GUTTER STRUCTURE FOR HOLDING FLEXIBLE AND NON-FLEXIBLE COVERS

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UNITED STATES PATENTS
1,419,126 6/1922 Besnard 52/13
2,805,506 9/1957 Thompson 50/739 X

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ABSTRACT

A gutter is provided for use with either flexible or nonflexible cover materials in forming building structures, such as greenhouses. The gutter serves as a conduit for carrying water, an important structural load carrying member, and as a means for securing cover materials to the building frame. The new gutter has a uniform cross-section along its length and can conveniently be formed by extruding aluminum through a die. The gutter includes a web and a pair of mounting plates to attach the gutter to vertical posts. A plurality of mounting brackets extend from the web and include means for securing a flexible cover thereto. The presence of the mounting plates and mounting brackets makes the gutter a strong, but lightweight structural member, and permits minimizing the thickness of the web.

A clip is provided for holding a flexible cover on a mounting bracket. The clip is an elongated, resilient member having a generally C-shaped cross section. The terminal ends of the C-shaped cross section in an externally unstressed state are positioned a distance apart that is less than the distance between the ends of a flange of the mounting bracket. The clip is resilient so that its cross section can be deformed to permit the clip to slip around the flexible cover when placed in overlapping contact about the outer surface of the flange. The flexible cover is held in frictional engagement between the internal surface of the terminal ends of the clip and the flange by the resilient force exerted by the clip as it attempts to regain its unstressed conformation.

15 Claims, 7 Drawing Figures
GUTTER STRUCTURE FOR HOLDING FLEXIBLE AND NON-FLEXIBLE COVERS

FIELD OF THE INVENTION

This invention relates to a gutter for attaching a flexible or a non-flexible cover to a frame, to structures including a flexible or a non-flexible cover attached on a frame, to a clip for attaching a flexible cover to a frame and to methods of forming frame structures, such as greenhouses and the like. While the detailed description of the invention which follows, and the drawings describe and illustrate the invention used in greenhouse structures, the invention possesses a variety of uses. For example, it is frequently necessary to enclose building construction sites in the winter with large sheets of polyethylene or the like to allow workmen some protection from the elements, or to permit concrete to cure at temperatures above 32°F. The present invention possesses utility in forming such enclosures.

BACKGROUND OF THE INVENTION

In recent years, new materials such as plastics, fiberglass, and the like have come to be used in construction of greenhouse structures, in place of the traditional glass.

At first, plastic was simply stretched over wood frames and wooden slats were then placed on top of the plastic and nailed to the wooden frames. Such construction was found to be relatively expensive to maintain and required a large amount of time to assemble. Additionally, with this construction, it was difficult to eliminate wrinkles in the cover.

It was later found that the structures could be made by using a plurality of arched ribs having grooves in their upper surfaces. The plastic was then positioned over the ribs and was held in place by the use of cables or rods which were stressed at their ends to cause the cables and adjacent cover to be drawn into the groove in the upper surface of the ribs.

While this construction eliminated the need for nailing and also helped to stretch the flexible covering, it still was difficult and time-consuming to install, created stress on the flexible covering at the area where it entered the groove, and also was not readily adaptable for use with materials such as corrugated fiberglass.

An improved structure for holding flexible covers is described in U.S. Pat. No. 3,531,899. This structure avoids the need for nailing a flexible cover to a frame, but does not eliminate the need for intermittently placing some sort of a holding device across greenhouse roof to securely fasten the cover to the frame. Until applicants' present invention, there has remained a need for simple effective means for securely holding a flexible cover by attachment to only the sides of the greenhouse.

In the past, different structural members were needed when using flexible cover made of material such as polyethylene or polyvinyl chloride on the one hand and relatively rigid covers made of such materials as fiberglass or aluminum on the other hand. Further, depending on what material was used, a variety of brackets, braces and other support members would be combined to form the overall support structure. Accordingly, there is a need for a structural member that can be used with either flexible or relatively non-flexible covers.

