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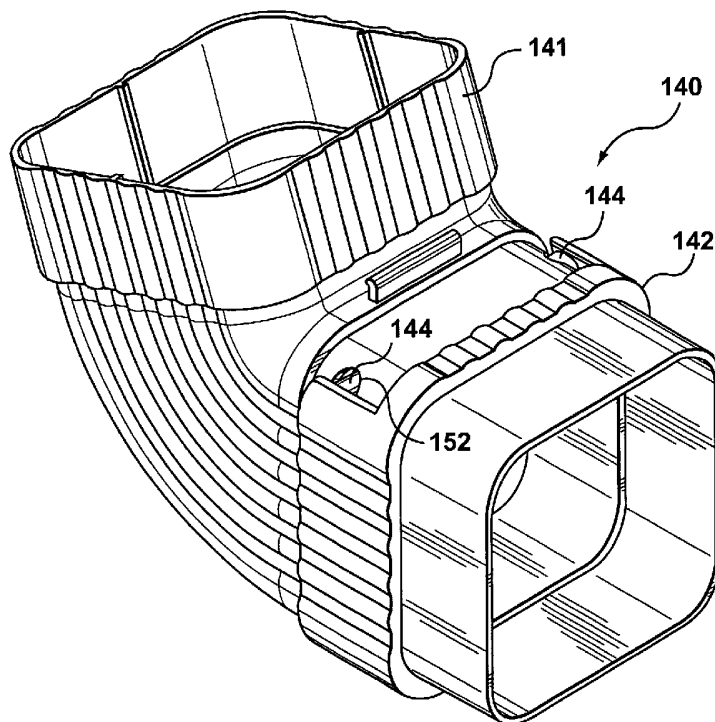
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(54) Title: PLASTIC GUTTER SYSTEM AND COMPONENTS THEREFOR



(57) Abstract: The invention is directed to a gutter system for channeling rainwater from a building. The gutter system includes gutter sections that are interconnected with joint members having gaskets incorporated thereon. Each gutter section has a substantially hollow space defined between inner and outer walls that are spanned by a plurality of ribs.

WO 2004/011738 A2



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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

Plastic Gutter System and Components ThereforField of the Invention

The invention relates to gutter systems that may be assembled and secured to a building for catching and channelling rainwater.

5 Background

Rainwater gutter systems for buildings are traditionally made from metal or plastic. Gutter systems made of plastic offer significant benefits over those made of metal in terms of durability and appearance. There are a number of problems associated with plastic gutter systems however.

10 One problem with plastic gutter systems is that the plastic tends to expand, contract or otherwise deform in temperature extremes. A typical plastic gutter system that spans up to 40 ft. may experience expansion or contraction of 1" or more over diverse climatic conditions. In addition, plastic gutter systems can become permanently deformed when exposed to extreme temperature conditions.

15 Conventional plastic gutter systems use various structures of joints and seals to attempt to provide a watertight seal while permitting the gutter section to slide within the joint as it undergoes expansion and contraction. Examples of such systems are disclosed in US patents Nos. 4257716, 4297053, 4313693, 4954015, 5035092, 5038528 and 5687510. A  
20 problem with these systems is that the gutter sections are still relatively pliable and are not adequately secured in the joints to deter deformation. Thus, over a period of time, the gutter sections tend to deform and shift from the joints to a sufficient extent that the gutter system leaks.

The problem is compounded by consumer preference for a "K style" gutter that, by virtue of its shape, is not effectively sealed using conventional joint and gasket systems. The  
25 conventional "K-style" gutter also tends to allow debris to collect within the gutter which reduces the effectiveness of the gutter system.

Another problem with conventional gutter systems is the manner in which downspouts are mounted to walls. Generally, an adjustable metal strap is wrapped around the downspout and mounted to the wall surface with screws on either side of the downspout.

Examples of such mounting systems are disclosed in US Patent Nos. 4,632,342 and 5,794,348. A problem with these systems is that the mounting fasteners are exposed and unsightly and the mounting attachments do not allow for simple installation and temporary disassembly of the downspout installation.

- 5 Another problem with conventional gutter systems is the manner in which the drainpipe is connected to the downspout. Conventional gutter systems employ a downspout to deliver water from the roof level gutters to ground level. The downspout is typically connected to a drainpipe that extends along the ground away from the building for delivering water to a desired location for drainage. A problem with conventional
- 10 connectors is that they do not allow sufficient flexibility in the movement of the drainpipe. This causes inconvenience where the positioning of the drainpipe interferes with household chores such as lawn mowing and raking of leaves.

Accordingly, there is a need for an improved gutter system, and components thereto, that overcome one or more of the above identified problems.

15 Summary of the Invention

According to one aspect of the present invention there is provided a gutter section for use in a rain gutter system, the gutter section comprising an inner wall defining a channel for receiving and channelling rain water, and an outer wall spaced from said inner wall to define a substantially hollow area between the inner wall and the outer wall.

- 20 According to another aspect of the claimed invention there is provided a gutter section for use in a rain gutter system comprising:

- an inner wall defining a channel for receiving and channelling rain water;
  - an outer wall defining a desired aesthetic outer shape for said gutter section; and
  - a heat sink between said inner wall and said outer wall to deter substantial expansion
- 25 and contraction of said gutter under ranging thermal conditions.

According to another aspect of the claimed invention, there is provided a gutter system comprising:

- (a) a plurality of gutter sections defining a channel for receiving and channelling rain water; and
- (b) a plurality of joint members for joining said gutter sections, each including an outer sleeve and an inner sleeve defining a passageway corresponding in shape to a substantial portion of the cross-sectional shape of said gutter sections for slidably receiving at least one of said gutter sections.

According to another aspect of the claimed invention, there is provided a joint member for adjoining one or more gutter sections of a gutter system, the joint member comprising:

- (a) an outer sleeve and an inner sleeve received defining a passageway corresponding in shape to a substantial portion of the cross-sectional shape of a gutter section for slidably receiving said gutter section; and
- (b) a gasket assembly having a gasket and an attachment member for supporting said gasket and attaching said gasket assembly to said joint member.

According to another aspect of the claimed invention, there is provided a clip for attaching a downspout to a wall, said clip comprising first and second clip members, at least one of said clip members having a means for attaching said clip to said wall, each of said clip members having a releasable interlocking device for releasably interlocking said clip members together around the downspout.

