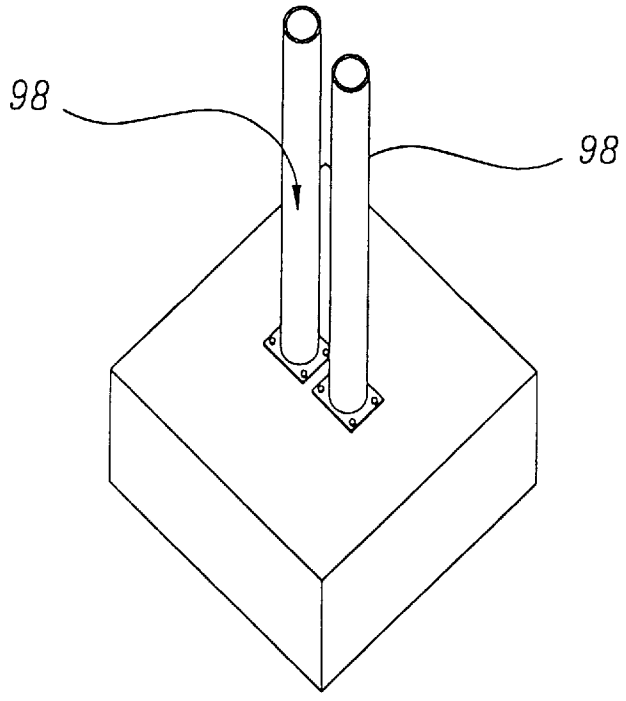

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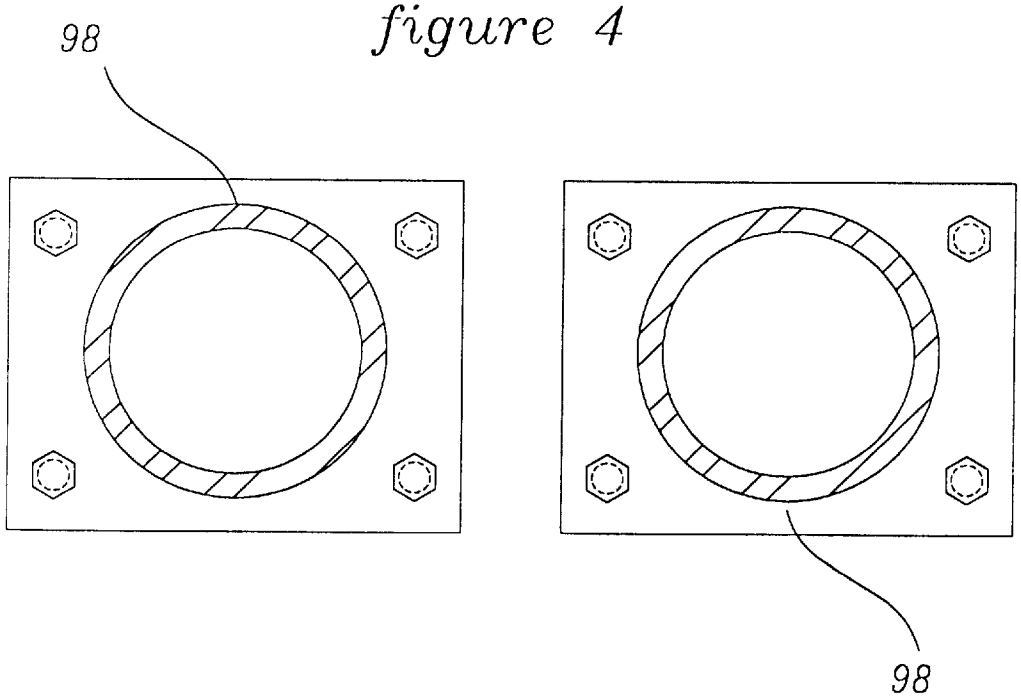

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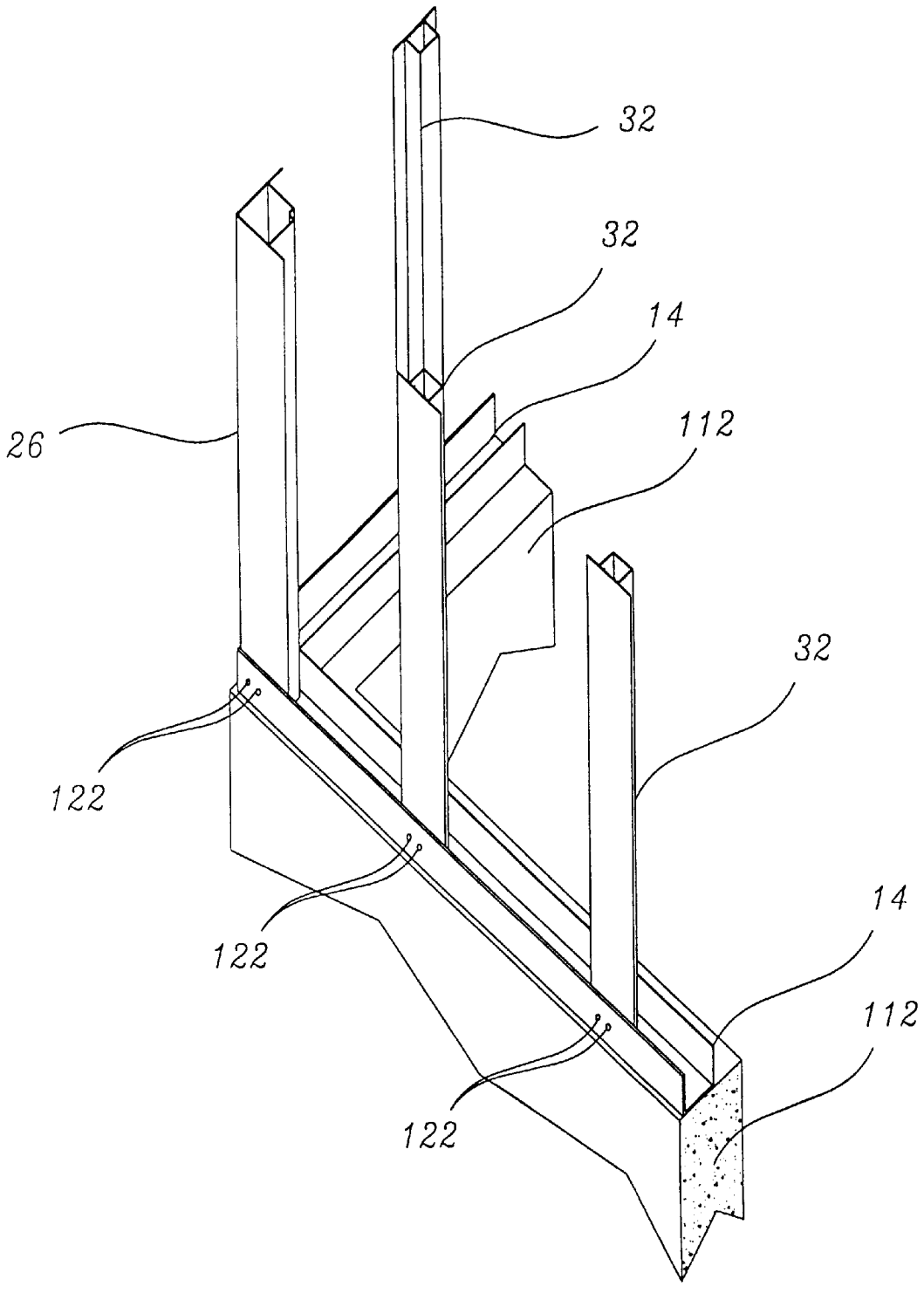

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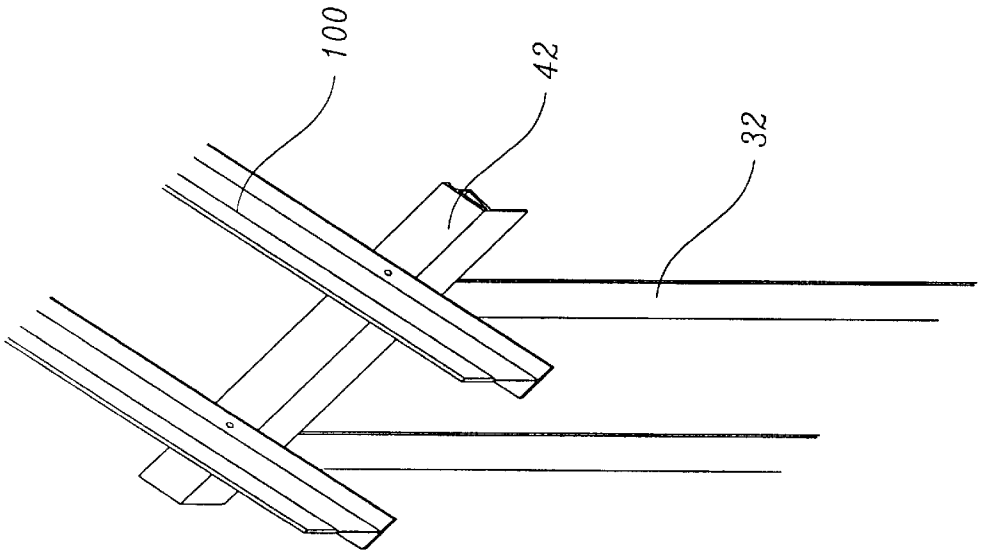

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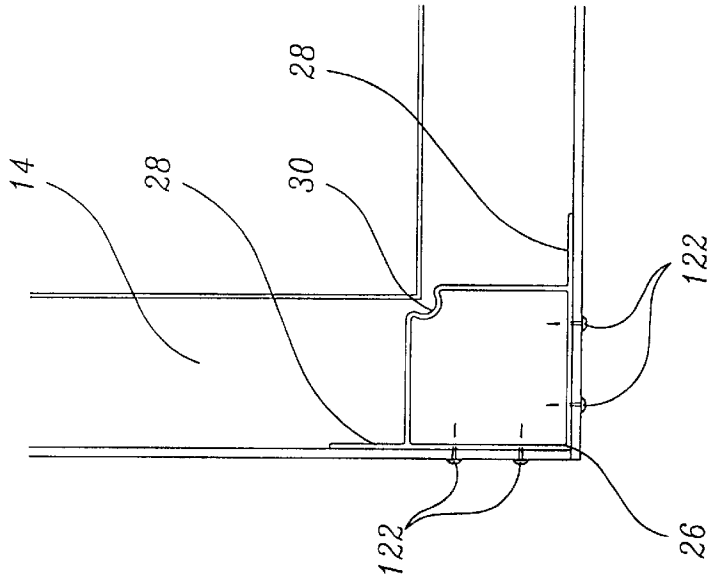

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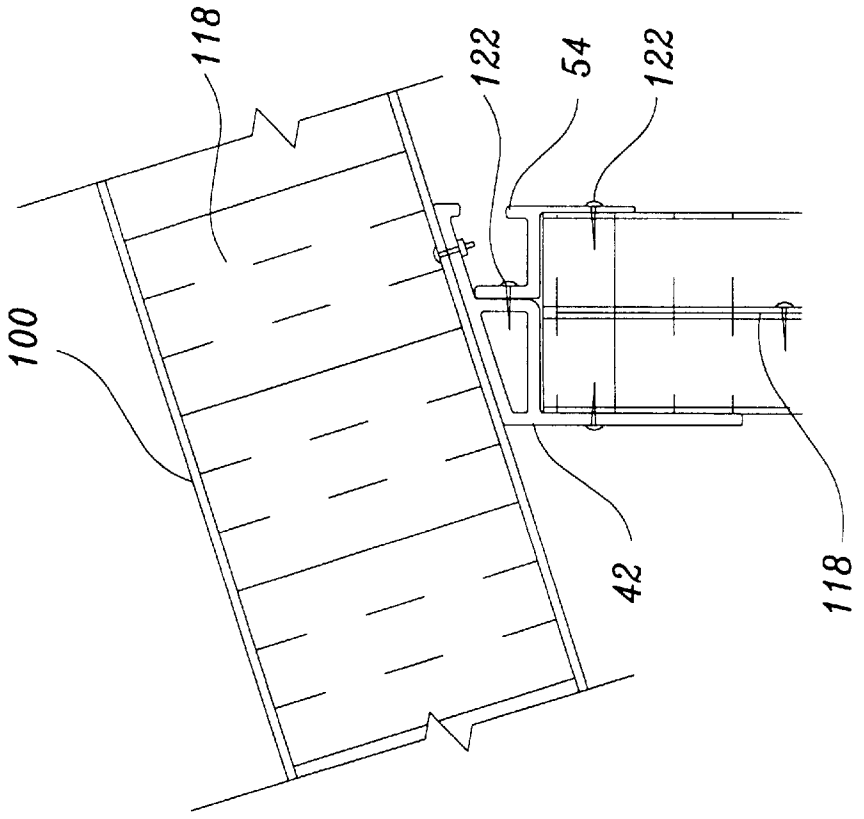