BRIEF DESCRIPTION OF THE INVENTION

The present invention, in one embodiment, comprises a gutter that can be used with either flexible or non-flexible cover materials. The new gutter comprises an elongated web having a first longitudinally extending sidewall, a second longitudinally extending sidewall, and a longitudinally extending central portion connecting the sidewalls. A first mounting plate depends from the web on one side of the central portion and a second mounting plate depends from the web on an opposite side of the central portion for securing the gutter to a support post. A first mounting bracket depends from the web and is spaced outwardly of and adjacent to the first mounting plate to form a first recess therewith and a second mounting bracket depends from said web and is spaced outwardly of and adjacent to the second mounting plate to form a second recess therewith, with the recess being capable of receiving a non-flexible cover material. A third mounting bracket on the first sidewall of the web extends inwardly toward the center axis of the web to form a shelf with the first sidewall and a fourth mounting bracket on the second sidewall of the web extends inwardly toward the center axis of the web to form a shelf with the second sidewalk. The first, second, third and fourth mounting brackets each have means for securing a flexible cover thereto.

Preferably, each mounting bracket includes a support rib connected to an elongated terminal flange. The terminal flange preferably has a substantially uniform cross section along its length, and a centrally located portion connected to the support rib. The ends of the terminal flange are rounded. A flexible cover can be held in laminar contact with the outer surface and the rounded ends of the terminal flange by a resilient clip.

In accordance with one aspect of the present invention, the resilient clip preferably is an elongated member having a cross section, in a plane transverse of its length, that is generally C-shaped. Each of the terminal ends of the C-shaped cross section have a smoothly curved internal and external surface. These smooth surfaces converge in a smooth curve at a point of inflection. The terminal ends of the C-shaped cross section in an externally unstressed state are positioned a distance apart that is less than the distance between the ends of the terminal flange on the mounting bracket. The clip is resilient so its C-shaped cross section can be deformed to permit the clip to slip around a flexible cover when the flexible cover is placed in laminar contact about the outer surface and ends of the terminal flange. The flexible cover is held in frictional engagement between the internal surface of the terminal arms and the ends of the flange by a resilient force exerted by the clip.

The gutter of this invention can be used to support either a flexible or non-flexible cover material as a roof material and simultaneously to support either a flexible or non-flexible cover material as a sidewall of a building structure. The gutter is easily manufactured as a one-piece extruded member and eliminates the need for close machining and fitting parts together during manufacture. The gutter can perform a variety of functions and permits great flexibility in systems designed for building structures. The gutter also permits building structures to be more simply erected because of its combination of a variety of functions into a single...
member and thereby enables relatively unskilled labor to erect building structures from it.

In another embodiment, the invention comprises a method of attaching a flexible cover on a gutter using the clip described above to hold the flexible cover on the mounting bracket described above.

The present invention provides a more air tight means for flexible cover hold down than has previously been possible. This air tightness makes the present structure especially desirable for use in constructing polyethylene or polyvinyl chloride greenhouses having a double layer roof with a layer of air under pressure maintained between the two layers.

The clip of this invention can be quickly installed. Installation requires no tools except a rubber mallet to drive the clip onto the mounting bracket. In some instances, the clip can be pressed on by hand. No additional screws, fasteners or special tools are required. Removal of the clip from a structure for replacement of the flexible cover is as easy and trouble free as the installation procedure. A screw driver can be used to loosen the clip at one end. Subsequently, the remainder of the clip can be stripped off in a longitudinal pulling motion to free the clip of any adhesive bandage.

The clip is almost unbreakable under normal applications and use, is maintenance free while in place, and can be reused. Based on present experience, the clip can be installed, removed, and then reinstalled at least 15 to 20 times.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings illustrate an example of a preferred embodiment of the invention and, together with the description, serve to explain the principles of the invention.

