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(54) **GUTTER ASSEMBLY AND METHOD FOR MAKING SAME**

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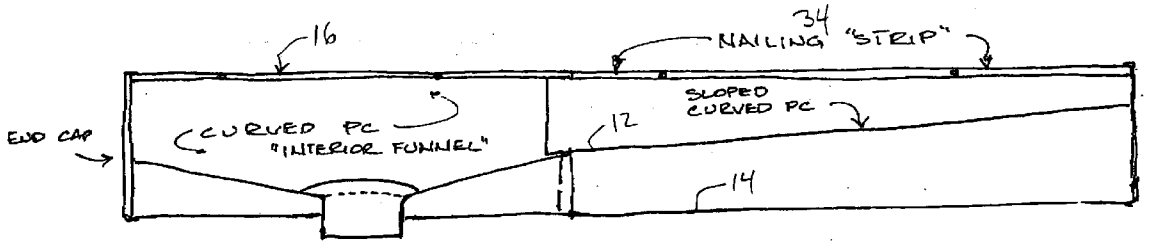
(57) **ABSTRACT**

A gutter assembly and method for making same are provided. The gutter assembly includes an inner channel for directing flow of water and debris; and an outer channel for supporting the inner channel, wherein the inner channel is disposed within the outer channel at a predetermined angle. The gutter assembly of the present disclosure facilitates the removal of water and debris from the roof of a building structure while protecting the structure and maintaining an aesthetically pleasing appearance.