According to another aspect of the claimed invention, there is provided a drainpipe connector system for connecting a downspout to a drainpipe, the drainpipe connector system comprising:

- a downspout connector including a first end and a second end, said first end being shaped for slidably engaging a downspout; and
- a hinge member having a first portion that is hingeably connected to said second end of said downspout connector and a second portion that is shaped for slidably engaging a drainpipe, the hinge member being rotatable relative to the downspout connector between a raised position and a lowered position; and

- a locking tab disposed on one or both of said downspout connector and said hinge member for releasably locking said hinge member in said raised position.

#### Description of the drawings

Figure 1 is an exploded perspective view of a gutter system in accordance with the present invention;

Figure 2 is a sectional view of a gutter section for the gutter system of Figure 1 as viewed along lines 2-2 of Figure 1;

Figure 3 is an exploded perspective view, with a portion cut away, of a joint member and gasket assembly for the gutter system of Figure 1;

Figure 4 is a perspective view of a first corner joint member for the gutter system of Figure 1;

Figure 5 is a perspective view of a second corner joint member for the gutter system of Figure 1;

Figure 6 is a perspective view of a downspout joint member for the gutter system of Figure 1;

Figure 7 is a perspective view of a hanger for the gutter system of Figure 1;

Figure 8 is an exploded perspective view of a downspout clip for the gutter system of Figure 1; and

Figure 9 is a perspective view of a downspout connector for a drainpipe hinge assembly for the gutter system of Figure 1;

Figure 10 is a perspective view of a hinge member mounted to the downspout connector for the drainpipe hinge assembly of Figure 9; and

Figure 11 is a perspective view of the hinge member of Figure 10.

#### Detailed Description of the Preferred Embodiment

A gutter system 20 in accordance with the present invention is shown in Figure 1. The gutter system 20 comprises a plurality of gutter sections 30 that are each supported and secured to a building (not shown) by hangers 34. The gutter sections 30 are adjoined using joint members 36. The gutter system 20 also includes downspout sections 42 that are secured to the building with downspout clips 44. The downspout sections 42 are adjoined using downspout joint members 45 and elbows 47. A lockable hinge assembly 140 pivotably connecting a drainpipe 135 to a downspout section 42 is also provided.

Referring to figure 2, gutter section 30 is shown in cross section. Gutter section 30 has a front side 38, a base 40 and a rear side 46. The gutter section 30 has a continuous inner wall 48 that defines a channel 49 for channelling rainwater along the gutter section 30. The gutter section 30 also has an outer wall 50 that is spaced from the inner wall 48 by a plurality of longitudinally extending ribs 52 to form a substantially hollow space 53 between the inner and outer walls 48, 50. The ribs 52 preferably extend at right angles to the walls 48, 50 in order to optimize the rigidity of the overall structure. The thickness of the ribs 52 is preferably less than the thickness of the walls 48, 50 to optimise the construction of gutter section 30 using an extrusion process.

The hollow space 53 defined between walls 48, 50 of gutter section 30 acts as a heat sink to reduce the sensitivity of the gutter section 30 to extreme temperatures. The ribs 52 add strength to the overall structure and enhance the ability of the gutter system to withstand permanent deformation when subjected to heavy snow loads and ice build-up. Also the strength and rigidity provided by the ribs 52 is helpful for home renovation, maintenance and repair applications where it is desired that the gutter section 30 support the weight of a ladder.

It is contemplated that the gutter section 30 could be formed without ribs 52 and that structural support and heat sink functionality can be accomplished by disposing an alternate material in the hollow space 53 such as a cellular foam material. It is also contemplated that hollow space 53 could be left unfilled although the benefits of rigidity will be lessened due to the absence of ribs 52 or other suitable structural support.

The channel 49 defined by inner wall 48 of gutter section 30 has radiused inner corners 54, 56 which reduce the likelihood of debris becoming caught in channel 49. The outer wall 50 preferably defines an aesthetically pleasing shape as desired for the gutter system

20. The outer wall 50 of the embodiment depicted in the figures has a recessed edge 58 and a conventional "k-style" profile.

Gutter section 30 includes a first hanger attachment member 62 and a second hanger attachment member 64 which engage corresponding attachment members 108 and 110 on hanger 34 as shown in Figure 8 and described in more detail below.

The gutter sections 30 are preferably constructed of a plastic material. Preferably, the gutter sections are made of vinyl using an extrusion process. The twin wall ribbed structure of gutter sections 30 reduces the cost of production relative to conventional gutter sections designed with a solid profile because less raw material is required to manufacture gutter sections 30 without sacrificing rigidity.

Referring to Figures 3-6, joint members for joining gutter sections 30 are shown generally at 36. A joint member for joining straight sections of gutter sections 30 is shown at 36a in Figure 3. Joint member 36 has an inner sleeve portion 63 and an outer sleeve portion 65. Inner sleeve portion 63 is positioned to slidably fit inside and adjacent to a substantial portion of the inner wall 48 of the gutter section 30. The outer sleeve portion 65 is positioned to slidably fit outside and adjacent to a substantial portion of the outer wall 50 of the gutter section 30. The inner sleeve portion 63 and the outer sleeve portion 65 therefore define a passageway 66 between them for receiving and enveloping a substantial portion of an end of the gutter section 30. Preferably, the passageway 66 has tapered edges 67 to guide the end of the gutter section 30 in place. An abutment 68 is disposed in the passageway 66 against which the end of the gutter section 30 abuts.

The joint members 36 have passageways 66 at both ends for receiving gutter sections 30. In this manner joint members 36 connect the gutter sections 30 end to end. The joint member 36 effectively envelopes the end of gutter section 30 to deter deformation of the gasket section 30.

Joint member 36 also includes support rings 72 that are disposed along inner sleeve portion 63 at both ends of the joint member 36. The support rings have first and second opposing walls 73 and 75 that define a groove 77 between them. Attachment apertures 79 are defined in second wall 75 of support ring 72 for receiving attachment tabs 98 of a

gasket assembly 82 as detailed below. First wall 73 of support ring 72 also defines a first gasket locking recess 81 as described below.