Of the drawings:

FIG. 1 is a schematic end view of a frame for a greenhouse having a cover installed to form the roof and sidewall.

FIG. 2 is a schematic side elevation view of the structure of FIG. 1 with the covers omitted for ease of viewing.

FIG. 3 is a greatly enlarged cross section taken along line 3—3 of FIG. 2 and shows a gutter construction in accordance with the teachings of the present invention.

FIG. 4 is an exploded perspective view of a portion of the gutter of FIG. 3 and showing how it would be joined to a support post and another gutter.

FIG. 5 is a front elevation view showing the use of a gutter with a flexible cover for the roof and sidewalls of a building structure.

FIG. 6 is a front elevation view showing the use of a gutter with a fiberglass roof and fiberglass sidewalls.

FIG. 7 is a perspective view of a portion of a clip used in FIG. 5 to fasten the flexible cover to the gutter.

With reference to FIGS. 1 and 2 of the drawings, it can be seen that a frame, generally 10, is provided for supporting a cover for a greenhouse. The greenhouse frame includes a first row 12 of coaxially aligned elongated gutters, generally 14, and a substantially parallel second row 16 of coaxially aligned elongated gutters that are identical to gutters 14. Row 16 is illustrated in FIG. 2 and includes eight gutters 14.

Supporting vertical supports 18 are provided at intervals along the length of gutters 14 to support the overall structural frame. These vertical supports can be anchored in concrete footings 15 embedded in the ground. It should be understood that row 12 would be positioned at the same elevation as row 16 above centrally located vertical supports 18 as illustrated in FIG. 1.

As illustrated in FIGS. 1 and 2, the greenhouse frame 10 includes a plurality of spaced, arched, substantially parallel, elongated, trusses or ribs 20 that provide support for a cover 22 that extends over the entire outer surface of these truss members. A joining member 24 extends along the top of the greenhouse and joins arched ribs 20 along the upper portions of their interior surface.

A second cover 26 is illustrated in FIG. 1 that forms one sidewall of the greenhouse structure.

In accordance with the invention, the gutter includes an elongated web having a first longitudinally extending sidewall, a second longitudinally extending sidewall and a longitudinally extending center portion connecting the sidewalls. As here embodied, and as illustrated in FIGS. 3 and 4, gutter 14 includes an elongated web 28. Web 28 includes an elongated center portion 30, a first longitudinally extending sidewall 32, and a second longitudinally extending sidewall 34. Center portion 30 has a concave upper surface and a center axis 36 that runs the length of gutter 14. Sidewalls 32 and 34 are integrally joined to opposite sides of center portion 30 and diverge upwardly and outwardly from each other from the opposing sides of center portion 30. Gutter 14 has a uniform cross section along its entire length.

In accordance with the invention, a first mounting plate depends from the web on one side of the central portion and a second mounting plate depends from the web on an opposite side of the central portion for securing the gutter to a support post. As here embodied, a first mounting plate, generally 36, extends vertically downwardly from center portion 30 adjacent first sidewall 32. Similarly, a second mounting plate, generally 40, extends vertically downwardly from center portion 30 adjacent second sidewall 34. The front of each mounting plate 38 and 40 has an aligned opening 42 (best seen in FIG. 4) at its lower end to receive a bolt 44 for securing gutter 14 to a vertical post 18. Bolt 44 is threaded at one end and a nut 45 is secured to the threaded end to fasten gutter 14 to support post 18.