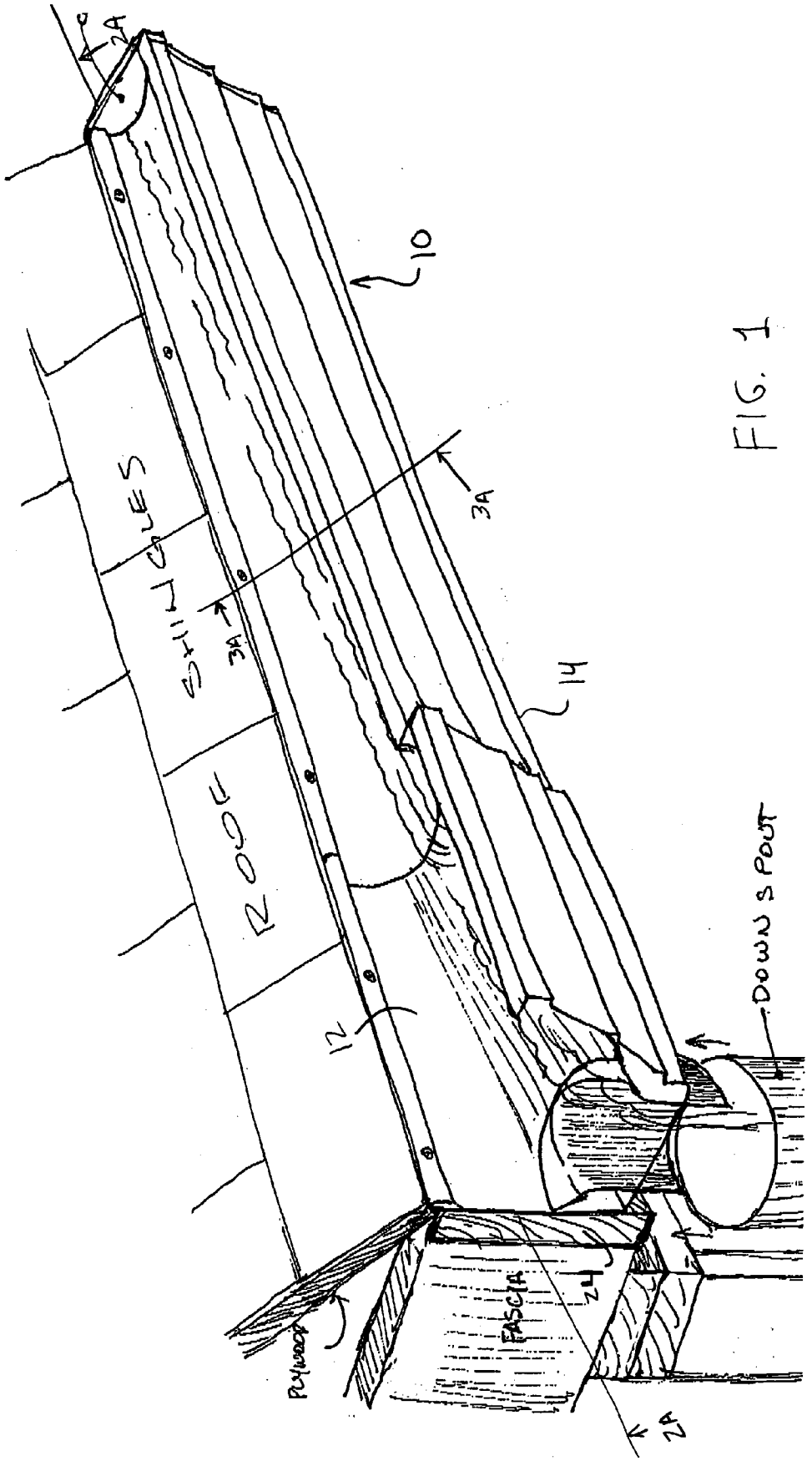



FIG. 1

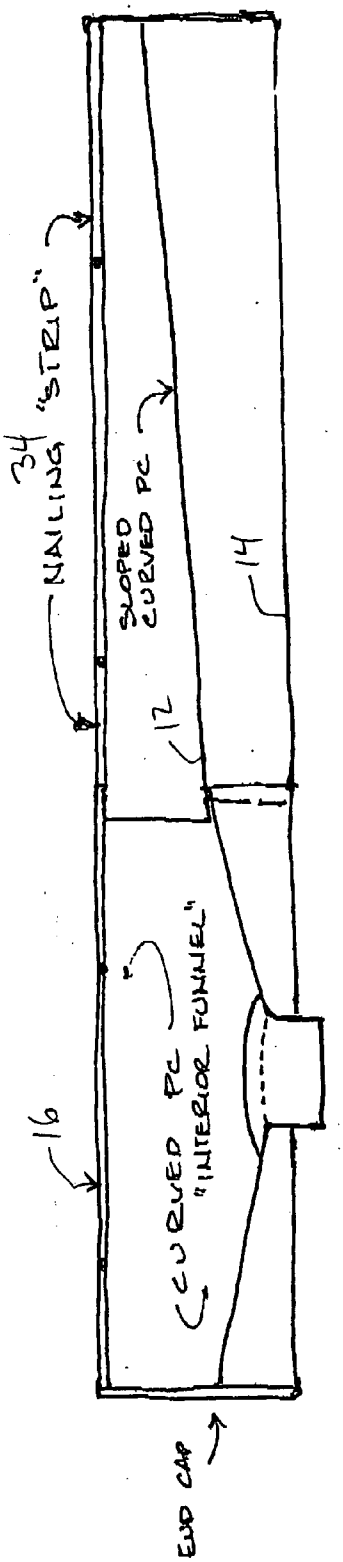

34
NAILING "STRIP"
SLOPED CURVED PC
14
12
CURVED PC "INTERIOR FUNNEL"
16
END CAP

FIG. 2A

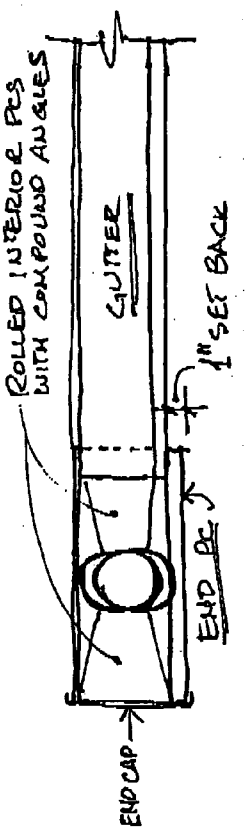