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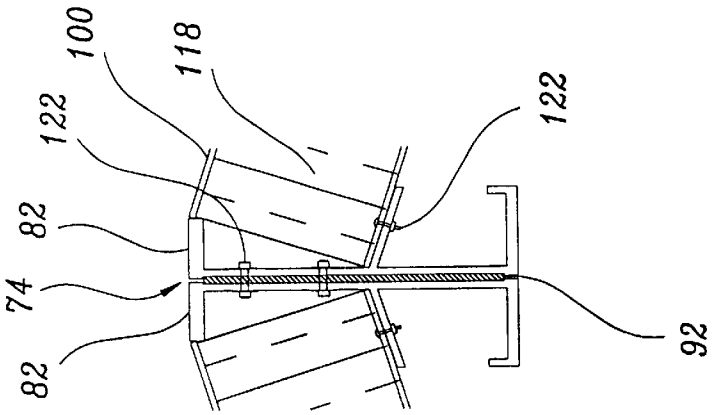

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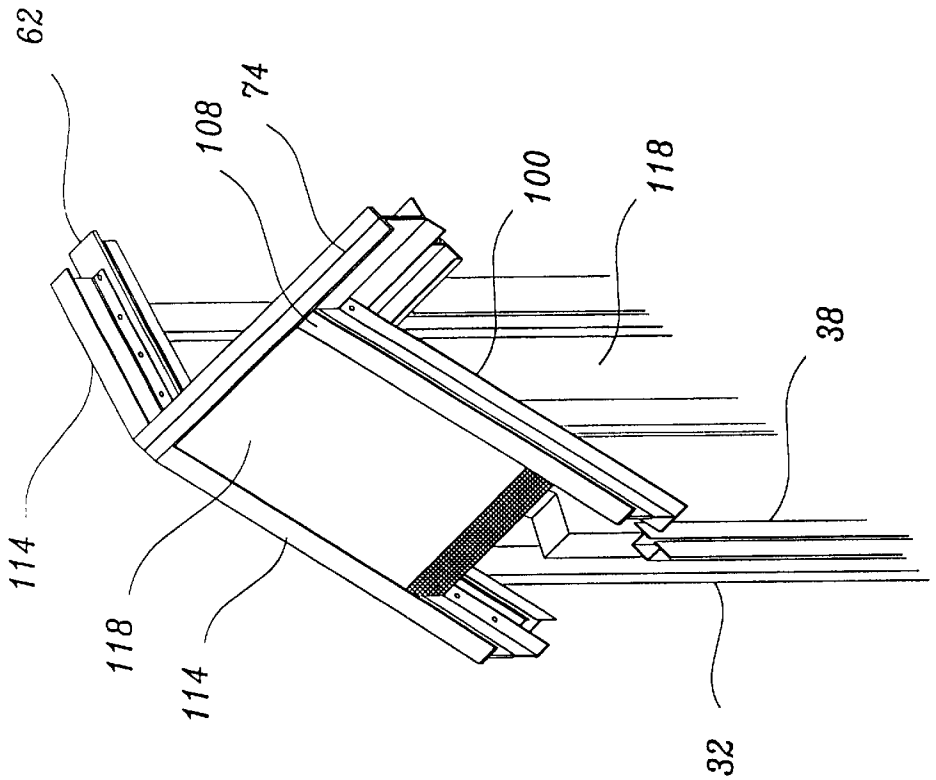

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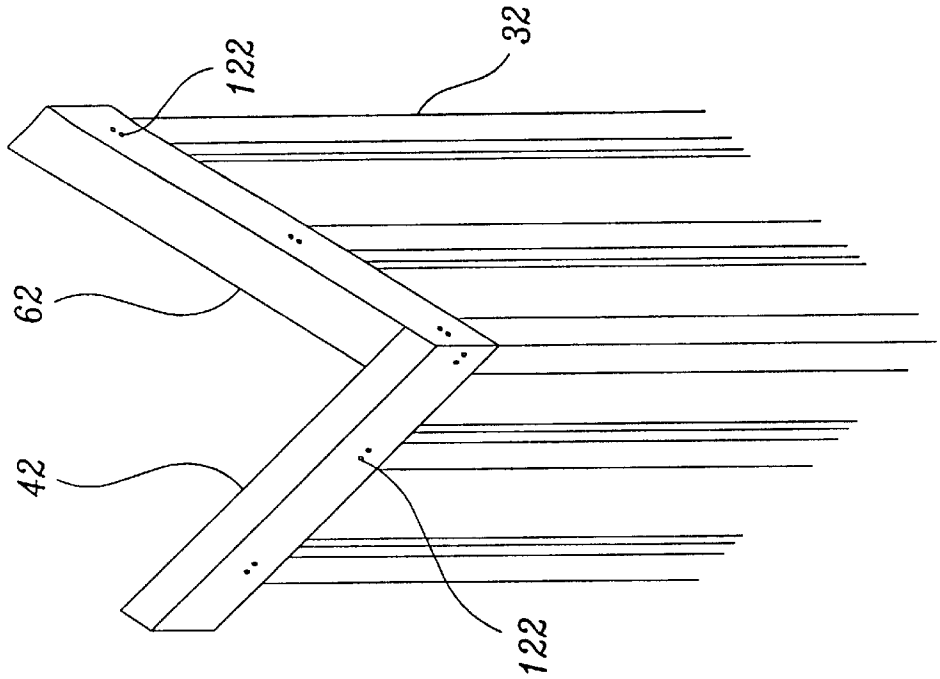

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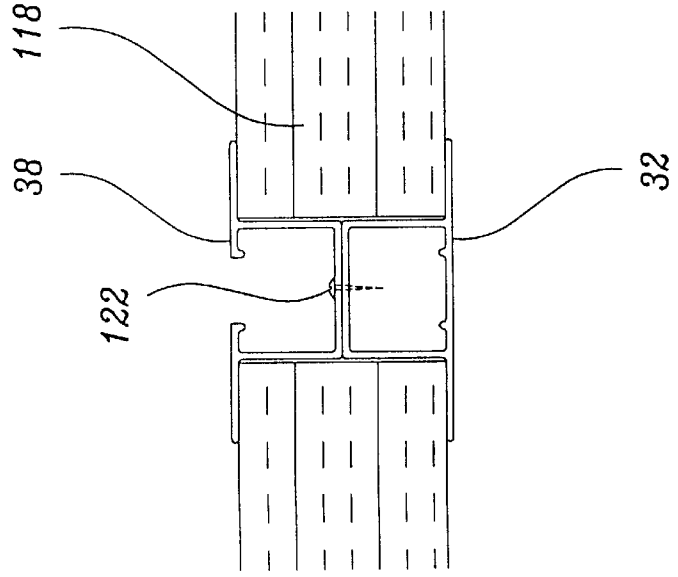

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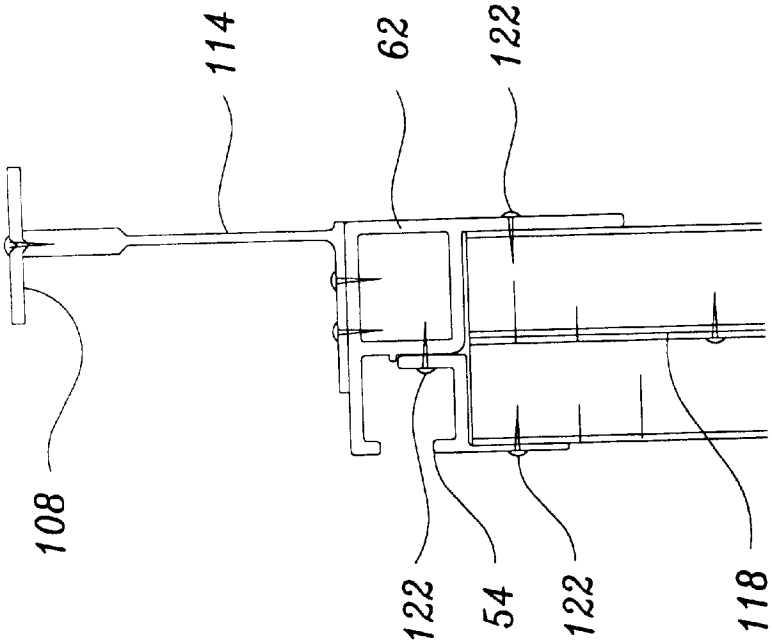

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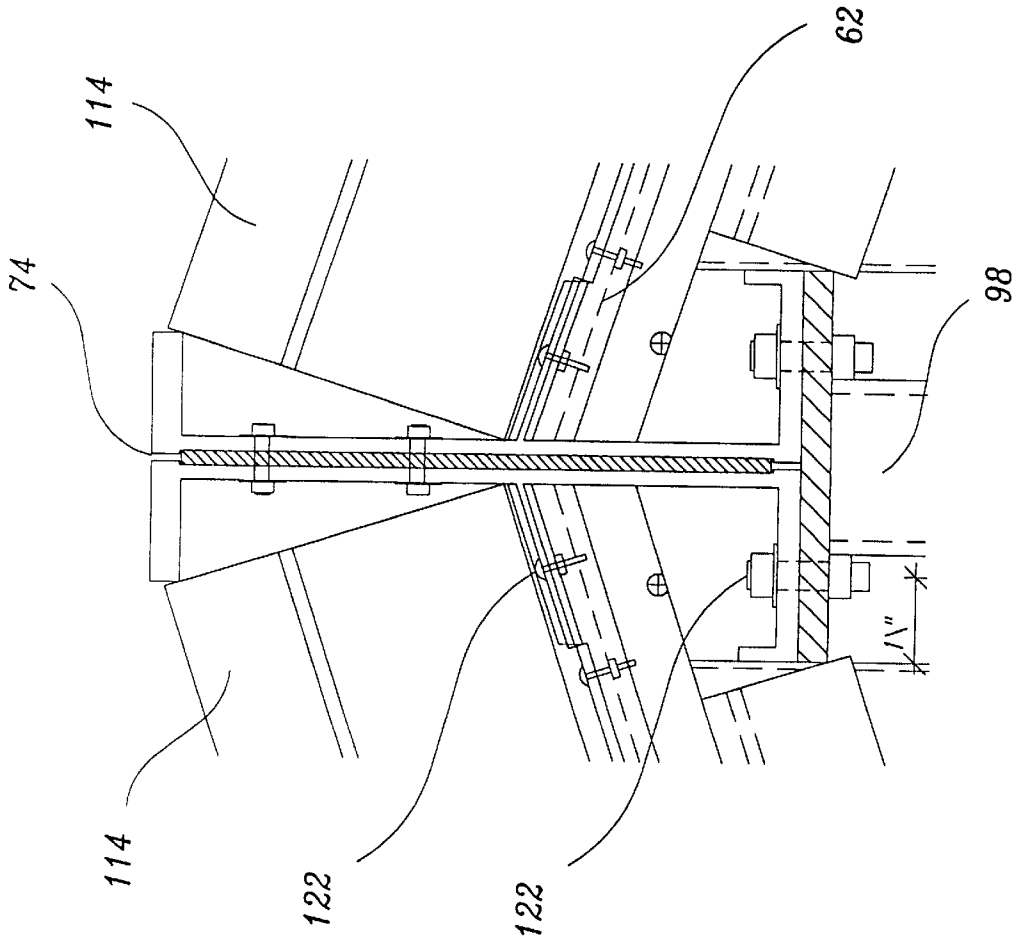