Gasket assembly 82 has a gasket 84 and an attachment ring 86. The gasket 84 has a double headed locking tab 88 and a double neck 90. The attachment ring 86 has a tongue 94, a collar 96 and attachment tabs 98. A second gasket locking recess 99 is defined in collar 96. Each of the tabs 98 of attachment ring 86 are positioned to lockably engage attachment apertures 79 on the support ring 72. Gasket 84 is preferably made of rubber, EPDM or other sealing materials that are sufficiently durable for exterior applications. Neck 90 of gasket 84 is removably secured around the tongue 94 of attachment ring 86 and is secured in place between collar 96 and first wall 73 of gasket ring 72 when the attachment ring 86 is lockably engaged within groove 77 of support ring 72. Locking tab 88 engages locking recesses 81 and 99 when the gasket 84 is secured to support ring 72 using attachment ring 86.

This gasket assembly 82 ensures that the joint between gutter sections 30 and joint member 36 is substantially sealed against water leakage. The gasket assembly 82 also ensures that the gasket 84 stays in place when the gutter system 20 is installed and on an ongoing basis when it is subjected to repeated movement of the gutter sections 30 caused by ongoing periods of thermodynamic expansion and contraction of the gutter system 20.

Further embodiments of joint members are shown in Figures 4-6. Figure 4 shows a joint member 36b that is adapted to join two corner gutter sections. The embodiment shown in Figure 4 has an outside corner 92 that defines a 90° angle. Figure 5 shows an alternate embodiment 36c that has an outside corner 93 that defines a 135° angle. Figure 6 shows a further embodiment 36d of a joint member that is adapted to join a gutter section that has a downspout. The joint member 36d has a front flange 95, a rear flange 97 and a tapered drainage section 100 leading to a drop outlet 101. The joint member 36d has apertures 102 for receiving fasteners (not shown) for fastening joint member 36 directly to a building. Flanges 95 and 99 are configured to slidably engage gutter sections 30 without the need for a gasket assembly 82 (since drainage section 100 will serve to catch rain water from the end of gutter sections 30).

Figure 1 also shows a further embodiment of joint member 36 in the form of an end cap 36e. End cap joint member 36e includes passageway 66 for receiving the end of a gutter

section 30 as described for joint member 36a above. End cap joint member 36e also includes a gasket assembly 82 for securely sealing the end of the gutter section 30.

Joint members 36 are preferably constructed from a plastic material using an injection moulding process. While it is contemplated that plastic joint members 36 will be used to support plastic gutter sections 30 it is possible that the joint members 36 could be used to support gutter sections 30 could be constructed of metal.

Referring to figure 7, a perspective view of a hanger 34 is shown. The hanger 34 has a rear wall 104 which can be fastened to the building with nails or screws disposed through aperture 105. The hanger has a base 106 and attachment members 108, 110 for engaging first and second hanger attachment members 62,64 of the gutter section 30. The hanger also has upper flanges 107 and 109 for engaging a leaf screen 111 as shown in Figure 1.

Referring to figure 8, a downspout clip 44 is shown. The downspout clip 44 has a first clip member 112 and a second clip member 114. The first and second clip members each have male locking members 116 and female locking members 118. The male locking members 116 each have an engaging member 120 having teeth 122. The female locking members 118 have a receiving mechanism 124 having angular receivers 128 corresponding to the teeth 122 of the engaging member 120 of male locking member 116. The engaging member 120 is received in the receiving mechanism 124 of female locking member 118 to form an interlock. The male and female locking members 116, 118 are preferably of reverse orientation relative to each other. However, other embodiments are also possible where the orientation of the locking members is the same. For example, the clips may be connected at one side by a hinge thus removing the necessity for the locking members to be of reverse orientation.

Each of the clip members 112,114 has an inner surface 126 and an outer surface 129. A sealed aperture 132 is formed on the inner surface 126 of each of the clip members 112,114. The aperture may be broken for receiving a screw or nail in order to facilitate the mounting of one of the clip members 112,114 to the side of the building.

Thus, one of the clip members 112, 114 is mounted to a wall or other surface of a building with a screw or nail (not shown) through the aperture 132. The downspout section 42 is placed in the clip member 112, 114 and other the clip member 112, 114 is

preferably reversed in orientation and slid in place over the mounted clip member 112. 114. As the inner surface 126 of the second clip member 114 is pushed tight against the downspout 42, the teeth 122 on the clip members 112,114 interact to lock the clip members 112,114 together. The adjustable locking member 116, 118 work over a range of distance that can effectively compensate for both flat wall surfaces and wall sections with overlapping longitudinal sections.

Referring to Figures 9-11, a lockable drainpipe hinge assembly 140 is shown. The hinge assembly has a downspout connector 141 for connecting to a downspout 42 and a hinge member 142 for slidably engaging a drainpipe 135 in a friction fit.

10 Pins 144 are disposed inwardly on an interior surface 146 of the hinge member 142. Preferably there are two pins 144. One or more pins are possible in other embodiments. In other embodiments the interior surface 146 may define recesses for receiving pins that are disposed on the downspout connector 141.

The hinge member 142 has an opening 150 defined between pins 144 to provide sufficient clearance for the hinge member 142 to pivot about the pins 144 when the pins 144 are connected to openings 152 in the downspout connector 141 as discussed below. A peripheral edge 154 of hinge member 142 is engaged by tab 156 on downspout connector 141 as detailed below to lock the hinge member 142 in place.

Downspout connector 141 has downspout connecting portion 158 for slidably engaging a downspout section 42 and a hinge connector portion 160 that connects to hinge member 142. The downspout connector 141 defines openings or recesses 152 for receiving pins 144. A resilient tab 156 is located on the surface of the downspout connector 141 for releasably engaging the peripheral edge 154 of the hinge member 142.

In operation, hinge member 142 is attached to the hinge connector portion 160 of downspout connector 141 such that pins 144 are received in the openings 152. Pins 144 and openings 152 are proportioned such that the pins 144 are rotatable in the openings 152. The hinge member 142 is pivotable between a lower position where the drain pipe is substantially lowered to the ground and a raised position where the drain pipe is substantially raised from the ground. The tab 156 releasably engages the peripheral edge 154 to retain the hinge member 142 in the raised position.

A person skilled in the art will appreciate that although specific embodiments have been described, the invention is not to be limited to the specific embodiments described herein.