ROLLED INTERIOR PCS WITH COMPOUND ANGLES
GUTTER
1" SET BACK
END PC
END CAP

FIG. 2B

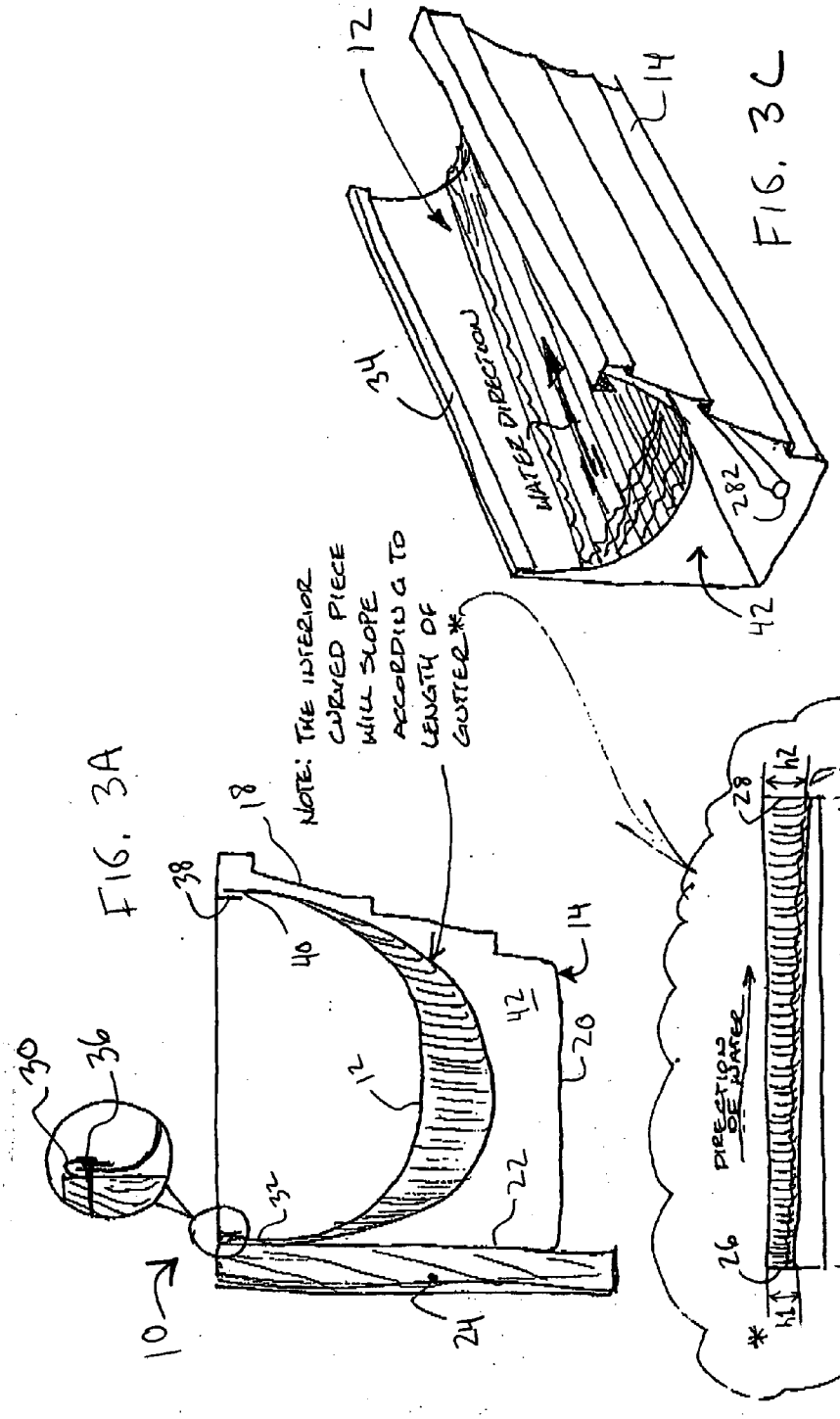



FIG. 3C

FIG. 3A

FIG. 3B

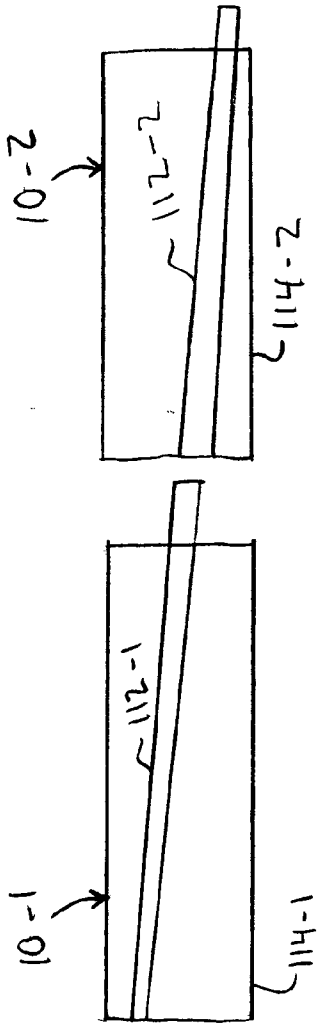



FIG. 4A