In accordance with the invention, a first mounting bracket depends from the web and is spaced outwardly of and adjacent to the first mounting plate to form a first recess therewith. A second mounting bracket depends from the web and is spaced outwardly of and adjacent to the second mounting plate to form a second recess therewith. The first and second recesses are capable of receiving non-flexible cover material such as a sheet of fiberglass. As here embodied, a first mounting bracket, generally 46, extends vertically downwardly from first sidewall 30 adjacent center portion 30 and forms a first recess 48 with first mounting plate 38. Similarly, a second mounting bracket, generally 50, extends vertically downwardly from second sidewall 34 adjacent center portion 30 and forms a second recess 52 with second mounting plate 40. Recesses 48 and 52 are provided to receive a rigid structural member such as an aluminum or fiberglass sidewall when it is desired to use such a member in forming the greenhouse. As will be explained in greater detail hereinafter, mounting brackets 46 and 50 can also be used to support a flexible cover when it is desired to form the greenhouse with a flexible sidewall.
In accordance with the invention, a third mounting bracket on the first sidewall of the web extends inwardly toward the center axis of the web to form a shelf with the first sidewall and a fourth mounting bracket on the second sidewall of the web extends inwardly toward the center axis of the web to form a shelf with the second sidewall. As here embodied, and as best seen in FIGS. 3 and 4, a third mounting bracket, generally 54, is integrally formed on first sidewall 32 a short distance from the outer edge of the first sidewall. Mounting bracket 54 extends perpendicularly from sidewall 32 toward the interior of gutter 14. The upper section of sidewall 32 and the mounting bracket 54 form a right angle shelf which can be received and support a structural member such as a truss 20 of the greenhouse structure.

Similarly, a fourth mounting bracket, generally 56, is integrally formed on second sidewall 34 a short distance from the outer edge of the second sidewall. Mounting bracket 54 extends perpendicularly from sidewall 34 toward the interior of gutter 14. The upper section of sidewall 34 and the mounting bracket 56 form a right angle shelf which can be received and support a structural member such as a truss 20 of the greenhouse structure.

As here illustrated in FIGS. 1 and 2, trusses 20 are held in parallel alignment by connection to gutters 14, and joining member 24. FIG. 3 illustrates the use of a bolt 19 that extends through a hole in a flange on truss 16 and a hole in the upper shelf section of sidewall 32 of gutter 14. Bolt 19 is secured by a nut 21. A plurality of such bolts are used to connect each truss 20 to the sidewalks 32 and 34.

If desired, longitudinal braces or cross braces can be provided to assist in holding the trusses in parallel alignment.

Mounting brackets 46, 50, 54 and 56 are substantially identical and are designed to support a flexible cover. Each mounting bracket 46, 50, 54 and 56 includes a main plate 58, a support rib 60, and a terminal flange 62. One end of main plate 58 connected the mounting bracket to web 28 of gutter 14. One end of support rib is connected to main plate 58 and a terminal flange 62 is connected to the other end of support rib 60. Each terminal flange 62 has a substantially uniform cross section along its length and has a centrally located portion connected to support rib 60, so that rib 60 and terminal flange 62 present a generally T-shaped cross section in a plane transverse of the length of gutter 14.

Each of the ends of terminal flange 62, as they appear in a cross section cut by a plane transverse of the length of gutter 14 (as illustrated in FIG. 3) are rounded to prevent undue stressing of a flexible cover placed in overlapping laminar contact therewith. The outer surface of terminal flange 62 (the surface speed farthest from support web 60) is convex and forms a smooth curve. Main plates 58 of mounting bracket 54 and 56 are provided with a series of weep openings 55 along their length to prevent water from collecting on the shelf formed by these mounting brackets.

As previously stated, a plurality of gutters 14 are coaxially aligned to form a row, and means are provided to maintain the gutters in correct alignment. In a preferred embodiment of the invention, a first means is provided to maintain the center portion of one gutter in coaxial alignment with the center portion of an adjacent second gutter, and second means are provided to maintain the sidewalls of one gutter in coaxial alignment with the corresponding sidewalls of an adjacent second gutter. As here embodied, the first means for maintaining the gutters in alignment is a splice plate receiver, in the form of a first lip 64 and a second lip 66, integrally formed in gutter 14 immediately below center portion 30 of web 28. Lip 64 is spaced below center portion 30 and extends from first mounting plate 38 inwardly toward the center axis of web 28 and parallel to center portion 30. Similarly, lip 66 is spaced below center portion 30 and extends from second mounting plate 40 inwardly toward the center axis of web 28 and parallel to center portion 30. Lips 64 and 66 form slots for receiving a splice plate 68, best seen in FIG. 4, which has a shape that corresponds to center portion 30.