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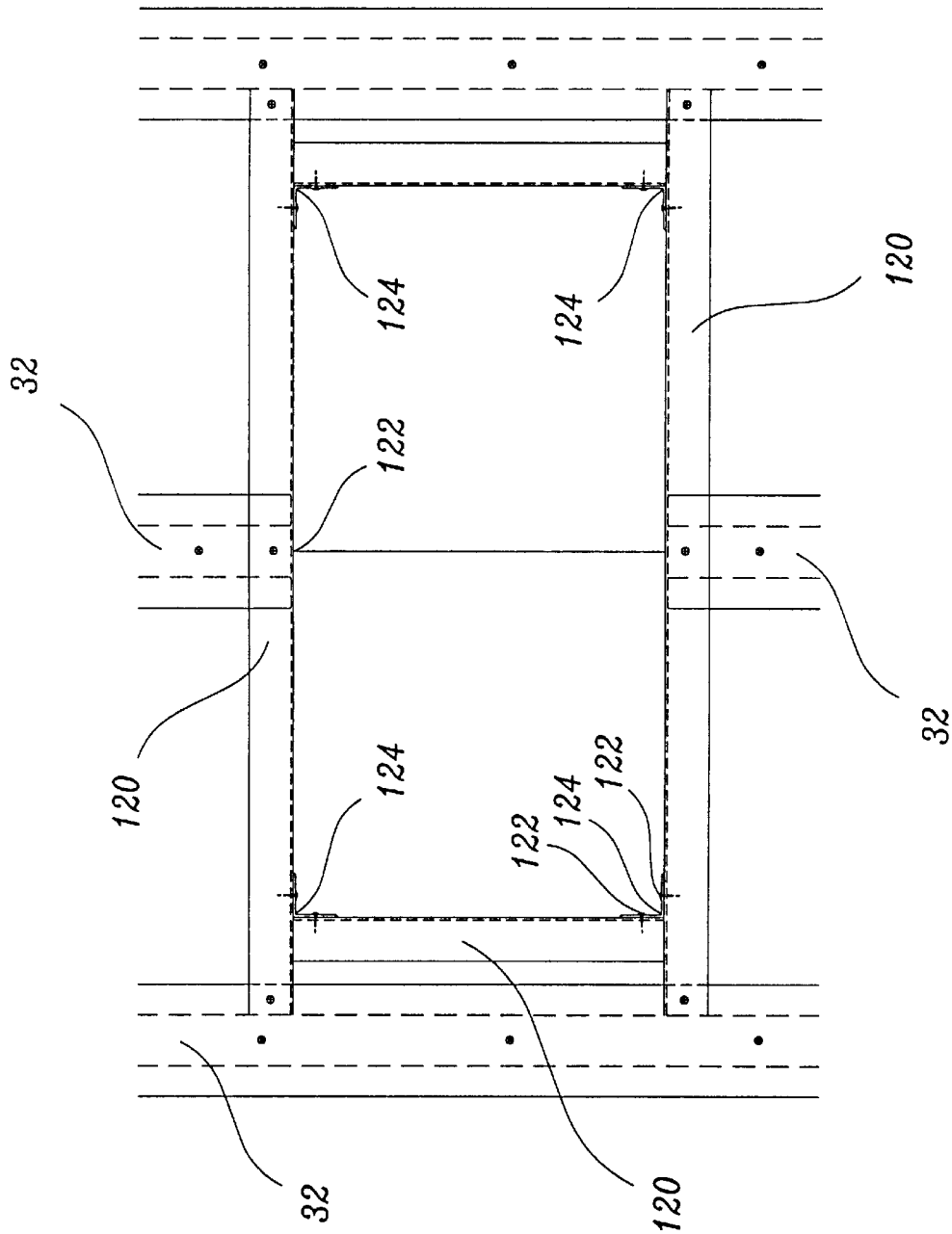

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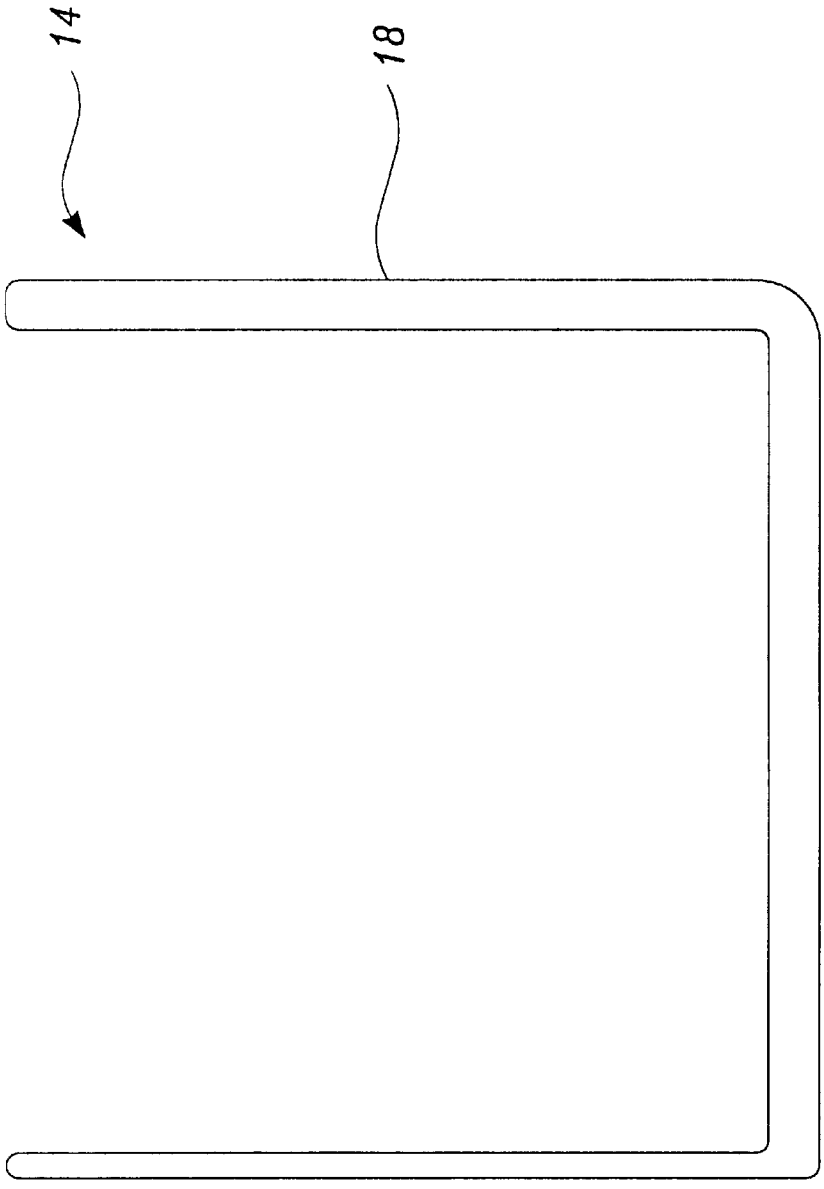

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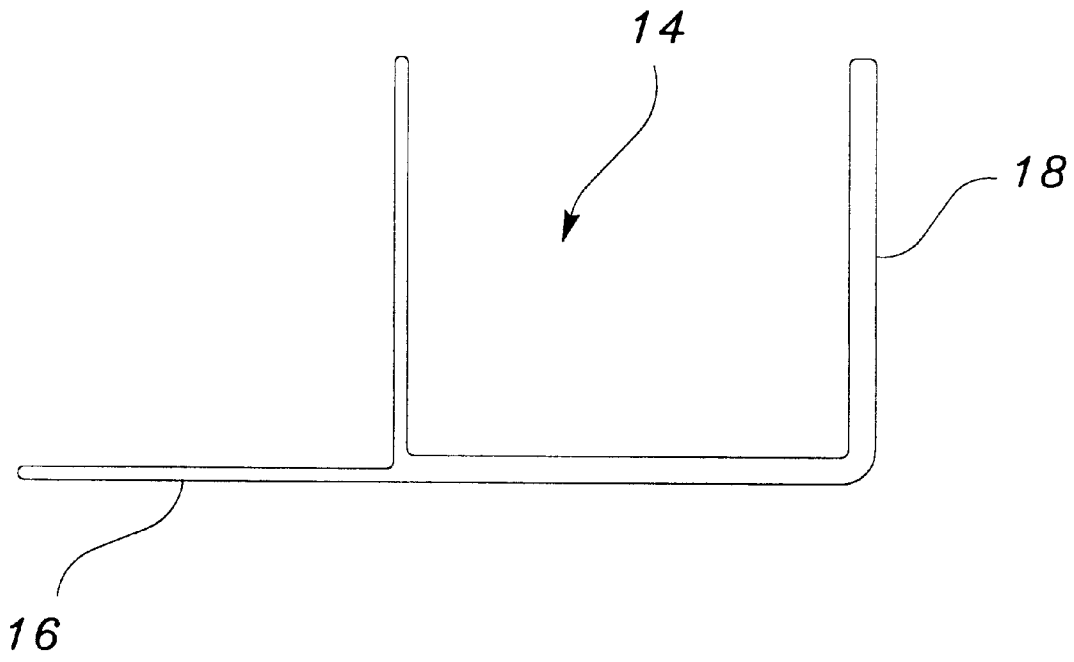

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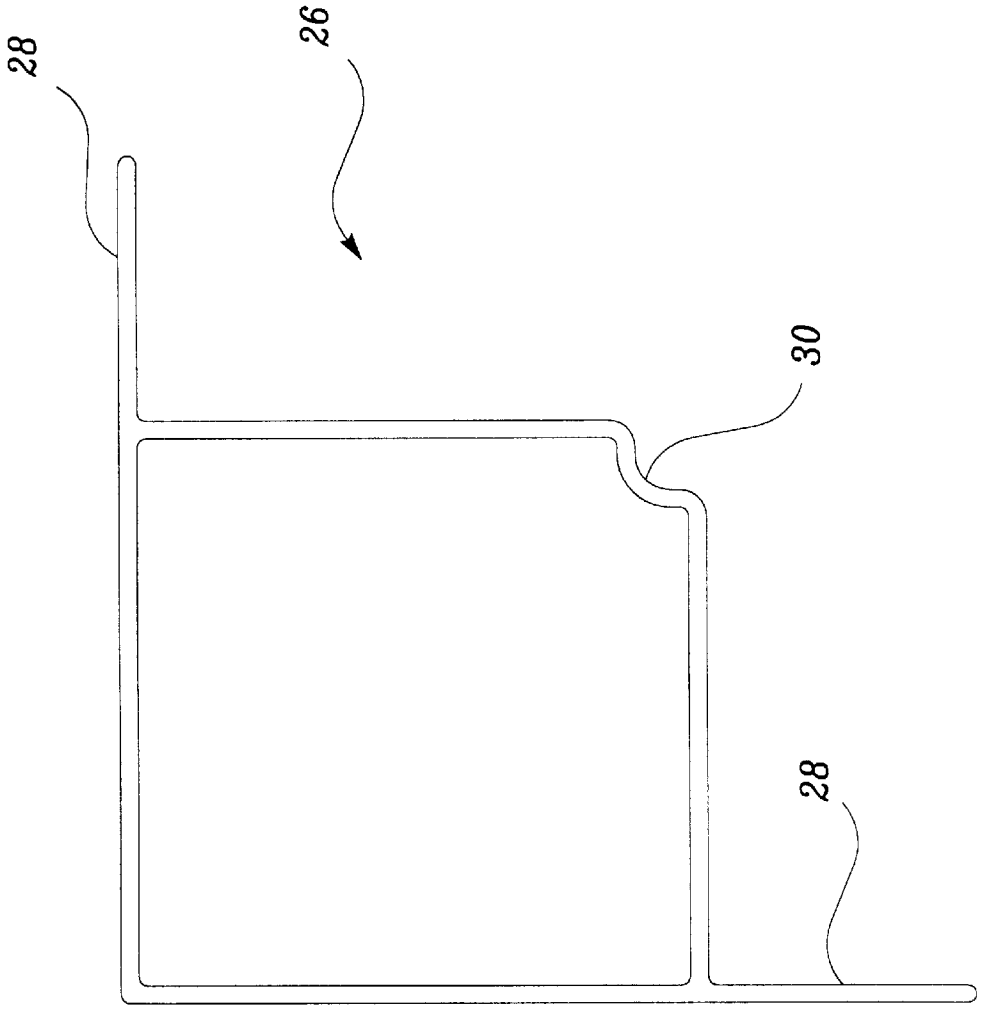