### Claims

- 5 1. A gutter section for use in a rain gutter system, the gutter section comprising an inner wall defining a channel for receiving and channelling rain water, and an outer wall spaced from said inner wall to define a substantially hollow area between the inner wall and the outer wall.
- 10 2. A gutter section according to claim 1 wherein said inner wall and said outer wall are spanned by a plurality of ribs.
3. A gutter section according to claim 2 wherein said gutter section is elongate and said ribs extend along the length of said gutter section.
4. A gutter section for use in a rain gutter system comprising:
  - an inner wall defining a channel for receiving and channelling rain water;
  - 15 • an outer wall defining a desired aesthetic outer shape for said gutter section; and
  - a heat sink between said inner wall and said outer wall to deter substantial expansion and contraction of said gutter under ranging thermal conditions.
- 20 5. A gutter section according to claim 4 wherein the gutter section is integrally formed.
6. A gutter section according to claim 4 wherein the gutter section is formed by an extrusion process.
7. A gutter section according to claim 4 wherein the gutter section has a plurality of ribs.
- 25 8. A gutter section according to claim 4 wherein the gutter section is formed of a plastic material.

9. A gutter section according to claim 4 wherein the gutter section has at least one flange for engaging a hangar for supporting said gutter section against a building.

10. A gutter section according to claim 4 wherein the inner wall has radiused corners.

11. A gutter system comprising:

(a) a plurality of gutter sections each defining a channel for receiving and channelling rain water; and

(b) a plurality of joint members for joining said gutter sections, each including an outer sleeve and an inner sleeve defining a passageway corresponding in shape to a substantial portion of the cross-sectional shape of said gutter sections for slidably receiving at least one of said gutter sections.

12. A gutter system as claimed in claim 11 further comprising a gasket disposed in said passageway for forming a substantially water tight seal between said joint member and said gutter section.

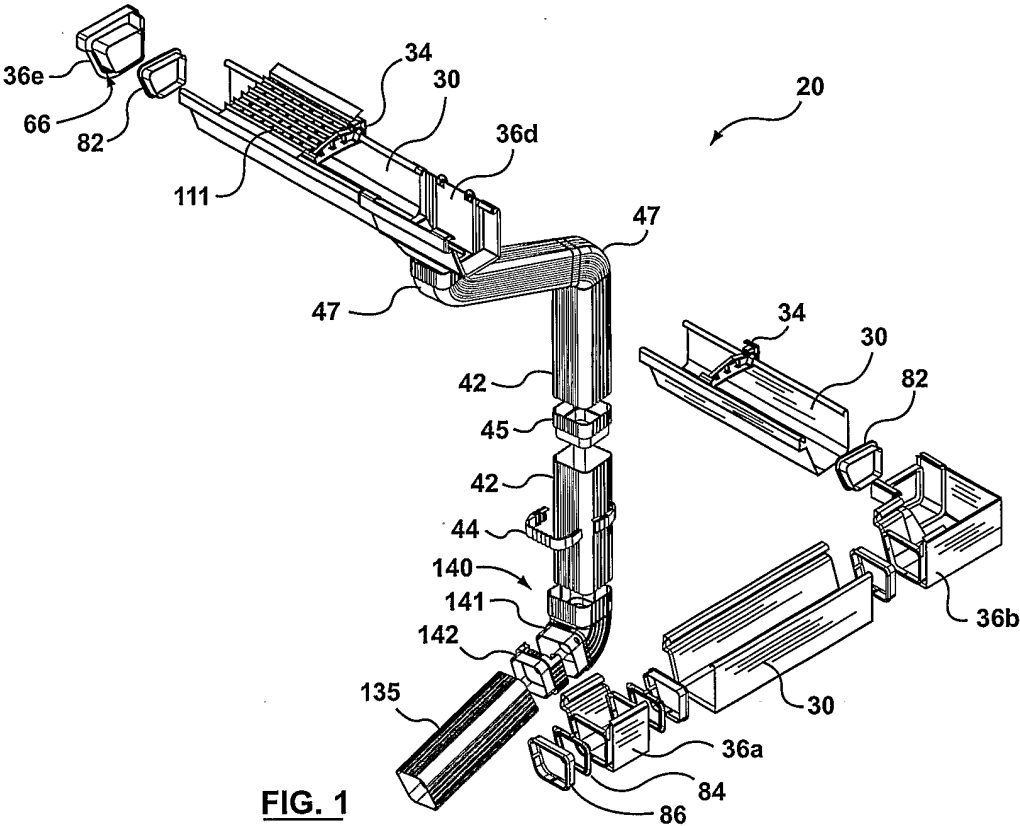
13. A gutter system as claimed in claim 11 wherein at least are of said plurality of gutter sections and said plurality of joint members is formed of plastic.

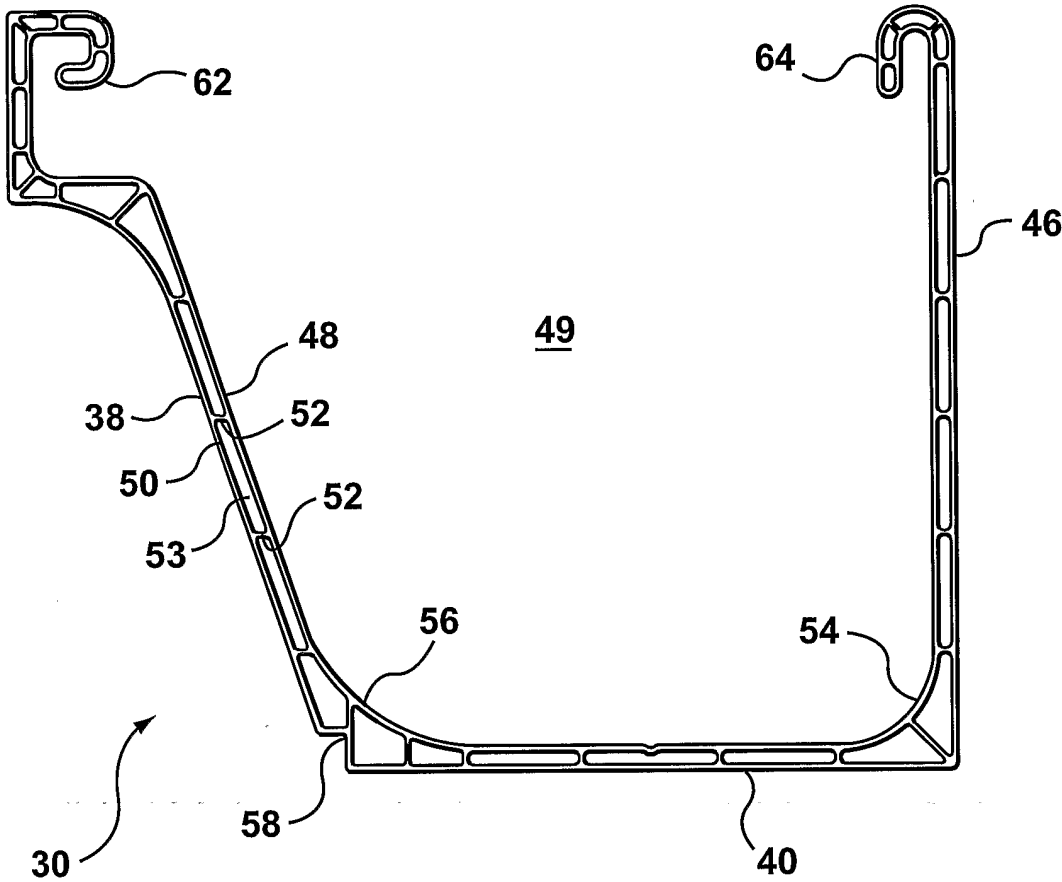
14. A joint assembly for adjoining one or more gutter sections of a gutter system, the joint assembly comprising:

(a) a joint member having an outer sleeve and an inner sleeve defining a passageway corresponding in shape to a substantial portion of the cross-sectional shape of a gutter section for slidably receiving said gutter section; and

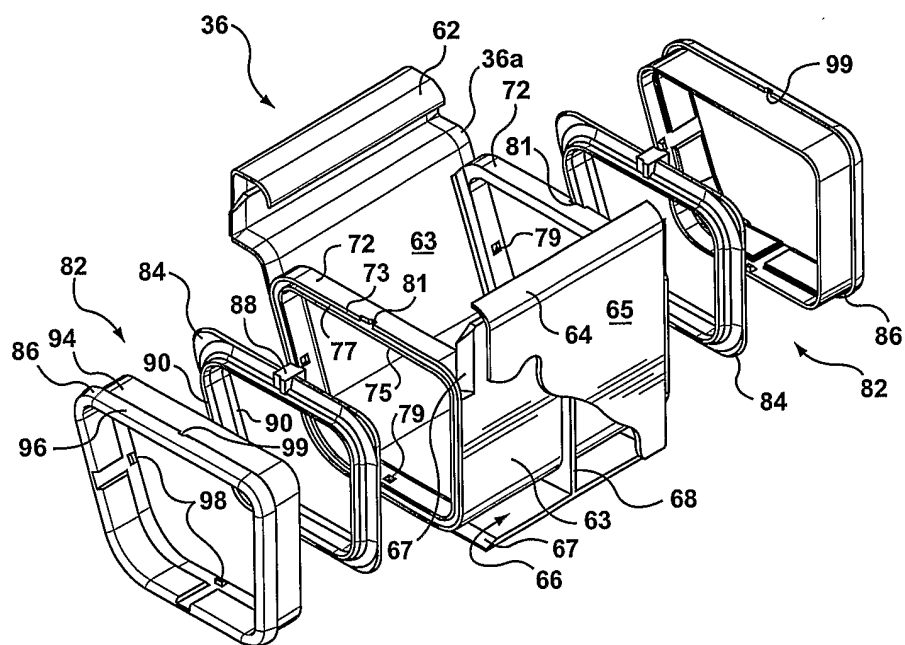
(b) a gasket assembly having a gasket and an attachment member for supporting said gasket and attaching said gasket assembly to said joint member.

15. A joint assembly as claimed in claim 14 wherein said joint member is integrally formed.
16. A joint assembly as claimed in claim 14 wherein said gasket assembly is releasably attached to said joint member.
- 5 17. A joint assembly as claimed in claim 14 wherein said gasket is formed of a material selected from the group of rubber or EPDM.
18. A clip for attaching a downspout to a wall, said clip comprising first and second clip members, at least one of said clip members having a means for attaching said clip to said wall, each of said clip members having a  
10 releasable interlocking device for releasably interlocking said clip members together around the downspout.
19. A drainpipe connector system for movably connecting a downspout to a drainpipe, the drainpipe connector system comprising:
- a downspout connector including a first end and a second end, said first  
15 end being shaped for slidably engaging a downspout;
  - a hinge member having a first portion that is hingeably connected to said second end of said downspout connector, and a second portion that is shaped for slidably engaging a drainpipe, the hinge member being rotatable relative to the downspout connector between a raised position  
20 and a lowered position; and
  - a locking tab disposed on one or both of said downspout connector and said hinge member for releasably locking said hinge member in said raised position.