Each end of gutter 14 is identical in shape so that a portion of splice plate 68 can be inserted into the slots at the front of one gutter 14 and into the slots at the back of an immediately adjacent gutter to keep both gutters in coaxial alignment. The gutters can then be brought into abutting relationship and splice plate 68 can be bolted, caulked, or otherwise secured to the gutters.

The second means for maintaining a gutter in alignment with an adjacent gutter includes a first splice and drip hook 70 and a second splice and drip hook 72. Splice and drip hook 70 extends from the lower surface of first sidewall 32 at a point opposite third mounting bracket 54. Similarly, splice and drip hook 72 extends from the lower surface of second sidewall 34 at a point opposite fourth mounting bracket 56. Hooks 70 and 72 have a curved, concave, upper surface and, as illustrated in FIG. 4, each can receive a splice rod 74. As explained above, each end of gutter 14 is identical in shape so that a portion of splice rod 74 can be inserted into the hooks 70 and 72 at the front of one gutter 14 and into the hooks 70 and 72 at the back of an immediately adjacent gutter to maintain the gutters in coaxial alignment.

Gutters 14 can be made in varying lengths to meet specific building requirements. Preferably, each gutter 14 is manufactured in a length of 20 feet, and would be connected at its front to an immediately adjacent gutter 14 by a splice plate 68 and splice rods 74 at its back to an immediately adjacent gutter 14 by another splice plate 68 and a pair of splice rods 74. Vertical support posts 18 can be positioned along the length of the building structure at intervals of 80 feet or 100 feet. Each support post is capable of simultaneously supporting the front of one gutter 14 and the back of an immediately adjacent gutter 14.

In accordance with one embodiment of the invention, and as illustrated in FIG. 5, the building structure includes a flexible cover 76 as the roof of the structure. When a flexible cover is used in forming the building structure, a resilient clip 78 is provided for holding it onto a mounting bracket. As illustrated in FIGS. 5 and 7, the clip 78 comprises an elongated member having a cross section in a plane transverse to its length that includes a generally C-shaped portion. As best illustrated in FIG. 7, each of the terminal ends of the cross section of the C-shaped clip have a smoothly curved internal and external surface with the surfaces converging in a smooth curve. Terminal ends 80 and 82, when the clip is in an externally un stressed state, are positioned a distance apart that is less than the distance between the ends of terminal flange 62.
Clip 78 is made of a resilient material, such as polyvinyl chloride, so that its C-shaped cross section can be deformed to permit clip 78 to slip around a flexible cover and the ends of terminal flange 62 to assume the position of each of clips 78 illustrated in FIG. 5.

As illustrated in FIG. 5, flexible cover 76 forms the top for the greenhouse structure and is held along one edge in frictional engagement between the internal surfaces of terminal ends 80 and 82 of clip 78 and the ends of flange 62 of a mounting bracket 54 by the resilient force exerted by clip 78.

As illustrated in FIG. 7, the top end portion of the C-shaped cross section of clip 78 has a larger effective radius of curvature than the other end 82 of the cross-sectional shape. It is desirable that the ratio of the maximum width at one end of the C-shaped cross section be in the range from about 1.2 to 2.0 to 1.0. This configuration for the cross section permits the clip to be easily slipped over one end of terminal flange 62 and easily deformed to slip over the other end of terminal flange 62.

The gutters of the present invention are desirably made of extruded aluminum. Extruded aluminum gutters of the cross-sectional shape illustrated in FIGS. 3-6 are strong, yet light in weight. The presence of the mounting plates and the mounting brackets contributes to the desirable strength properties, and permits minimizing the thickness of the web. The gutter of this invention is an important structural load-carrying member of a greenhouse frame, and also serves as a conduit for carrying away rain water, and a means for securing cover material to the greenhouse frame.