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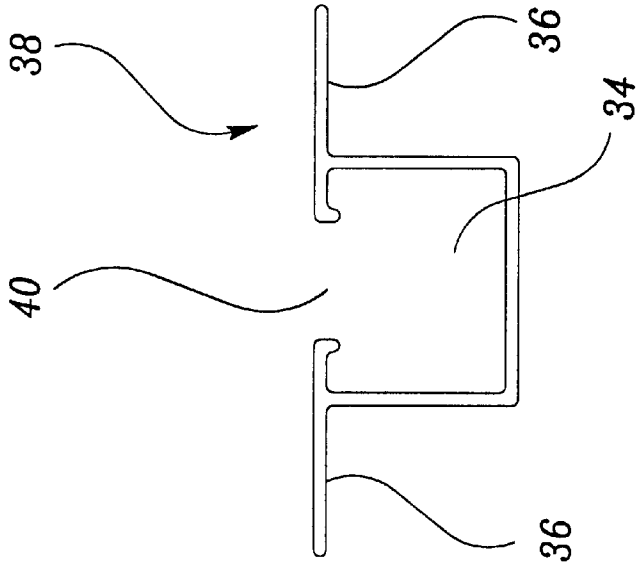

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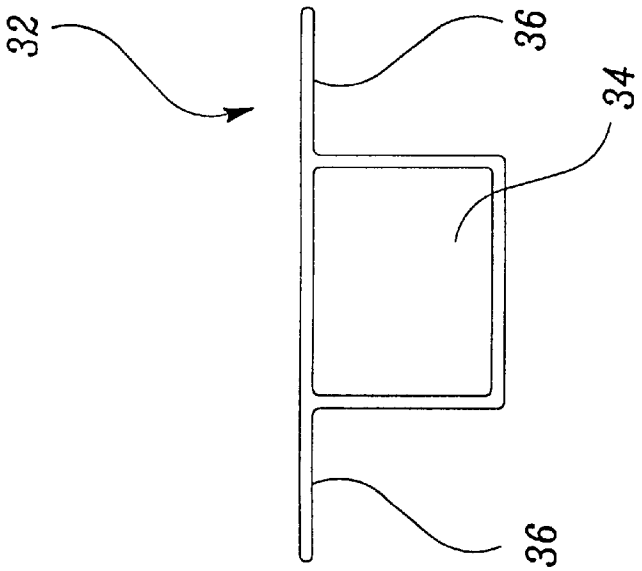

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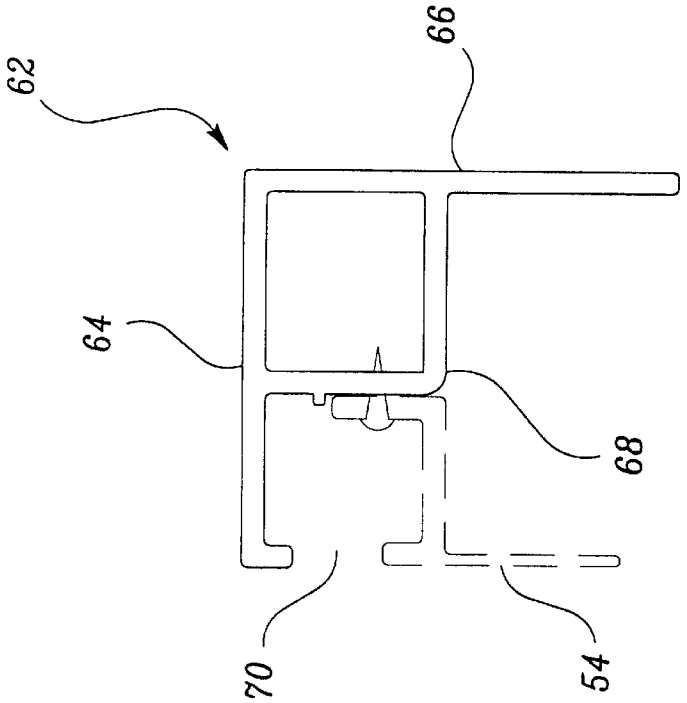

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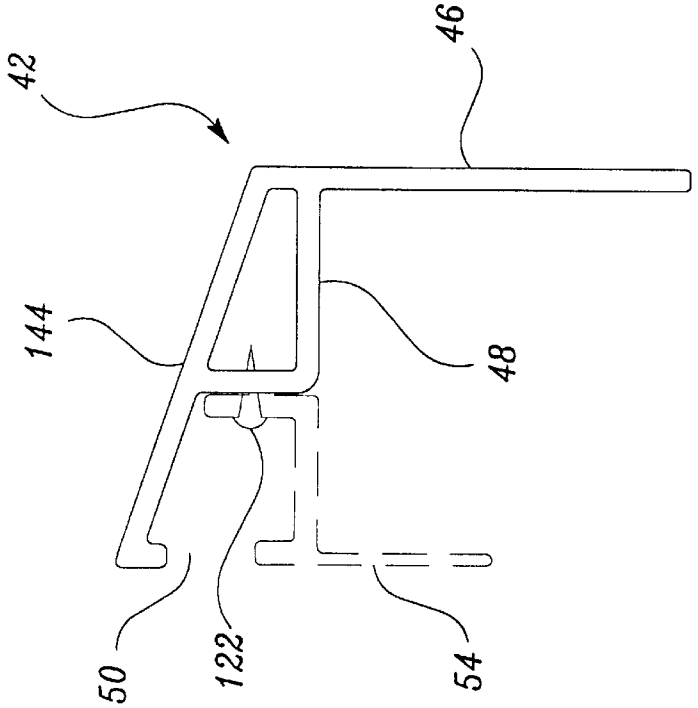

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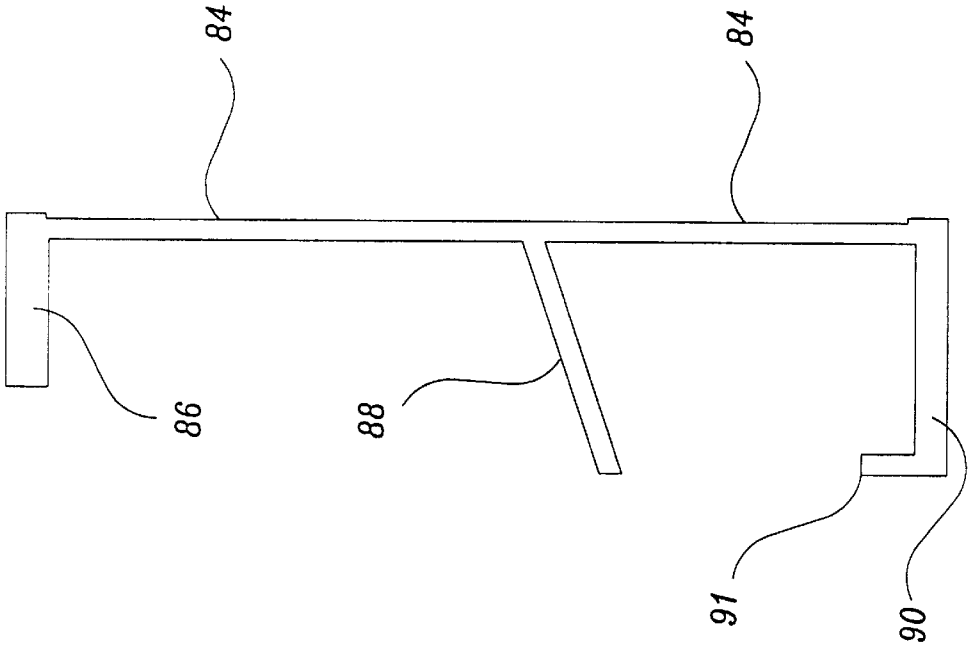

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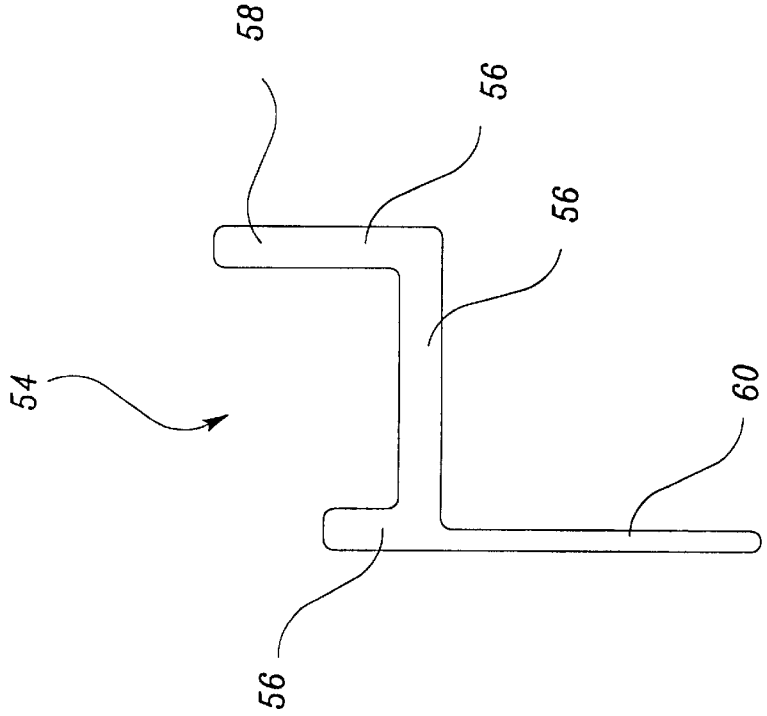

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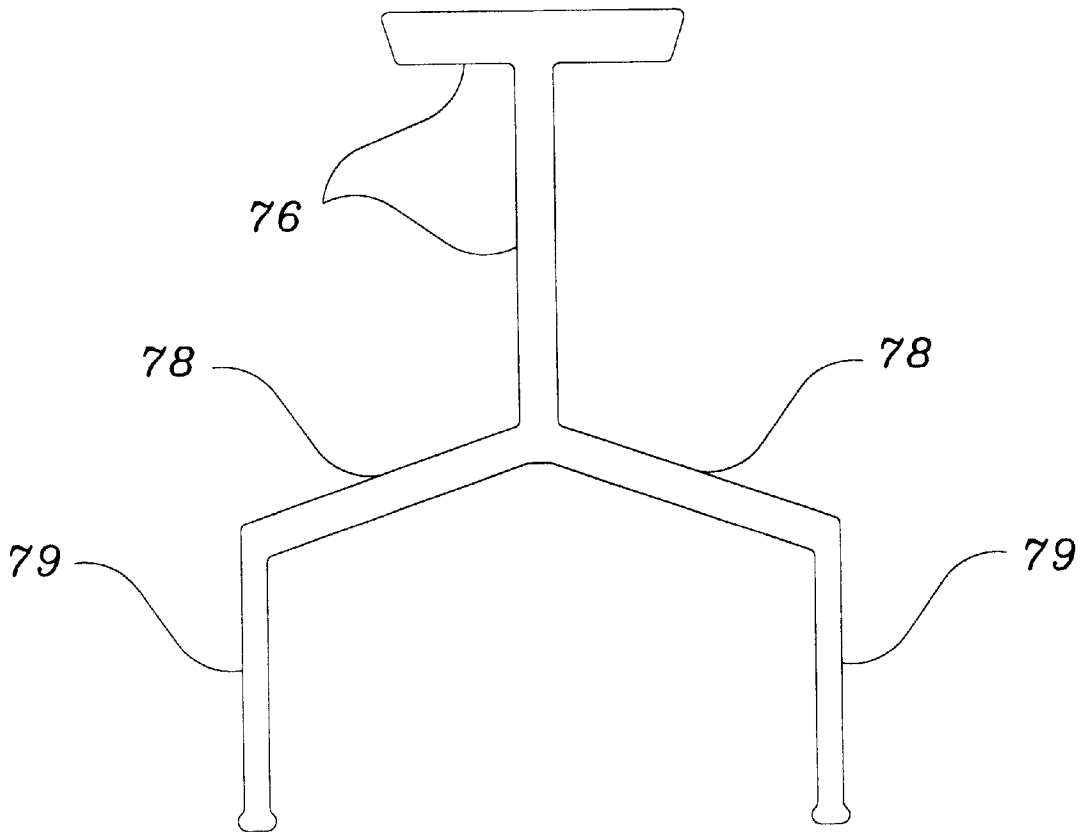