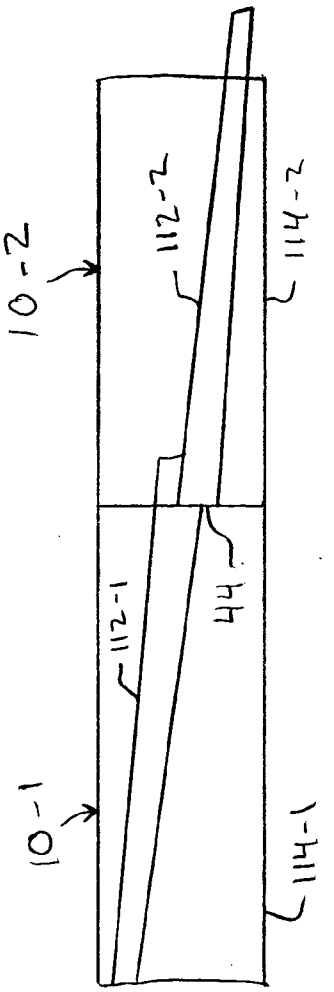



FIG. 4B

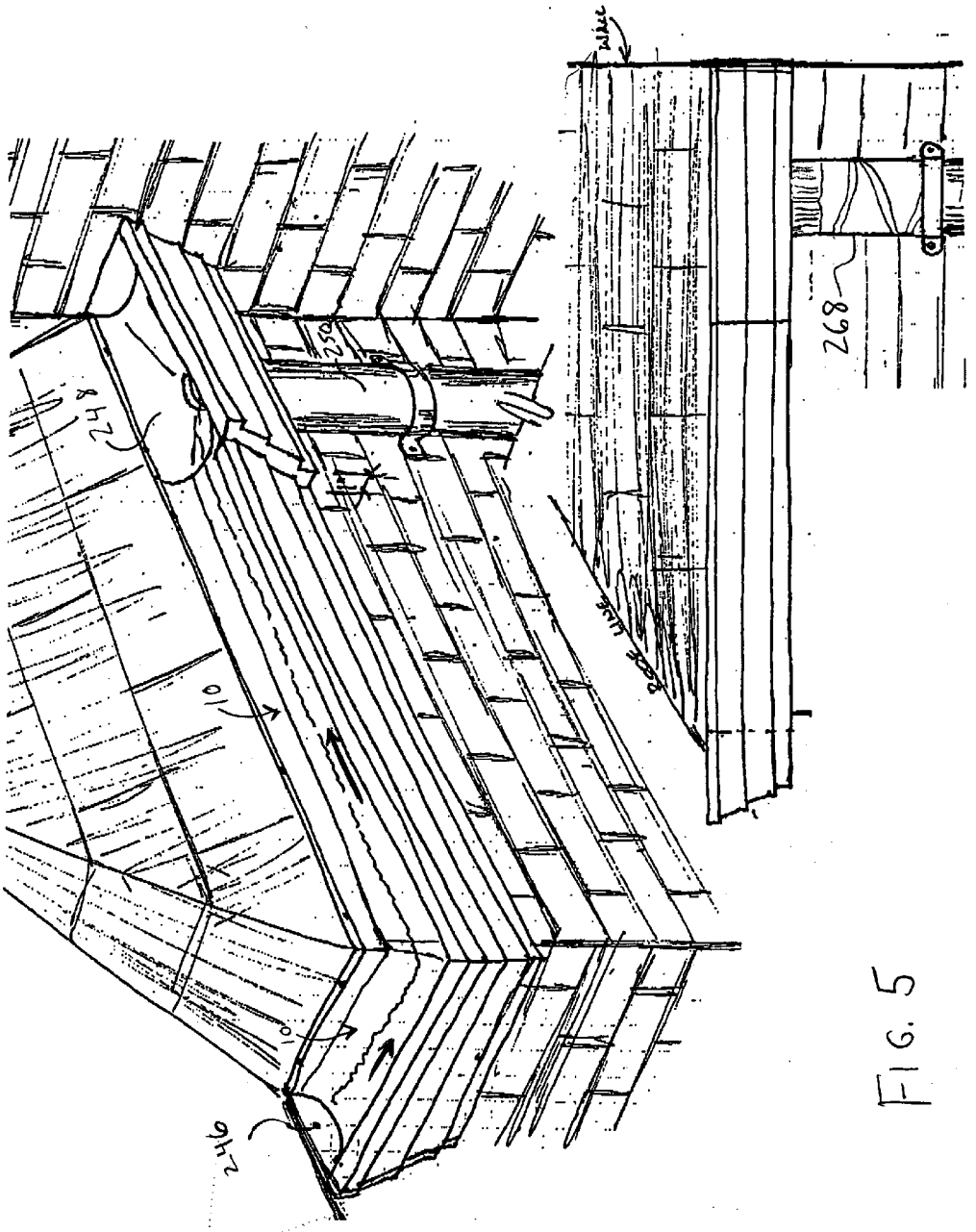



FIG. 5

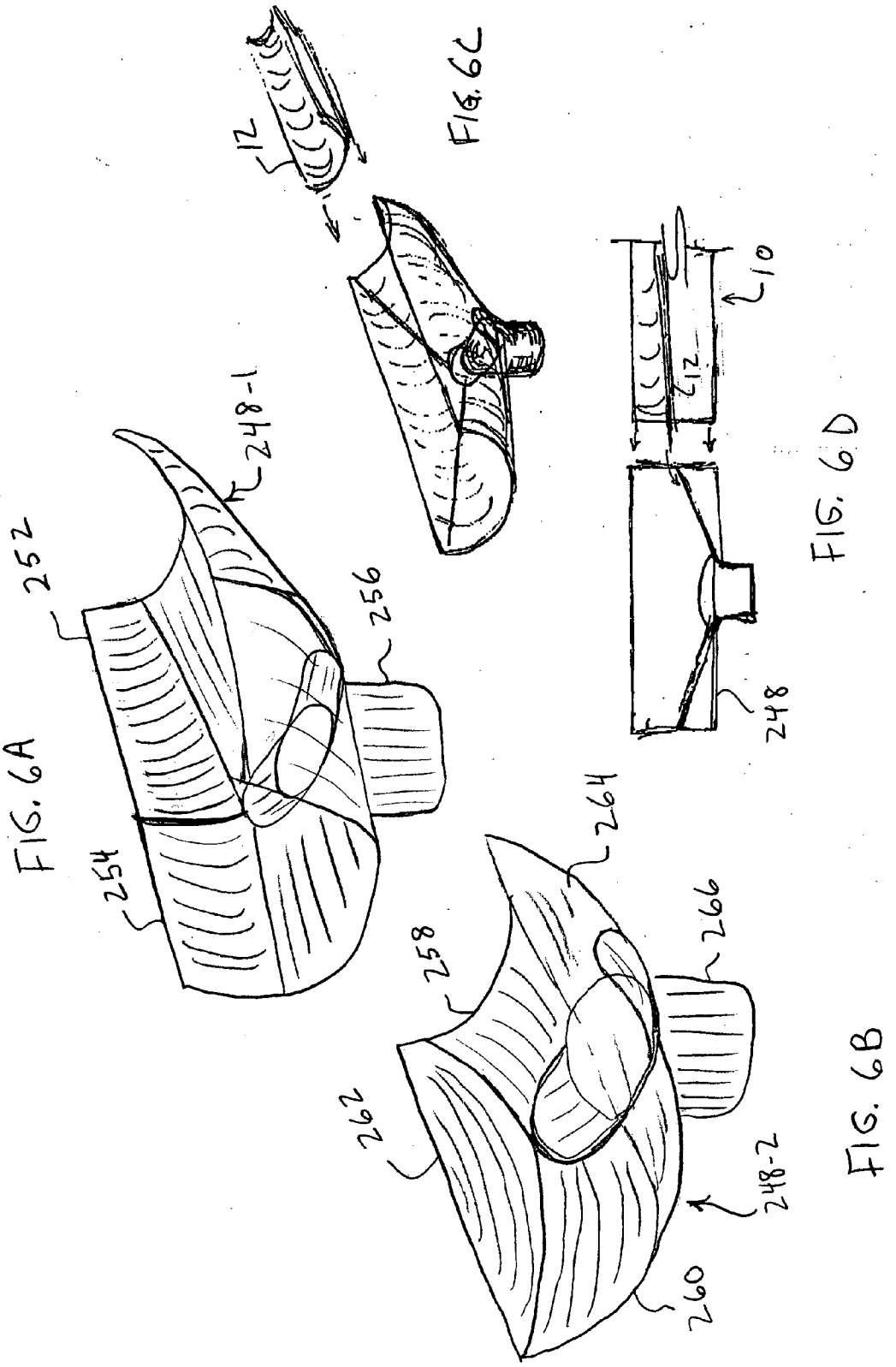


FIG. 6A
252
248-1
256
254
FIG. 6C
12
FIG. 6D
10
12
248
FIG. 6B
264
266
258
262
248-2