The structure illustrated in FIG. 5 is assembled by first erecting the frame generally 10. Subsequently, a flexible cover such as flexible cover 76 which can conveniently be a sheet of polyethylene or polyvinyl chloride is draped over the trusses 20 and loosely placed or draped over each mounting bracket 54 in the row 16 of gutters 14. Clip 78 is then hooked over the top end of a terminal flange 62 of a mounting bracket 54 in row 16 and the portion of clip 78 adjacent to end 82 is rested against the outer surface of this terminal flange. Subsequently, clip 78 is pressed or tapped down with a mallet depending on the cover thickness, with force being applied as denoted by force arrows 84 illustrated in FIG. 7. The application of force on the larger width end of clip 78 deforms the generally C-shaped cross section of clip 78 and permits the bottom end 82 of clip 64 to lock into place behind the lower end of terminal flange 62 of mounting bracket 54. Flexible cover 76 is now held tightly and firmly on mounting bracket 54 for the life of the cover. The operation described above can be repeated to affix the other side edge of flexible cover 22 to an elongated mounting bracket (not illustrated) on gutters 14 of row 12 of the frame structure generally 10. If desired, a lubricant can be applied to clip 78 to aid in attaching the clip to terminal flange 62. In some circumstances water serves as a sufficient lubricant.

The removal of clip 78 from mounting bracket 54 can be accomplished by raising the top end 80 of clip 78 near the longitudinal end of the clip with a tool such as a screw driver. After the first 6 inches of the length of the clip has been loosened, the balance of the clip will pull off easily.

It should be realized, that the clips 78 of this invention can be spotted at strategic places along the length of flexible covers, or can be used to enclose the complete perimeter of the cover. The clips can conveniently be used with flexible covers having widely varying thicknesses. For example, a clip having an overall height of about 1 inch and a greatest width of about one-half inch can be used to attach polyethylene sheets varying in thickness from about 4 mil to 14 mil with no modification of the size of the clip or terminal flange. Thicker or thinner sheets of flexible cover can be fastened by making minor dimensional changes in either the clip or the terminal flange.

A flexible cover 86 can be used to form the side of the building structure and is attached to mounting bracket 54 by a resilient clip 78 in a manner similar to that described above. When flexible cover 86 is used to form the side of the building structure, horizontal side strips 88 are secured to vertical posts 15 of the building structure along their height. Strips 88 have an outer end similar in design to rib 60 and terminal flange 62 of mounting brackets 38, 40, 54 and 56 so that clips 78 can be used to secure flexible cover 86 to the building structure at various height positions. Also, vertical side strips 90, as best seen in FIGS. 4 and 5 can be secured to vertical post 15. Strips 90 also have an outer end similar in design to rib 60 and terminal flange 62 so that clips 78 can be used to secure flexible cover 86 to strips 90. Heat loss in the structures can be reduced by as much as 30% by using two overlying flexible covers with air between the covers for the roof and sides of the structures and clips 78 can be used with two or more flexible covers.

In accordance with another embodiment of the invention, and as illustrated in FIG. 6, a relatively rigid material such as fiberglass is used as the outer surfaces of the building structure. In this embodiment of the invention, a fiberglass roof, generally 92, is placed over trusses 20 and is secured thereto. A purlin and roof bracing angle 94 is secured to mounting brackets 54, and a rubber strip 96 is caulked onto the upper arm of angle 94. A self-tapping screw is then passed through fiberglass roof 94, rubber strip 96, and bracing angle 94 to secure the roof to the building structure.