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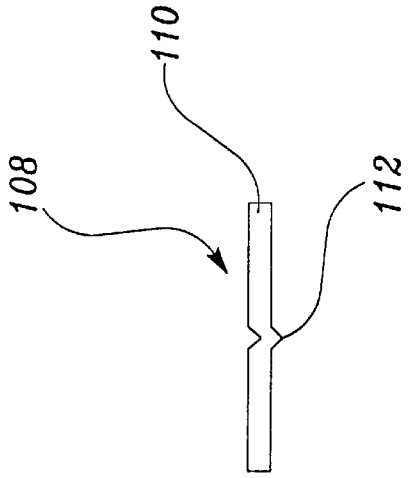

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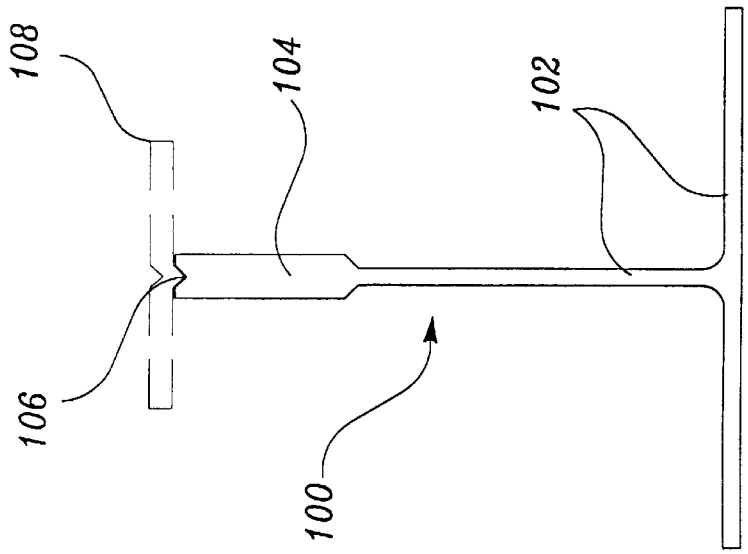

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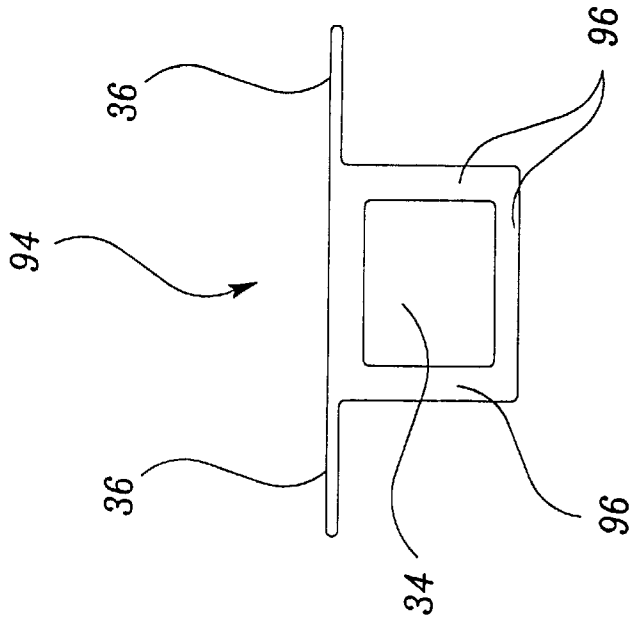

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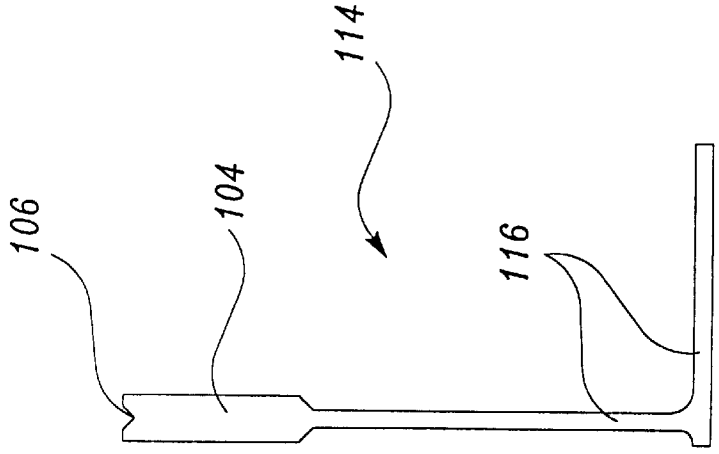

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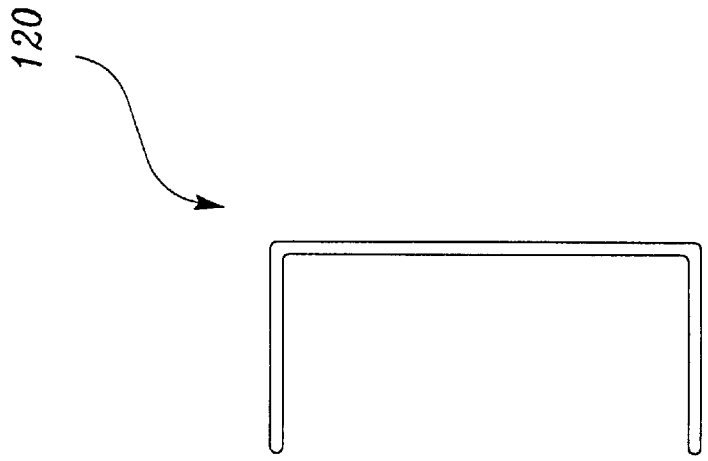

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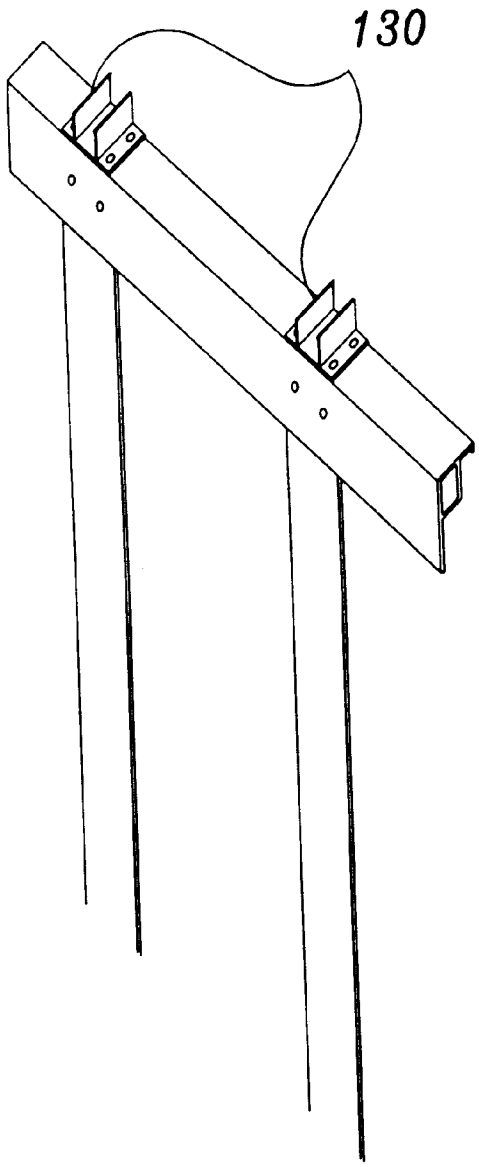

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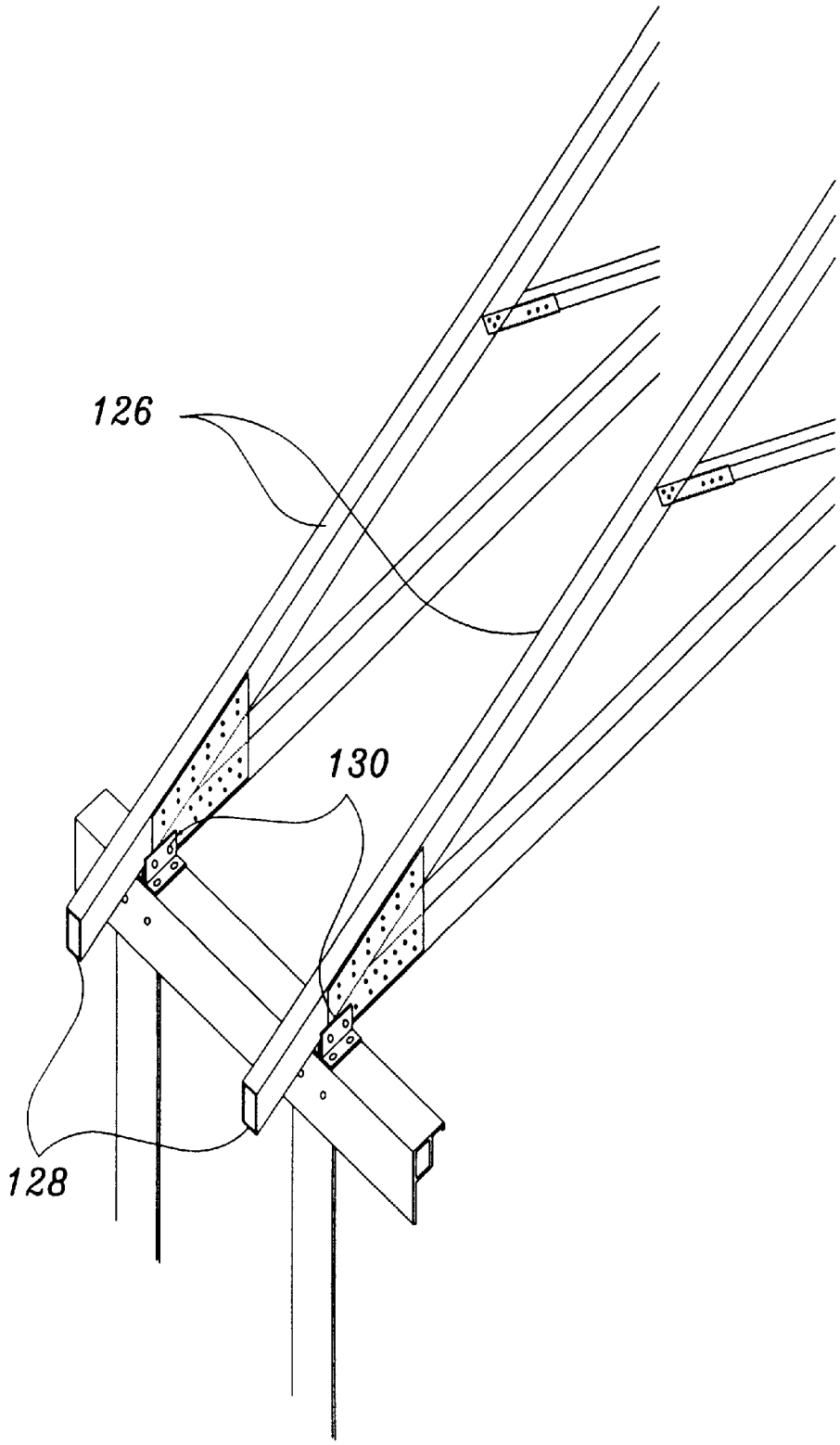

figure 33

STRUCTURAL FRAMING SYSTEM AND METHOD OF ASSEMBLY

This application claims priority of Provisional Patent Application #60/074,950, filed Feb. 17, 1998.