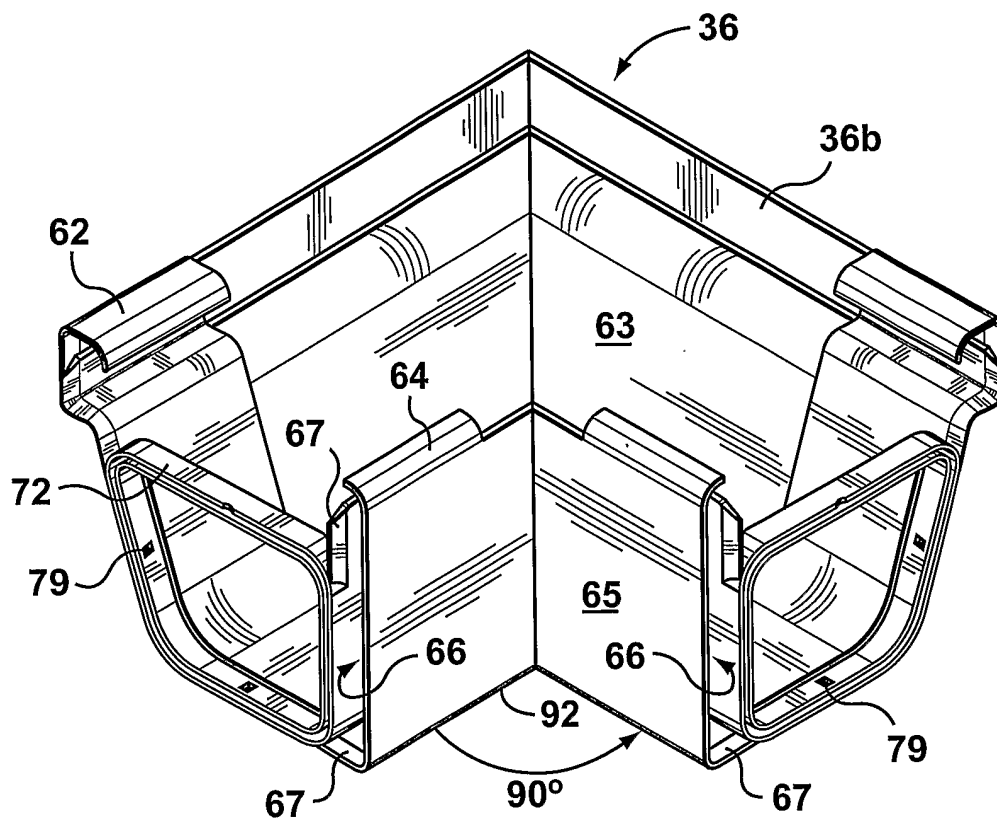


**FIG. 2**

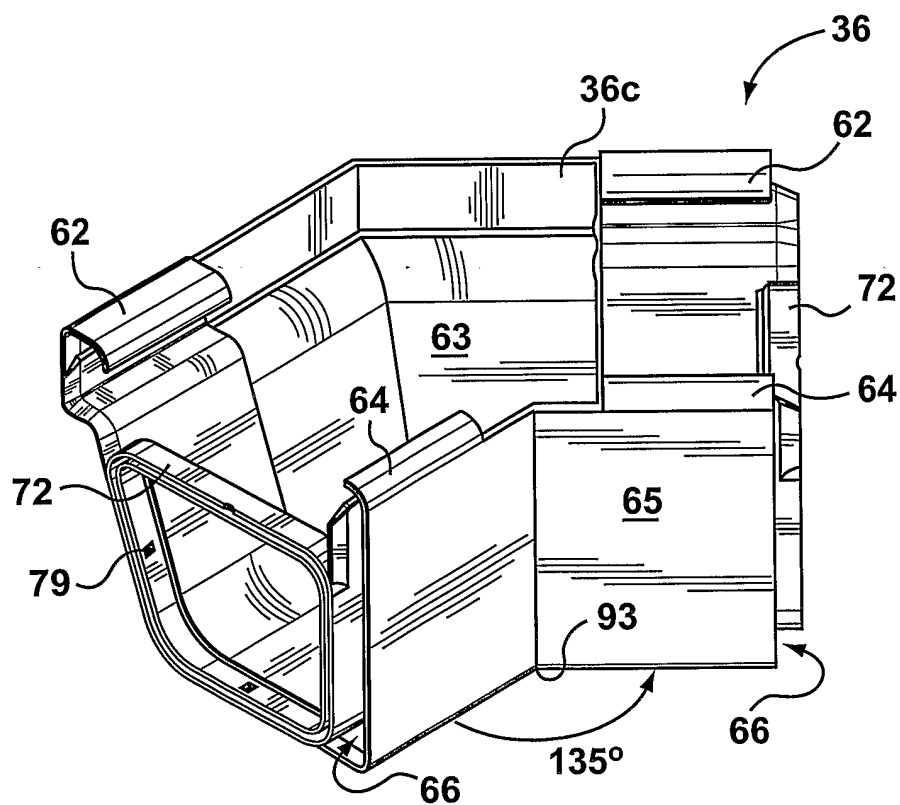


**FIG. 3**

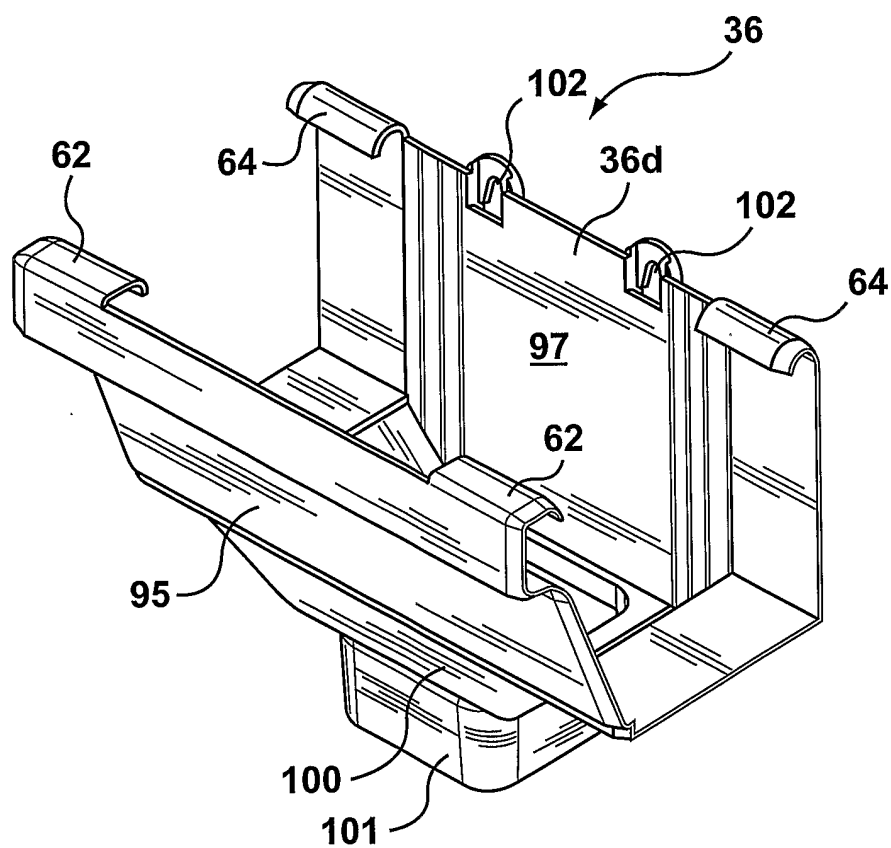
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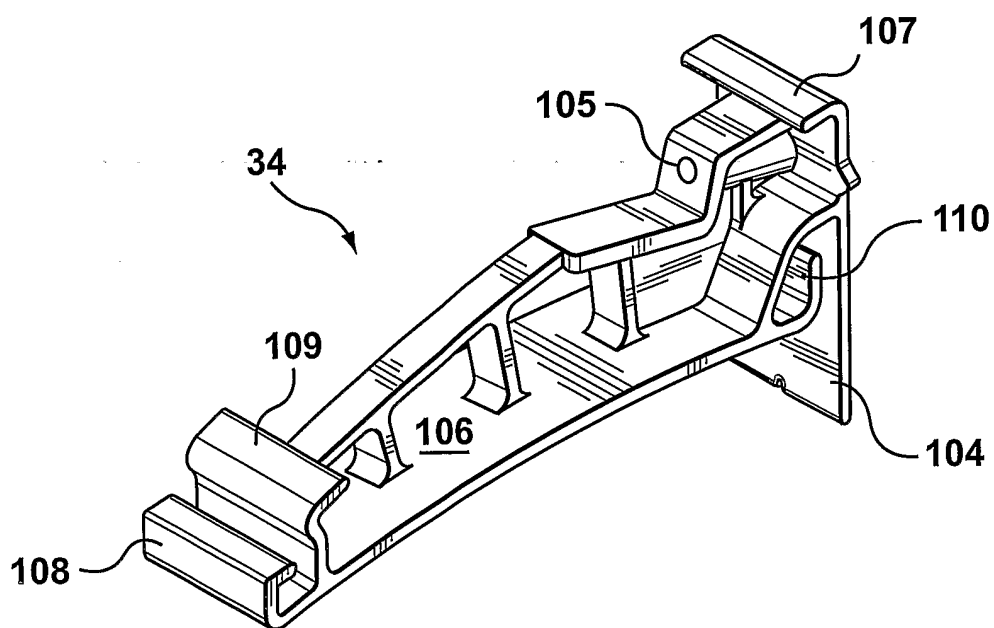
**FIG. 4**