In this embodiment of the invention, the building structure is provided with a fiberglass sidewall 98. A first bracing angle 100 is secured to vertical post 15 along a middle portion of its height and a second bracing angle 102 is spaced below bracing angle 100 and also secured to vertical post 15. A cross tie 104 is secured to bracing angles 100 and 102 and a rubber strip 106 is attached to cross tie 104. Fiberglass siding 98 can then be secured to the building structure by a self-tapping screw which passes through sidewalk 98, rubber strip 106 and cross tie 104. fiberglass siding 98 can be secured to vertical post 15 at different positions along its height such as at the bottom of post 15 by a fixing means 108 which includes two bracing angles, a cross tie, and rubber strip in an arrangement identical to that just described. The upper end of fiberglass sidewalk 98 is force fit into recess 52 with a rubber spacer strip 110.

The gutter 14 of this invention can be used to support a wide variety of different structural elements. Gutter 14 can be used to support either a flexible roof cover material or a non-flexible roof cover material. The type of sidewall material used can be selected independently of the type of roof cover and can be either a flexible or non-flexible material. Further, if desired, the sidewall
of the building structure can be made of two different types of cover material. For example, the top portion of the building structure sidewall can be a flexible cover material and the bottom portion can be a non-flexible cover material. Suitable fixing means would be provided on vertical post 15 to secure these materials to it. The use of a building sidewall having two different materials would enable the top flexible cover portion to be removed in the summer to permit wind to pass through the greenhouse.

The gutter of the present invention permits infinite variation in the internal design of a building structure for control of environmental and ecological systems. For example, large building structures could be erected by forming three or more rows of parallel gutters and providing a roof cover over the entire structure. In this design, the intermediate row or rows of gutters would use brackets 54 to support the end of one roof cover and brackets 56 to support the end of an adjacent roof cover. One section of the 3-row structure, can be sealed from an adjacent section by erecting intermediate building sidewalks from the intermediate row or rows of gutters in a manner similar to the erection of flexible sidewalk 76 shown in FIG. 5.

At times, it is desirable to sterilize a section of a greenhouse with steam. The ability to seal off a section of the greenhouse for such sterilization protects adjacent plants and minimizes steam requirements. The intermediate flexible sidewalks can be easily removed when the sterilization procedure is completed. The gutters of the present invention permit inside or outside walls of either a flexible or non-flexible material to be positively attached any place in the structure because means to receive and support either a flexible or non-flexible material are extruded in the gutter on both of its sides in the form of depending mounting brackets 46 and 48 and cooperating mounting plates 38 and 40.

The invention in its broader aspects is not limited to the specific details shown and described and departures may be made from such details without departing from the principles of the invention and without sacrificing its chief advantages.

What is claimed is:

1. A gutter for use with either flexible or non-flexible cover materials comprising:
   a. an elongated web having a first longitudinally extending sidewall, a second longitudinally extending sidewall, and a longitudinally extending central portion connecting the sidewalks;
   b. a first mounting plate depending from the web on one side of the central portion and a second mounting plate depending from the web on an opposite side of the central portion for securing the gutter to a support post;
   c. a first mounting bracket depending from the web and spaced outwardly of and adjacent to the first mounting plate to form a first recess therewith and a second mounting bracket depending from said web and spaced outwardly of and adjacent to the second mounting plate to form a second recess therewith, with the recesses being capable of receiving a non-flexible cover material; and
   d. a third mounting bracket on the first sidewall of the web, said third bracket extending inwardly toward the center axis of the web to form a shelf with the first sidewall and a fourth mounting bracket on the second sidewall of the web, said fourth bracket extending inwardly toward the center axis of the web to form a shelf with the second sidewall, the first, second, third and fourth mounting brackets each including means for securing a flexible cover thereto;

2. The gutter of claim 1 wherein each mounting bracket includes a main plate attached to said web, a support rib having one end attached to said main plate, and a terminal flange connected to the other end of the support rib, said terminal flange having a substantially uniform cross section along its length, and having a centrally located portion connected to said support rib, and the ends of said terminal flange being rounded.