BACKGROUND OF THE INVENTION

The present invention relates in general to structural framing systems and pertains, more particularly, to a pultruded fiberglass, lightweight, and easily assembled frame for a house, shed or storage area which also provides superior strength, especially for climates which expose the structure to high winds.

Pultrusion allows fiberglass structural components to be manufactured in lengths which allow their superior strength characteristics to be utilized in the form of structural building components. The pultrusion process, although not the same, can be likened to an ordinary extrusion process in which fiberglass fibers are interlaced with a resin which is cured by the application of heat. The process is thoroughly described in U.S. Pat. No. 3,556,888 Pultrusion Machine and Method, issued to Goldsworthy on Jan. 19, 1971. It is important to note that the art of the present invention is not drawn to the pultrusion process itself, but to the unique shape, form, interconnection, application and method of use of the structural products described herein which are especially adapted to formation by pultrusion methods.

With conventional structural framing systems, a tradeoff often exists between the weight of the structural materials, the ease of assembly of the structural materials, the skill level of the construction personnel required for assembly, the insulation properties of the structural materials, the material weathering and corrosion resistance characteristics, the material fire resistance, and the strength of the final structural assembly. For example, structural materials manufactured of steel generally provide a strong and fire resistant structural assembly but present weight concerns which inhibit material transporting, are difficult to assemble, are corrosion and weathering sensitive, are poor thermal insulators and often require many skilled construction personnel for assembly. Wood structural framing systems generally provide low weight, ease of assembly, and good insulation properties, but are often moderate to poor in their weathering, strength, and fire resistant characteristics and often require specialty assembly tools and skilled construction personnel. The art of the present invention provides for excellent material weight properties and ease of assembly with only a few ordinary tools and non-skilled construction personnel. The art of the present invention further provides for exceptional insulation properties, outstanding weathering characteristics, good fire resistance, and a final structural strength which is commensurate with many steel structures. All of the aforesaid advantages are available when the structural components of the present art, with the unique shapes, order of assembly, and means of connection described herein, are formed via the process of fiberglass pultrusion in a preferred embodiment.

Accordingly, it is an object of the present invention to provide a structural framing system and method of assembly which is easily assembled, light in weight, energy efficient, fire resistant, weather and corrosion resistant, and structurally strong.

Another object of the present invention is to provide a structural framing system and method of assembly which provides all of the aforementioned characteristics in a cost effective manner.

A further object of the present invention is to provide a structural framing system and method of assembly which is capable of being assembled with a limited number of ordinary tools and non-skilled construction personnel.

A still further object of the present invention is to provide a structural framing system having components which are readily manufactured from pultruded fiberglass.

SUMMARY OF THE INVENTION

To accomplish the foregoing and other objects of this invention, there is provided in a preferred embodiment a structural framing system having a plurality of pultruded fiberglass sill plates arranged in a substantially rectangular form; said rectangular form having an internal and external portion. There is further provided, four or more pultruded fiberglass outside corner posts, which are mounted substantially perpendicular to and attached to said sill plates, a plurality of pultruded fiberglass outside studs which are also mounted substantially perpendicular to the sill plates, one or more pultruded fiberglass eave headers (with inside attachment clips) across and on the top of the plurality of outside studs, one or more pultruded fiberglass gable headers (with inside attachment clips), again across and on the top of the plurality of outside studs but located in a substantially 90° spatial relation with said eave headers, a ridge beam attached between the two opposing sides of the substantially rectangular form containing the gable headers, one or more column studs for support of said ridge beam, a plurality of pultruded rafters placed and attached between the ridge beam and the eave headers, a plurality of pultruded fiberglass inside studs which mate and attach to the outside studs within the substantially rectangular form, and a plurality of pultruded fiberglass window and door channels for those openings where a window or door would be desired. An alternative embodiment would replace the pultruded rafters and ridge beam with a plurality of trusses formed in a conventional manner, preferably from pultruded fiberglass material.

Often the aforementioned sill plates are placed and secured onto a concrete footing. In a preferred embodiment, each sill plate is comprised of a pultruded and substantially "U" shaped channel cross section having an extension plate extending from the bottommost portion of the "U" on the internal side. Each extension plate is perpendicular to the walls of the "U". An alternative embodiment of the sill plate would be comprised of the substantially "U" shaped channel only and would be used primarily for conventional foundations.

The aforesaid outside corner posts are substantially rectangular and hollow in cross section with extension ears on each portion of the cross section which abuts the external portion of the substantially rectangular sill plate form. In a preferred embodiment, the outside corner post has a concave cross section portion which is located on a corner nearest the internal portion of the rectangular cross section and substantially opposite the corner of the portion of the cross section which is located near the external portion of the rectangular sill plate form. In a preferred embodiment, both the extension ears and the concave portion run the entire length of the outside corner post.

The aforementioned outside studs are capable of being cut to various lengths. In a preferred embodiment, each outside stud is pultruded as a one piece substantially rectangular and hollow cross section on a plate extending beyond the width of the rectangular cross section. An alternative description would describe the outside stud as a substantially rectangu-

lar and hollow cross section having coplaner and substantially flat ears on that portion of the outside stud which is located near the external portion of the substantially rectangular sill plate form. Operating in conjunction with the outside studs are a plurality of inside studs. Each inside stud has the substantially same cross section as the outside stud with a lengthwise slot located between said flat ears and through a wall of said rectangular cross section. This slot allows for convenient runs and placement of utility wires, pipes, etc within the hollow portion of the inside stud. The inside stud is placed such that it mates and attaches lengthwise with the outside stud and has its flat ears opposite and away from said outside stud and on the internal side of the substantially rectangular sill plate form.

Each eave and gable header is mounted parallel with and opposite the sill plate on a topmost portion of the outside studs. Securing of each eave or gable header is achieved via the use of an inside attachment clip which holds the header to the outside and inside stud combination. The combination of the inside clip and the header forms a header channel for utility runs. A channel cover, typically vinyl, is used for enclosure and covering of said channel if no other covering material such as drywall is placed thereover.

Upon the installation of the eave headers and gable headers the ridge beam is placed and attached between the two opposing sides of the substantially rectangular form containing the gable headers. The ridge beam may take one of two forms. In an alternative embodiment, the ridge beam comprises two fastener joined pultruded sections, between which is sandwiched a flitch plate, preferably of steel, to maintain the necessary stiffness for a given span. In a preferred embodiment, the ridge beam is pultruded as one piece. The ridge beam has a ridge beam cover, preferably of vinyl, which may be placed onto its interior exposed portion if not covered by a material such as drywall or other wallboard.

The ridge beam is supported by column studs or steel columns at each end and at any other point where support is required. In an alternative embodiment, steel columns are used to support the ends of the ridge beam. In a preferred embodiment, column studs are used to support said ridge beam. Each column stud comprises a cross section substantially similar to the outside studs except that the wall thickness of said substantially rectangular cross section is substantially thicker than the outside stud. When installed, the column stud would replace and function as a typical outside stud.

Upon installation of the ridge beam, rafters are placed and attached between the ridge beam and the eave headers. In a preferred embodiment, the rafters are pultruded and placed and separated by 24 inches, center to center, but may be separated by any width required by the application. Each rafter has an attaching rafter clip which is able to sandwich and hold roofing panels and/or insulation material between the clip and the main body section of the rafter.

Onto and parallel with each gable header is placed and fastened an end rafter. A rafter clip is placed onto each end rafter in order to sandwich and hold roofing panels and/or insulation material between the clip and the main body section of the rafter.

An alternative embodiment places trusses, in lieu of the rafter and ridge beam combination, across the eave headers and secures each truss with a truss clip. Each truss is formed in a conventional manner, preferably of pultruded fiberglass members of substantially rectangular cross section with a hollow core.

In order to provide structural mounting for windows and doors, a plurality of substantially "C" shaped window and door channels are mounted vertically and/or horizontally where necessary. These channels function much as conventional framing lumber with the exception that they offer all of the advantages of pultruded fiberglass.

Although the preferred embodiments of the structural framing system components described herein would utilize a pultruded fiberglass material, the structural framing system of the present art may be manufactured of a variety of materials, including but not limited to wood, plastic, steel, aluminum, or other composite materials. The preferred and alternative embodiments described herein may also be manufactured in different sizes and colors.

All of the aforementioned structural components are fastened together in their respective locations with the use of conventional fasteners such as sheet metal screws, machine screws, nuts, and concrete anchor bolts, but may also be fastened using other types fasteners such as pins, studs or clamps or with the use of specialty adhesives. In a preferred embodiment, the fasteners are comprised of #10 sheet metal screws except for fastening of the column studs, ridge beam, flitch plate and associated beam, end rafters, and roof rafters which use ¼-20 machine screws for fastening.

BRIEF DESCRIPTION OF THE DRAWINGS

Numerous other objects, features and advantages of the invention should now become apparent upon a reading of the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a perspective view of a preferred embodiment of the structural framing system;

FIG. **2** is a perspective view of a structural inside column used for gable end support in an alternative embodiment;

FIG. **3** is a top plan view of the structural column of FIG. **2**;

FIG. **4** is a perspective view of structural columns used for ridge beam support internal to the structural framing system in an alternative embodiment;

FIG. **5** is a top plan view of the structural columns of FIG. **4**;

FIG. **6** is a perspective view of an outside corner post and outside studs mounted within alternative embodiment sill plates;

FIG. **7** is a top plan view of the outside corner post of FIG. **6**;

FIG. **8** is a perspective view of the roof rafters, eave plate, and outside studs assembled in a preferred embodiment;

FIG. **9** is a right side plan view of the assembly of FIG. **8**;

FIG. **10** is a perspective view an alternative embodiment ridge beam assembled with the rafters in place;

FIG. **11** is a right side plan view of the ridge beam portion of the assembly of FIG. **10**;

FIG. **12** is a top side plan view of the inside and outside stud assembly in a preferred embodiment;

FIG. **13** is a perspective view of the eave header, gable header and outside stud assembly in a preferred embodiment;

FIG. **14** is a right side plan view of the gable header and end rafter mounted onto an outside stud in a preferred embodiment;

FIG. **15** is a plan view of the alternative embodiment ridge beam assembled with end rafters in place and an alternative embodiment steel column support of the gable end;

FIG. **16** is a front plan view of a window opening showing the use of window and door channels in a preferred embodiment;

FIG. **17** is a cross sectional view of an alternative embodiment of a sill plate;

FIG. **18** is a cross sectional view of a preferred embodiment of a sill plate;

FIG. **19** is a cross sectional view of a preferred embodiment of an outside corner post;

FIG. **20** is a cross sectional view of a preferred embodiment of an outside stud;

FIG. **21** is a cross sectional view of a preferred embodiment of an inside stud;

FIG. **22** is a cross sectional view of a preferred embodiment of an eave header, showing an inside attachment clip in phantom;

FIG. **23** is a cross sectional view of a preferred embodiment of a gable header, showing an inside attachment clip in phantom;

FIG. **24** is a cross sectional view of a preferred embodiment of an inside attachment clip;

FIG. **25** is a cross sectional view of a preferred embodiment of a ridge beam;

FIG. **26** is a cross sectional view of a fastener joined section of a ridge beam of an alternative embodiment;

FIG. **27** is a cross sectional view of a preferred embodiment of a roof rafter showing a rafter clip in phantom;

FIG. **28** is a cross sectional view of a preferred embodiment of a rafter clip;

FIG. **29** is a cross sectional view of a preferred embodiment of an end rafter;

FIG. **30** is a cross sectional view of a preferred embodiment of a structural column stud;

FIG. **31** is a cross sectional view of a preferred embodiment of a window and door channel;

FIG. **32** is a perspective view of an eave header supported by outside studs and having a pair of truss clips mounted thereon;

FIG. **33** is a perspective view of one end of a pair of trusses mounted onto the assembly of FIG. **32**.