260

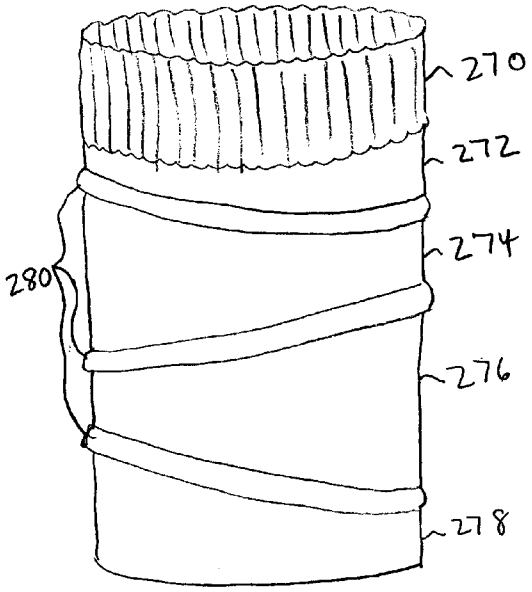



FIG. 7A

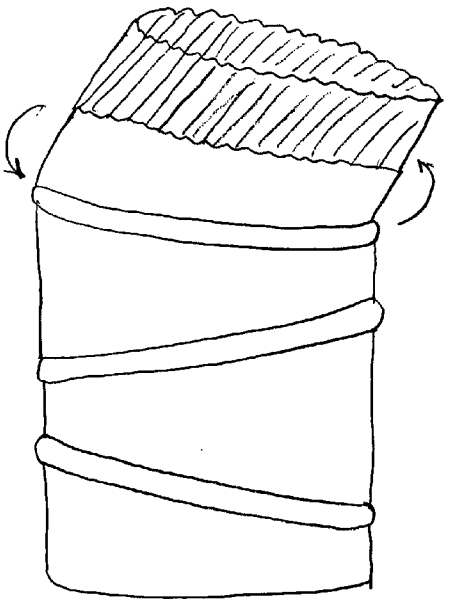


FIG. 7B

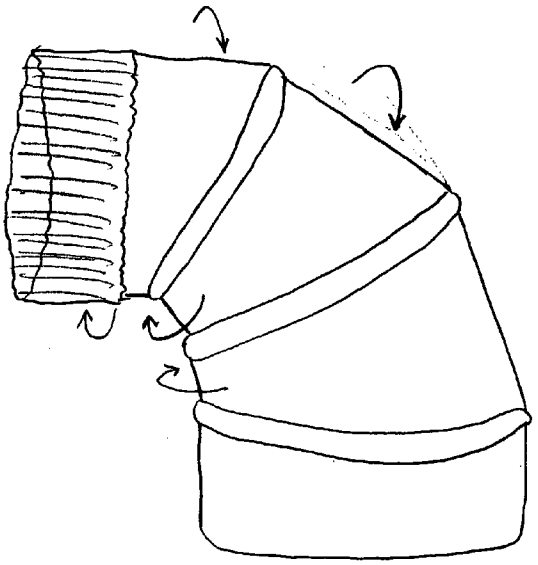


FIG. 7C

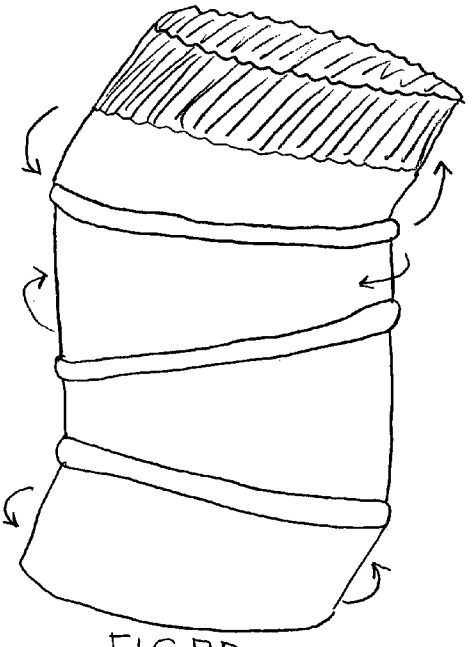


FIG. 7D