3. The structure of claim 2 wherein the outer surface of said terminal flange is convex.

4. The gutter of claim 1 including aligning means for maintaining coaxial alignment of the gutter with another gutter.

5. The gutter of claim 4 wherein said aligning means includes a first lip extending from said first mounting plate inwardly toward the centerline of said web and a second lip extending from said second mounting plate inwardly toward the centerline of said web, said lips forming a pair of slots for slidably receiving a splice plate.

6. The gutter of claim 5 wherein said aligning means includes a first hook on said first sidewall for slidably receiving a first splice rod and a second hook on said second sidewall for slidably receiving a second splice rod.

7. The gutter of claim 6 wherein said first hook is positioned adjacent said first mounting and said second hook is positioned adjacent said fourth mounting bracket.

8. The gutter of claim 4 wherein said aligning means includes a first hook on said first sidewall for slidably receiving a first splice rod and a second hook on said second sidewall for slidably receiving a second splice rod.

9. A structure comprising:
   a. a first row of coaxially aligned elongated gutters, and a second row, substantially parallel to said first row, of coaxially aligned elongated gutters;
   b. a cover attached to the gutters of said first and second rows along substantially the entire length of each of said rows;
   c. each of said gutters comprising:
      i. an elongated web having a first longitudinally extending sidewall, a second longitudinally extending sidewall, and a longitudinally extending central portion connecting the sidewalks;
      ii. a first mounting plate depending from the web on one side of the central portion of a second mounting plate depending from the web on an opposite side of the central portion for securing the gutter to a support post;
      iii. a first mounting bracket depending from the web and spaced outwardly of and adjacent to the first mounting plate to form a first recess therewith and a second mounting bracket depending from said web and spaced outwardly of and adjacent to the second mounting plate to form a second recess therewith, with the recesses being capable of receiving a non-flexible cover material; and
      iv. a third mounting bracket on the first sidewall of the web, said third bracket extending inwardly toward the center axis of the web to form a shelf with the first sidewall and a fourth mounting bracket on the second sidewall of the web, said fourth bracket extending inwardly toward the center axis of the web to form a shelf with the second sidewall, the first, second, third and fourth mounting brackets each including means for securing a flexible cover thereto;
toward the center axis of the web to form a shelf with the first sidewall and a fourth mounting bracket on the second sidewall of the web, said fourth bracket extending inwardly toward the center axis of the web to form a shelf with the second sidewall, the first, second, third and fourth mounting brackets each having means for securing a flexible cover thereto.

10. The structure of claim 9 wherein each mounting bracket includes a main plate attached to said web, a support rib having one end attached to said main plate, and a terminal flange having a substantially uniform cross section along its length, and having a centrally located portion connected to said support rib, and the ends of said terminal flange being rounded.

11. The structure of claim 10 wherein said cover is a flexible cover and is held onto the third mounting brackets of said second row by a resilient clip and the fourth mounting brackets of said first row by a resilient clip.

12. The structure of claim 11 wherein said resilient clips each comprise an elongated member having a cross section in a plane transverse of the length of said gutters that includes a generally C-shaped portion, each of the terminal ends of said C-shaped cross section portion having a smoothly curved internal and external surface that converge in a smooth curve, said terminal ends in an externally unstressed state being positioned a distance apart that is less than the distance between said ends of said terminal flange, said clip being resilient so that its cross section can be deformed to permit said clip to slip around said flexible cover and the ends of said terminal flange, said flexible cover being held in frictional engagement between the internal surface of said terminal ends and the ends of said flange by the resilient force exerted by said clip.

13. The structure of claim 12 in which a plurality of said clips are mounted on the third mounting brackets of said first row and the fourth mounting brackets of said second row to hold down said flexible cover.

14. The structure of claim 13 in which the outer surface of said terminal flange is convex.

15. The structure of claim 9 wherein said cover is fiberglass and is seated in the shelf formed by the third mounting brackets of the second row and the shelf formed by the fourth mounting brackets of the third row.

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