DETAILED DESCRIPTION

Referring now to the drawings there is shown a preferred embodiment in FIGS. **1**, **6–16**, **18–25**, & **27–31** of the structural framing system and the individual components of the invention, with FIGS. **6**, **7**, **15**, **32** & **33** having some alternative components. Alternative embodiments of the structural column stud, sill plate and ridge beam are shown in FIGS. **2–5**, **17**, **26** respectively. An alternative embodiment showing the use of trusses is shown in FIG. **32**. All of the structural components described hereafter, except for those noted, are elongated members whose cross section is substantially constant throughout the members elongation, thereby requiring description of the cross section only.

The drawings show the structural framing system **10** affixed to a concrete footing **12**. Preferred embodiments would not require a concrete footing **12**, although one may be used for added structural integrity. The drawings also show a plurality of sill plates **14** arranged in a substantially rectangular form **20**. The substantially rectangular form **20** defines an internal portion **22** and an external portion **24**. In a preferred embodiment, the sill plate **14** is manufactured of pultruded fiberglass with a cross section of "U" shaped channel **18** and an integral extension plate **16** extending from the lowest portion of the "U" shape **18**. The integral extension plate **16** provides additional support for said sill plate **14**,especially when a concrete footing **12** is not used. Alternative embodiments of the sill plate **14** do not contain the extension plate **16** and are primarily for applications which have a concrete footing **12**.

Into the sill plates **14** "U" shaped channel **18**, at the corners of the substantially rectangular form **20**, is attached and mounted four or more outside corner posts **26** which are positioned substantially perpendicular to and attached to said sill plates **14**. In a preferred embodiment, the outside corner posts **26** are formed from pultruded fiberglass with a substantially rectangular and hollow cross section **27** with extension ears **28** on each portion of the cross section which abuts the external portion **24** of the substantially rectangular **20** sill plate **14** form. A preferred embodiment of the outside corner post also has a concave cross section portion **30** which is located on a corner nearest the internal portion **22** of the rectangular cross section **27** and substantially opposite the corner of the portion of the cross section **27** which is located near the external portion **24** of the rectangular sill plate form **20**. In a preferred embodiment, both the extension ears **28** and the concave portion **30** run the entire length of the outside corner post **26**.

Further attached and mounted onto the sill plates **14** is a plurality of outside studs **32** which are also placed within and **3**substantially perpendicular to the sill plates **14** nearest the external portion **24**. In a preferred embodiment, the outside studs **32** are formed from pultruded fiberglass and separated by **24** inches, center to center, but may be separated by any width required by the application. The aforementioned outside studs **32** and the outside corner posts **26** are capable of being cut to various lengths in order to accommodate the height and contour of the structure **10** desired. In a preferred embodiment, each outside stud **32** is formed as a one piece substantially rectangular and hollow cross section **34** having coplaner and substantially flat ears **36** on that portion of the outside stud which is located near the external portion **24** of the substantially rectangular sill plate form **20** when placed. Operating in conjunction with the outside studs **32** are a plurality of inside studs **38**. Each inside stud **38** has substantially the same cross section as the outside stud **32** except that the inside stud **38** has a lengthwise slot **40** located between said flat ears **36** and through a wall of said rectangular cross section **34**. Hereafter for claim purposes, the cross sectional description of the inside stud **38** shall be described as a second rectangular and hollow cross section in combination with a second coplaner and substantially flat ear. The slot **40** in the inside stud **38** allows for convenient runs and placement of utility wires and pipes within the hollow portion of the inside stud **38**. The inside stud **38** is placed, within the sill plate **14** and attached, and assembled such that it mates lengthwise with the outside stud and has its flat ears opposite and away from **1022** of the su **32** on the internal portion **22** of the substantially rectangular sill plate form **20**. The inside stud **38** is also attached and mounted in a position which is substantially perpendicular to the sill plates **14**. Again, in a preferred embodiment, each inside stud **32** is formed as a single stud from pultruded fiberglass.

Upon placement of the outside studs **32**, outside corner posts **26**, and the inside studs **38**, the structural framing system **10** is capable of accepting an attachment of two or more eave headers **42** onto those portions of said studs **38**, **32** and posts **26** opposite the sill plate **14**. The eave header **42** cross section is formed from a first eave plate **44** and a

second eave plate **46** which are positioned between 90 and 135 degrees relative to each other. Within the portion having said angle between 90 and 135 degrees is placed an eave plate support section **48**. The eave plate support section **48** forms a support web between the aforesaid plates **44**, **46** and thereby reinforces the strength of the header **42**. Although the support section **48** may take the form of any shape which helps to support the aforesaid plates **44**, **46**, in a preferred embodiment, the section **48** forms a substantially right angle. Again, in a preferred embodiment, each eave header **42** is formed as a single header from pultruded fiberglass. Furthermore, in a preferred embodiment, the eave headers **42** are typically used in pairs and placed on two opposing sides of the substantially rectangular form **20** in order to form the eave base for the structural framing system **10**.

Securing of each eave header **42** is achieved via the use of an inside attachment clip **54** which holds the header to the outside **32** and inside **38** stud combination via attachment to the eave plate support section **48**. The combination of the inside clip **54** and the header **42** forms an eave header channel **50** for utility runs. A channel cover, typically vinyl, is used for enclosure and covering of said channel **50**.

The inside attachment clip **54** cross section is typically formed from a clip "U" shaped channel **56** having an attachment lip **58** and a contacting ear **60** formed integrally with said channel **56**. The attachment lip **58** extends above the open end of the "U" shaped channel **56** and is generally parallel with and in-line with a leg of the topmost portion of the "U" of the "U" shaped channel **56**. In a preferred embodiment, affixation of the inside attachment clip **54** to the eave header **42** is achieved via a fastener **122** which is placed through the attachment lip **58** and into the eave plate support section **48**. The fastener **122** is typically a screw but may also be a pin, clamp, bolt or even an adhesive.

The contacting ear **60** is generally parallel with a leg of the "U", opposite the attachment lip **58**, of the "U" shaped channel **56** but extends below the base of the "U". In operation, the contacting ear **60** abuts the inside stud **38** and allows the eave header **42**/inside attachment clip **54** combination to affix to the inside stud **38**/outside stud **32** combination when the aforesaid fastener **122** is secured.

For the gable ends of the structural framing system **10**, two or more gable headers **62** are placed atop the inside stud **38**/outside stud **32** combination. In a preferred embodiment, the gable headers **62** are placed in a generally 90 degree horizontal relationship with the eave headers **42**. The gable headers **62** share a somewhat similar geometric cross section with the eave header **42**. The gable header **62** is comprised of a first gable plate **64**, a second gable plate **66**, and a gable plate support section **68**. The gable header **62** cross section is formed from a first gable plate **64** and a second gable plate **66** which are positioned approximately 90 degrees relative to each other. Within the portion having said angle is placed a gable plate support section **68**. The gable plate support section **68** also forms a support web between the aforesaid plates **64**, **66** and thereby reinforces the strength of the header **62**. Although the support section **68** may take the form of any shape which helps to support the aforesaid plates **64**, **66**, in a preferred embodiment, the section **68** forms a substantially right angle. Again, in a preferred embodiment, each gable header **62** is formed as a single header from pultruded fiberglass. Furthermore, in a preferred embodiment, the gable headers **62** are typically used in pairs and placed on two opposing sides of the substantially rectangular form **20** in order to form the gable base for the structural framing system **10**.

As with the eave headers **42**, securing of each gable header **62** is achieved via the use of an inside attachment clip **54** which holds the header to the outside **32** and inside **38** stud combination via attachment to the gable plate support section **68**. The combination of the inside clip **54** and the header **62** forms a gable header channel **70** for utility runs. A channel cover, typically vinyl, is used for enclosure and covering of said channel **70** if not altready covered by drywall or other wallboard type material.

Upon the installation of the eave headers **42** and gable headers **62** a ridge beam **74** is placed and attached between the two opposing sides of the substantially rectangular form **20** containing the gable headers **62**. In a preferred embodiment as shown in FIG. **25**, the ridge beam **74** is comprised of a "T" -shaped member **76** having one or more rest plates **78** at the base of the "T". The rest plates **78** are positioned at an angle between 90 and 135 degrees relative to the base of the "T" where they are mounted. Onto the rest plates **78** and opposite the base of the mounting point is placed one or more plate ears **79** which are mounted substantially inline with the "T"-shaped member **76**. Alternative embodiments could have plate ears **79** with any angle relative to the "T"-shaped member **76** which the user desires.

In a preferred embodiment, placement of the ridge beam **74** is accomplished by the removal of the plate ears **79** only on that portion of the ridge beam **74** which rests upon the gable headers **62**.

In a preferred embodiment, once the proper length of plate ears **79** are removed, the ridge beam **74** is positioned onto the gable headers **62** generally towards the center of the substantially rectangular form **20**. Alternative embodiments may position the ridge beam **74** onto any portion of the gable headers **42** which is desired by the user. Upon positioning, the ridge beam **74** is secured to the gable headers **42** with fasteners **122** wherever the user deems appropriate. In a preferred embodiment, a ridge beam cover, typically vinyl, is placed between the plate ears **79** opposite the rest plates **78** if the space between said ears **79** has not been previously encased by a covering material such as drywall. This allows the volume defined by the rest plates **78** and plate ears **79** to serve as an area for utility runs. Again, in a preferred embodiment, each ridge beam **74** is formed as a single beam from pultruded fiberglass.

In some applications, a longer and stiffer ridge beam may be desirable. An alternative embodiment of the ridge beam **74** would be useful in this type of application. An alternative ridge beam **74** is comprised of two fastener joined sections **82** between which is sandwiched a flitch plate **92**. The flitch plate **92** is typically manufactured of steel although other structural materials such as aluminum alloy, composites, wood or plastic may be used for the flitch plate **92** as required for the application. The cross section of the fastener joined section **82** is comprised of a first vertical plate **84** onto which is formed a top plate **86**. In a preferred form, the top plate **86** generally forms a right angle with the first vertical plate **84**. Alternative forms could place the top plate **86** at any angle which is necessary for the application.

Onto the first vertical plate **84** and opposite the top plate **86** is formed a bottom channel plate **90** having a bottom channel ear **91** in a preferred form. The bottom channel plate **90** is generally positioned in a 90 degree relation to the first vertical plate **84** in a preferred form. Alternative forms may have any angle which is most desirable for the application. Between the top plate **86** and the bottom channel plate **90** is formed a rest plate **88**. The rest plate **88** typically forms a minor angle with the first vertical plate **84** between 40 and 90 degrees, depending on the desired pitch of the roof of the structural framing system **10**.

The alternative embodiment of the ridge beam **74** which contains the flitch plate **92** is typically placed and fastener mounted onto steel columns **98** at the gable ends of the structural framing system **10**, although column studs **94** may also be used. The bottom channel plate **90** of the alternative embodiment of the ridge beam **74** is typically placed onto the steel columns **98** and secured with fasteners **122**. The ridge beam **74** position is generally towards the center of the substantially rectangular form **20**. Further alternative embodiments may position the alternative ridge beam **74** onto any portion of the gable end which is required by the application.

Support is provided on the ends of the ridge beam **74** by column studs **94** or steel columns **98**. The column studs **74** replace the outside studs **32** under the gable header **62** where the ridge beam **74** is located. Each column stud **74** has substantially the same outside cross section as the outside stud **32** with the exception that the substantially rectangular and hollow cross section **34** has a thickened rectangular wall **96**. In a preferred embodiment, each column stud **74** is formed as a single stud from pultruded fiberglass. If further support is required for the ridge beam **74**, one or more column studs **94** or steel columns **98** are located under the ridge beam **74** at various points within the structural framing system **10**. In an alternative embodiment, especially where building codes or strength requirements dictate, steel columns **98** are used to support the ridge beam as an alternative to the column studs **94**. When steel columns **98** are used, typically channels **120** are positioned and secured next to the steel column **98**. This provides a secure interface of the gable headers **62** with the intersection point of the steel column **98**, ridge beam **74** and gable headers **62**.