**FIG. 5**



**FIG. 6**



**FIG. 7**

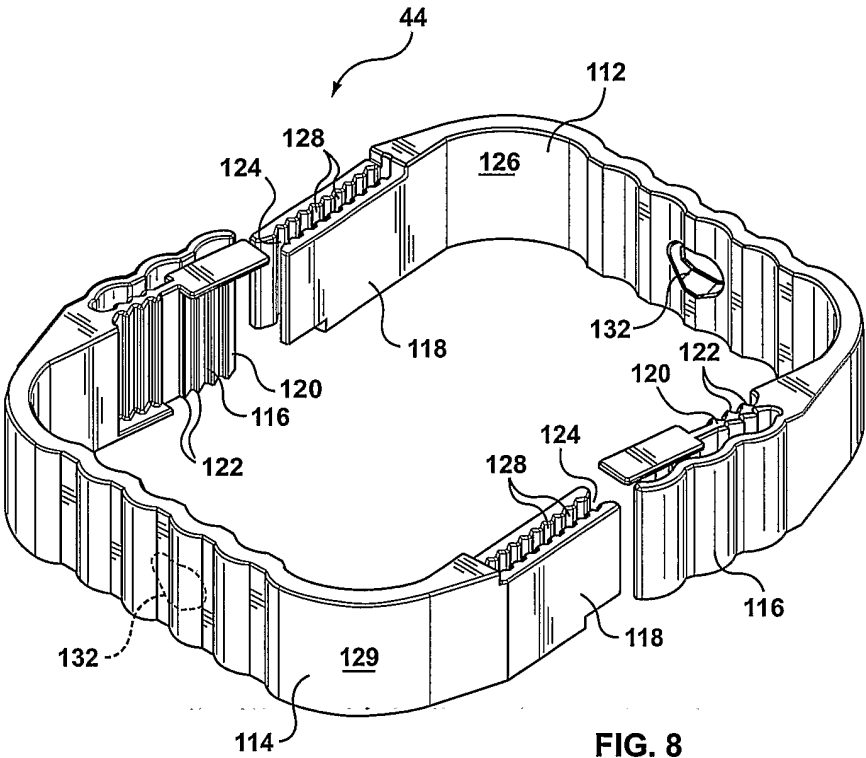
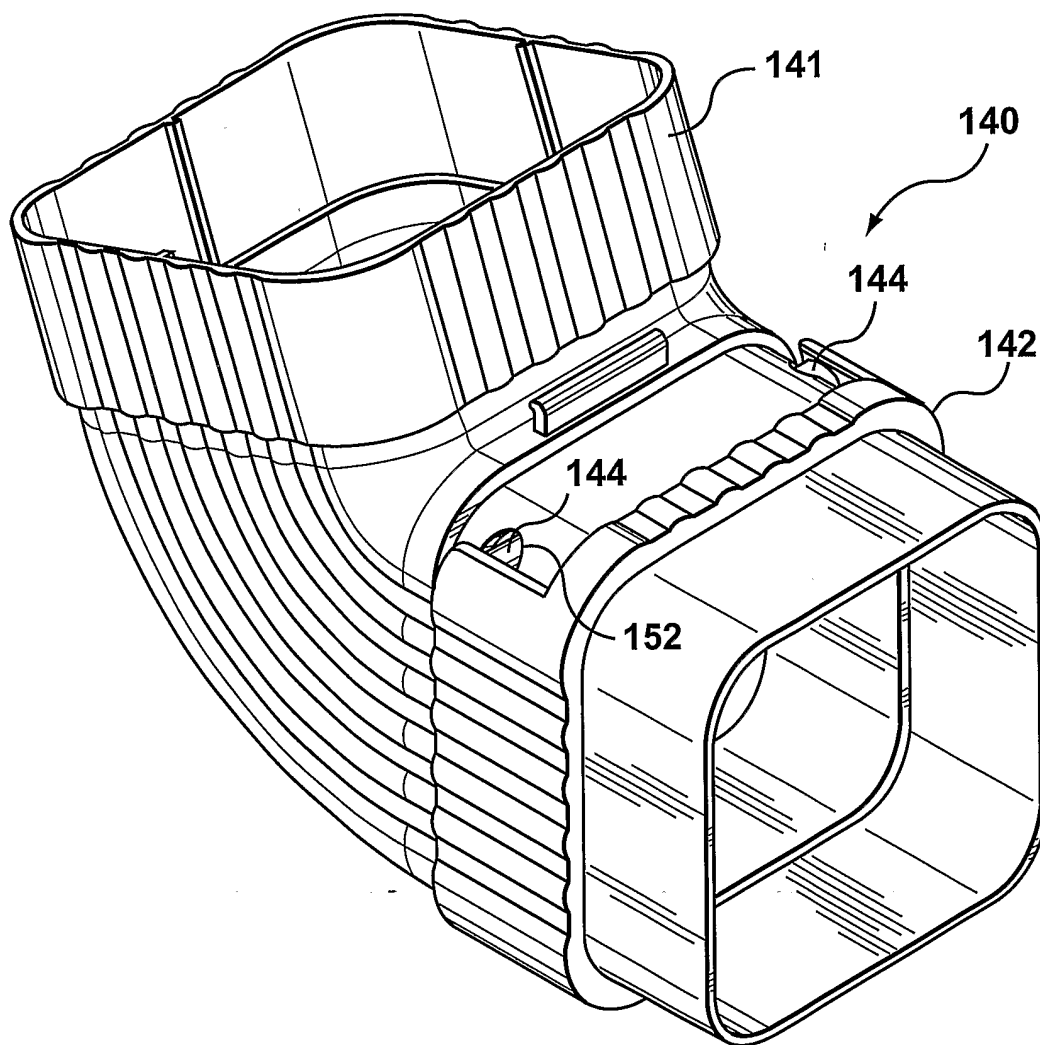
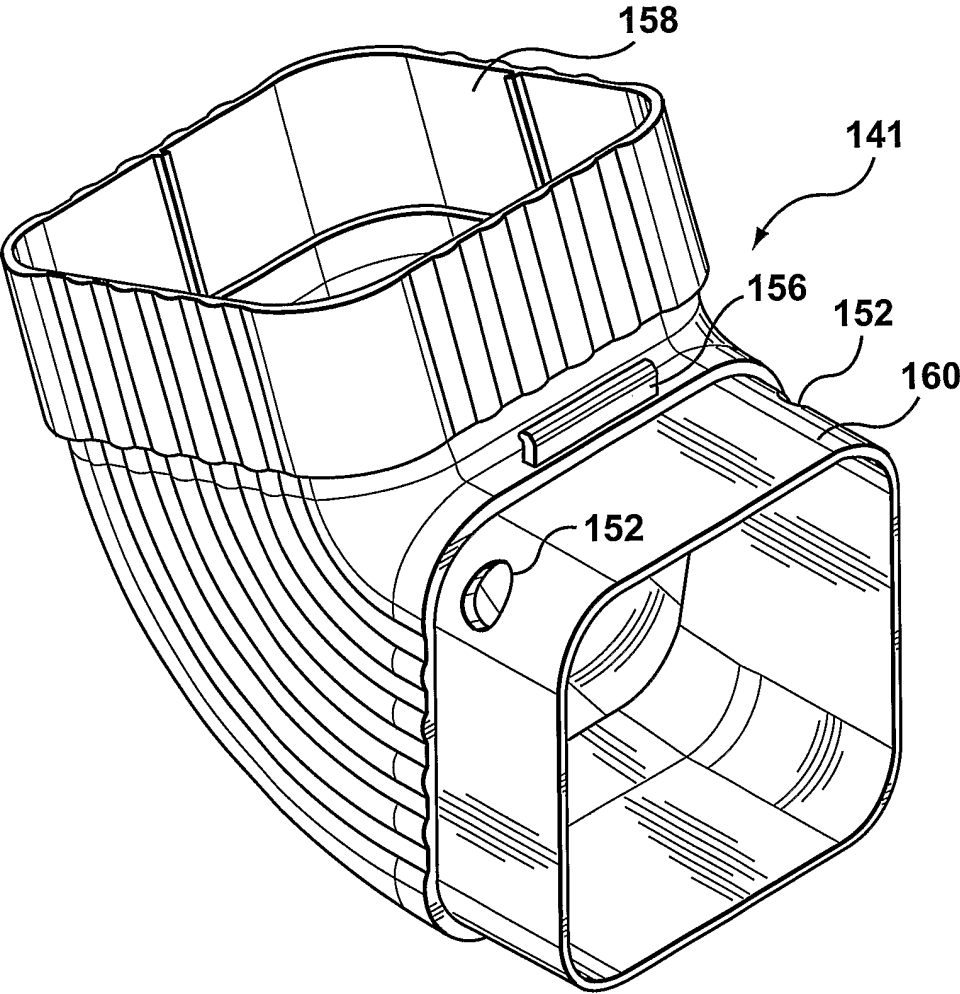