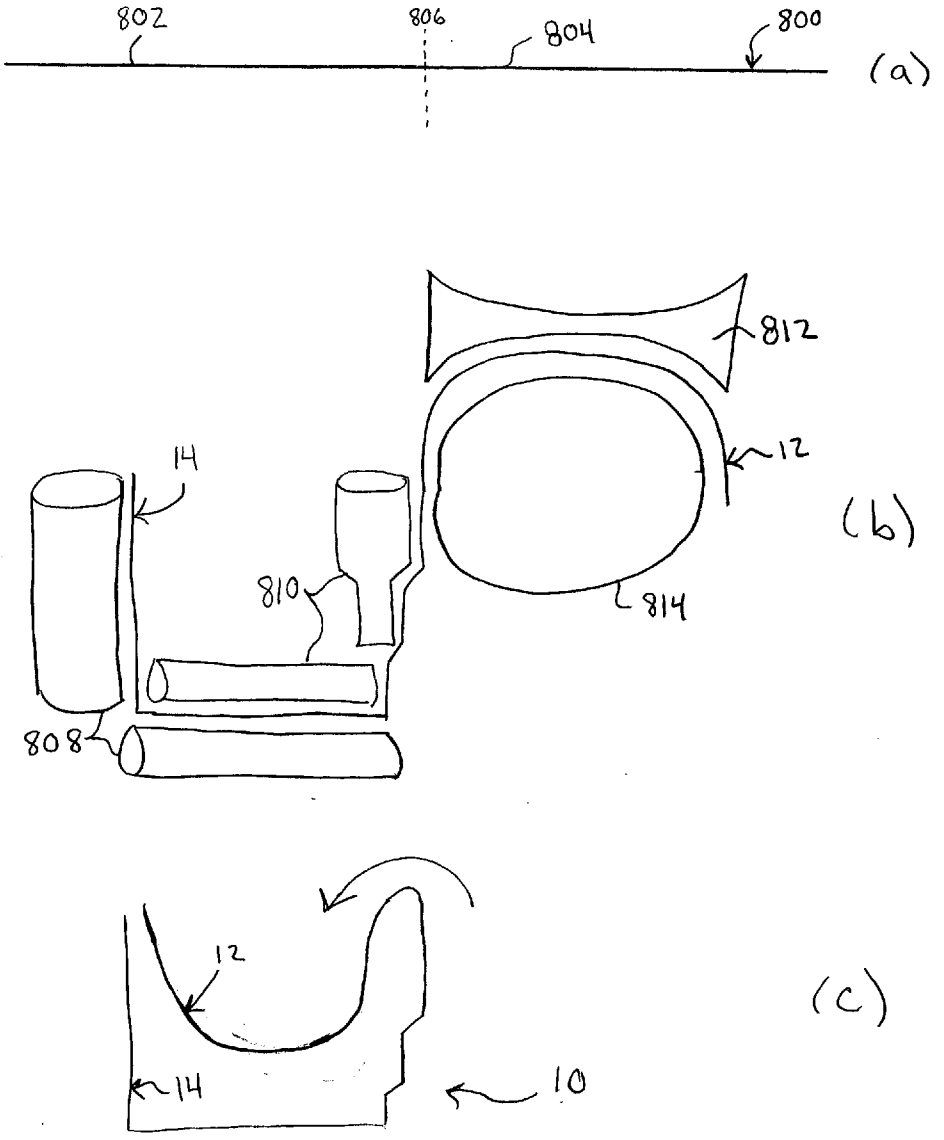



FIG. 8

# GUTTER ASSEMBLY AND METHOD FOR MAKING SAME

## BACKGROUND

[0001] 1. Field of the Disclosure

[0002] The disclosure relates generally to a gutter for directing rainwater and debris from a roof of a structure, and more particularly, to a gutter assembly including an inner channel for directing the flow of rainwater and debris and an outer channel for creating an aesthetically pleasing appearance.