Upon installation of the ridge beam **74** and its supporting columns **98** or studs **94**, a plurality of rafters **100** are placed and attached between the ridge beam **74** and the eave headers **42**. Each rafter **100** rests upon the first eave plate **44** and the rest plate, **78** or **88**, of the ridge beam **74**. Again, each rafter is secured with fasteners **122** to the ridge beam **74** and the eave header **42**. In a preferred embodiment, each rafter **100** is separated by **24** inches, center to center, but may be separated by any width required by the application.

In a preferred embodiment, the rafter **100** cross section is formed as a substantially inverted "T" shaped form **102** with an attaching rafter clip **108** located at the topmost portion of the inverted "T". The substantially inverted "T" shaped form **102** contains a thickened top boss portion **104** which allows for fasteners **122** to be placed into it for securing of the rafter clips **108**. Further securing of the rafter clip **108** is provided by a lengthwise notch **106** on the thickened top boss portion **104** of the rafter **100**. In a preferred embodiment, each rafter **100** is formed as a single rafter from pultruded fiberglass.

Each rafter clip **108** is formed as a substantially flat plate **110** with a center rib **112**. The center rib **112** fits integrally with the lengthwise notch **106** of the rafter **100** to help secure the rafter clip **108** to the rafter **100**. In a preferred embodiment, each rafter clip **108** is formed as a single pultruded fiberglass plate.

Before the rafter clip **108** is secured to the rafter **100**, a roofing panel or insulation **118** is typically placed into the area formed by the ears of the "T" **102** and the rafter clip **108**. Once fastened, the rafter clip **108** helps to hold and secure the roofing panel or insulation **118** in place.

At each gable end of the structural framing system **10**, an end rafter **114** is used in place of the rafter **100** and fits between the ridge beam **74** and the eave header **42** as a typical rafter **100**. The end rafter **114** has substantially the same cross section as the rafter **100** with the exception of its cross section having a substantially "L" shaped form **116**. The ear of the "L" shape **116** is placed toward the internal portion **22** of the substantially rectangular form **20** when installed and functions the same as the "T" **102** of the rafter **100**. Use of this end rafter **114** prevents unwanted overhang near the external portion **24** of the substantially rectangular form **20** at the gable ends and also brings outside closure to the edge of the structure within the rafter plane. Again, in a preferred embodiment, each end rafter **114** is formed as a single pultruded fiberglass rafter. A rafter clip **108** is placed onto each end rafter **114** in the same manner as with the rafters **100** in order to sandwich and hold roofing panels and/or insulation material **118**.

An alternative embodiment would replace the structure defined by the ridge beam **74**, the rafters **100**, and the end rafters **114** with a plurality of roof trusses **126**. Each roof truss **126** rests upon opposing eave headers **42** and spans the entire width of the structure. Each roof truss **126** is secured to the eave header **42** by means of a truss clip **130** which is secured to each member by means of fasteners **122**. The roof truss **126** is of conventional design and preferably formed from plurality of rectangular pultruded members having a hollow cross section **128** and connected with fasteners and/or plates. The exact angular placement of the rectangular members **128** within the truss **126** form can vary substantially in a conventional truss design as described here.

Should the user desire window or door framing, a plurality of window and door channels **120** are provided. Each window and door channel **120** is of substantially "C" shaped cross section and in a preferred embodiment formed as a single pultruded fiberglass channel. Each channel **120** is mounted vertically and/or horizontally where necessary to form a generally rectangular frame and is cut to the required length when placed. The channels **120** function much as conventional framing lumber with the exception that they offer all of the advantages of pultruded fiberglass in a referred embodiment. An angle **124** is typically placed at the intersection of each channel **120** and secured with fasteners **122** in order to secure each channel **120**.

Although the preferred embodiments of the structural framing system described herein would utilize a pultruded fiberglass material, the structural framing system of the present art may be manufactured of a variety of materials, including but not limited to wood, plastic, steel, aluminum, or other composite materials. The preferred and alternative embodiments described herein may also be manufactured in different sizes and colors.

All of the aforementioned structural components are fastened together in their respective locations with the use of conventional fasteners **122** such as sheet metal screws, machine screws, nuts, and concrete anchor bolts, but may also be fastened using other types fasteners such as pins, studs or clamps or with the use of specialty adhesives. In a preferred embodiment, the fasteners are comprised of #10 sheet metal screws except for fastening of the column studs, ridge beam, flitch plate and associated beam, end rafters, and roof rafters which use ¼-20 machine screws for fastening.

Upon assembly of the structural framing system **10**, the external **24** and the internal **24** portions may be finished as the user desires. That is, if exterior siding is desired, it may be attached to the outside studs **32** as in conventional framing systems. If interior drywall is desired, it may also be attached to the inside studs **38** as in conventional framing systems. Again typically fasteners **122** are used for the attachment. Provisions have been made and described herein for utility runs such as electric and water.

From the foregoing description those skilled in the art will appreciate that all objects of the present invention are realized. An structural framing system and method of assembly been shown and described which permits a user to provide a strong, and weather and corrosion resistant, frame for a house, shed or shelter with a minimum of skilled labor or specialty tools. The art of this invention in its preferred pultruded form is able to withstand severe wind, temperature and corrosion conditions and yet provide a comfortable shelter. The present invention, in alternate embodiments with the unique cross sections described, provides for the use of materials other than pultruded fiberglass when the conditions require.

Having described the invention in detail, those skilled in the art will appreciate that modifications may be made of the invention without departing from its spirit. Therefore, it is not intended that the scope of the invention be limited to the specific embodiments illustrated and described. Rather it is intended that the scope of this invention be determined by the appended claims and their equivalents.

What is claimed is:

1. A structural framing system, comprised of:

a plurality of elongated members, said elongated members further described as,

a plurality of sill plates arranged in a substantially rectangular form having an internal and external portion; and

four or more outside corner posts placed onto and substantially perpendicular to said sill plates at corners of said rectangular form; and

a plurality of outside studs placed and secured onto and substantially perpendicular to said sill plates near said external portion; and

a plurality of inside studs placed and secured onto and substantially perpendicular to said sill plates near said internal portion and mated lengthwise with said outside stud; and

two or more eave headers placed and secured onto said outside studs and said inside studs opposite said sill plate and on two opposing sides of said substantially rectangular form whereby said eave headers form an eave base; and

two or more gable headers placed and secured onto said outside studs and said inside studs opposite said sill plate and onto those sides of said substantially rectangular form not having eave headers; and

one or more ridge beams placed between the sides of said substantially rectangular form having said gable headers and attached thereto; and

one or more columns placed at each end of said one or more ridge beams, whereby said columns provide support for said ridge beam; and

a plurality of rafters placed and attached between said ridge beam and said eave headers.

2. The structural framing system as set forth in claim **1** whereby:

said sill plates, outside corner posts, outside studs, inside studs, eave headers, gable headers, ridge beams, columns, and rafters are manufactured of pultruded fiberglass material.

3. The structural framing system as set forth in claim **1** whereby:

said sill plate comprises a cross section of "U" shape; and

said outside corner post comprises a substantially rectangular cross section with extension ears on a portion of the substantially rectangular cross section which abuts said sill plate and which is proximate said external portion; and

said outside stud comprises a cross section which is substantially rectangular with coplanar and substantially flat ears on that portion of said outside studs substantially rectangular cross section which is proximate said external portion; and

said inside stud comprises a cross section equivalent to said outside studs and further comprising a lengthwise slot between said substantially flat ears; and

said eave header cross section comprises an integral first eave plate, a second eave plate and an eave plate support section, said first eave plate and said second eave plate integrally positioned between 90 and 135 degrees relative to each other and said eave plate support section positioned within an area formed between said first eave plate and said second eave plate, whereby said rafters are able to rest upon said first eave plate; and

said gable header cross section comprises an integral first gable plate, a second gable plate and a gable plate support section, said first gable plate and said second gable plate integrally positioned approximately 90 degrees relative to each other and said gable plate support section positioned within an area formed between said first gable plate and said second gable plate; and

said rafters cross section comprises an inverted "T" shaped form having a top side and bottom side.

4. The structural framing system as set forth in claim **3** whereby:

said sill plates, outside corner posts, outside studs, inside studs, eave headers, gable headers, ridge beams, columns, and rafters are manufactured from pultruded fiberglass material.

5. The structural framing system as set forth in claim **3** whereby:

said ridge beam cross section comprises a "T" shaped member having a base and a top, and having one or more rest plates attached upon said base of said "T", and further having one or more plate ears integrally attached to said rest plates,

whereby said rafters are able to rest upon said rest plates.

6. The structural framing system as set forth in claim **3** whereby:

said ridge beam cross section comprises two fastener joined sections having a flitch plate sandwiched between said fastener joined sections;

said fastener joined section cross section having a first vertical plate with a top plate, and a bottom channel plate attached to said vertical plate opposite said top plate, and a rest plate attached between said top plate and said bottom channel plate,

whereby said rafters are able to rest upon said rest plate.

7. The structural framing system as set forth in claim **3** whereby:

said column is comprised of a column stud having an outside cross section of substantially similar outside cross section as said outside stud.

8. The structural framing system as set forth in claim **3** whereby:

said column is comprised of a steel column.

9. The structural framing system as set forth in claim **1** further comprising:

one or more end rafters located proximately near said gable headers between said eave header and said ridge beam.

10. The structural framing system as set forth in claim **9** whereby:

said end rafter comprises a substantially "L" shaped cross sectional form.

11. The structural framing system as set forth in claim **3** whereby:

said eave headers and said gable headers are secured onto said outside studs and said inside studs with a plurality of inside attachment clips which attach to said eave headers and said gable headers.

12. The structural framing system as set forth in claim **11** whereby:

said inside attachment clip comprises a clip "U" shaped channel, having an open end and a closed end, and having an attachment lip and a contacting ear formed integrally with said "U" shaped channel such that said attachment lip extends above the open end of said "U" shaped channel and said contacting ear extends below the closed end of said "U" shaped channel,

whereby affixation of the inside attachment clip to the eave header is achieved via placement of a fastener through said attachment lip and into said eave header or gable header; and

whereby said eave headers and said gable headers are secured onto said outside studs and said inside studs via said contacting ear abutment against said inside stud and said second eave plate or second gable plate abutment against said outside stud when said fastener is placed.

13. The structural framing system as set forth in claim **3** further comprising:

a plurality of rafter clips having a substantially flat shape and attached to said top side of said rafters,

whereby said rafter clips are capable of holding insulation or roofing panels against said rafters.

14. The structural framing system as set forth in claim **3** further comprising:

a plurality of window and door channels of substantially "C" shape and formed into a substantially rectangular frame, whereby said frame may accept a door or window.

15. The structural framing system as set forth in claim **14** whereby:

said sill plates, outside corner posts, outside studs, inside studs, eave headers, gable headers, ridge beams, columns, rafters, and window and door channels are manufactured from pultruded fiberglass material.

16. The structural framing system as set forth in claim **3** said sill plate cross section further comprising:

an extension plate extending from said "U" shape, whereby said extension plate provides additional support for said sill plate.

17. A structural framing system, comprised of:

a plurality of elongated members, said elongated members further described as,

a plurality of sill plates arranged in a substantially rectangular form having an internal and external portion; and

four or more outside corner posts placed onto and substantially perpendicular to said sill plates at corners of said rectangular form; and

a plurality of outside studs placed and secured onto and substantially perpendicular to said sill plates near said external portion; and

a plurality of inside studs placed and secured onto and substantially perpendicular to said sill plates near said internal portion and mated lengthwise with said outside stud; and

two or more eave headers placed and secured onto said outside studs and said inside studs opposite said sill plate and on two opposing sides of said substantially rectangular form whereby said eave headers form an eave base; and

two or more gable headers placed and secured onto said outside studs and said inside studs opposite said sill plate and onto those sides of said substantially rectangular form not having eave headers; and

a plurality of roof trusses of conventional design placed and secured upon said eave headers on each of said two opposing sides; and

said roof trusses formed from a plurality of substantially rectangular members having a hollow core.

18. The structural framing system as set forth in claim **17** whereby:

said sill plates, outside corner posts, outside studs, inside studs, eave headers, gable headers, and said substantially rectangular members of said roof trusses are manufactured of pultruded fiberglass material.

* * * * *