FIG. 8

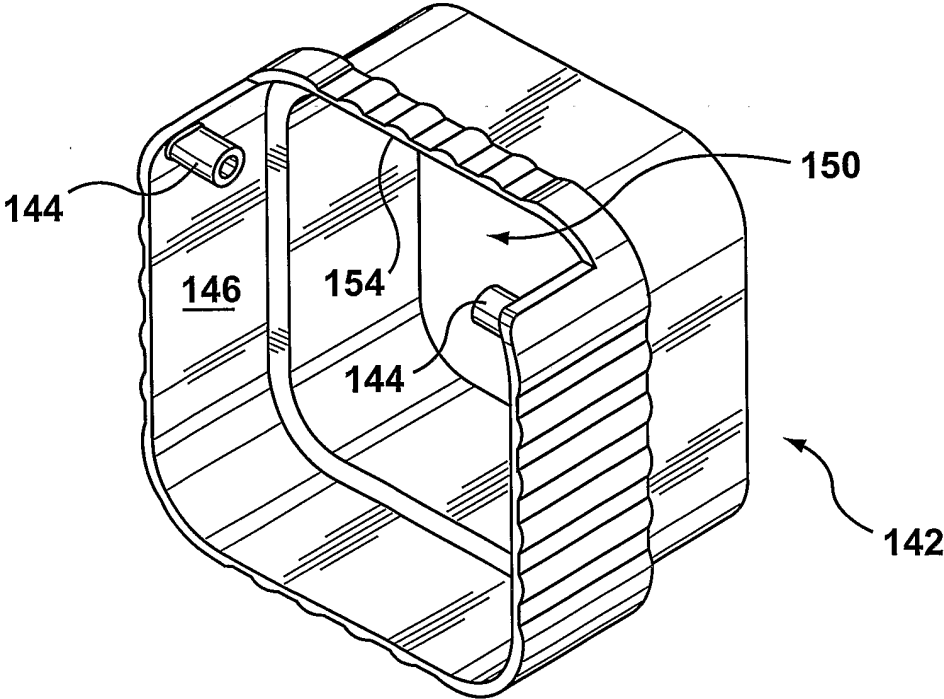
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**FIG. 9**



**FIG. 10**



**FIG. 11**