[0003] 2. Description of the Related Art

[0004] Typically, the roofs of homes and other buildings have rain gutters or eaves troughs hung on the outer edge of the eaves below the roof line to catch and redirect rainwater flowing down from the roof. The gutters receive and redirect the flow of water into a downspout which carries the water to the ground.

[0005] A common problem with rain gutters and downspouts is that leaves, branches, pine needles and other debris often collect and accumulate within the gutters and downspouts, clogging them and preventing water from flowing through the gutters and into the downspouts. Also, when water from rain or melting snow flows down the roof, the debris on the roof is carried into the gutters and downspouts, clogging them both. If the gutters or downspouts are clogged, the gutters overflow onto the ground possibly causing soil erosion and/or damage to the building's foundation.

[0006] In the prior art, devices have been developed to attempt to prevent the clogging of gutters and downspouts. These devices include screens, sieve devices and liners, which all work under the same principles of keeping debris out of the gutter while allowing water to flow into the gutter. However, in many cases, leaves and debris get caught in the above-mentioned devices restricting or preventing water from entering the gutter. In this situation, water may back up under the roof shingles and cause damage to the roof sheathing or fascia board. This condition may be further compounded in winter weather where ice and snow may develop on the clogged device causing stress on the gutter support from the added weight or may cause the formation of an ice dam from the collection of water. Additionally, these devices require period cleaning to remove the debris lodged in them.

[0007] Furthermore, during installation, gutters are typically mounted with a pitch to allow water to flow to one end. However, by sloping the gutter, a portion of the fascia board is exposed and over time damage will result. Furthermore, the sloping of the gutter results in an unsightly appearance to the building.

[0008] Therefore, a need exists for a gutter system which facilitates the flow of water and debris from a building structure while maintaining its appearance. A further need exists for a gutter system which requires no cleaning or maintenance.

## SUMMARY

[0009] A gutter assembly and method for making same are provided. The gutter assembly includes an inner channel for directing flow of water and debris; and an outer channel for supporting the inner channel, wherein the inner channel is disposed within the outer channel at a predetermined angle. The gutter assembly of the present disclosure facilitates the removal of water and debris from the roof of a building structure while protecting the structure and maintaining an aesthetically pleasing appearance.

[0010] In one aspect of the present disclosure, a gutter assembly is provided including an inner channel for directing flow of water and debris; and an outer channel for supporting the inner channel, wherein the inner channel is disposed within the outer channel at a predetermined angle. The inner channel has a substantially arcuate cross-section and the outer channel includes a front face, a bottom wall and a back wall, wherein the back wall is coupled to a structure for supporting the assembly.

[0011] In another aspect, the inner channel and outer channel are integrally formed from a flat sheet of material. Furthermore, the inner channel and outer channel may be formed from sheet metal, aluminum, plastic or vinyl.

[0012] In a further aspect of the present disclosure, the gutter assembly may include a heating mechanism disposed between the inner channel and outer channel.

[0013] In another aspect, the inner channel of the gutter assembly is of a longer length than the outer channel and the inner channel telescopically mates with the inner channel of at least one additional gutter assembly.

[0014] The gutter assembly may further include an end piece for directing water from the inner channel to a downspout, wherein the end piece is substantially funnel shaped, and a connector for coupling the end piece to the downspout, wherein the connector includes a plurality of rigid sections coupled by a flexible member.

[0015] In another aspect of the present disclosure, a method for making a gutter assembly is provided. The method includes the steps of providing a single flat sheet of material; forming a first channel in a first half of the sheet of material, the first channel being U-shaped including a front face, a bottom wall, and a back wall; forming a second channel in a second half of the sheet material, the second channel being substantially arcuate shaped; and folding the second channel over and into the first channel.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The above and other aspects, features, and advantages of the present disclosure will become more apparent in light of the following detailed description when taken in conjunction with the accompanying drawings in which:

[0017] **FIG. 1** is a perspective view of a gutter assembly attached to the outer edge of an eaves surrounding a building in accordance with the present disclosure;

[0018] **FIG. 2A** is a cross-sectional view of the gutter assembly taken along line **2A-2A** of **FIG. 1**;

[0019] **FIG. 2B** is a top plan view of the gutter assembly of **FIG. 1**;

[0020] **FIG. 3A** is a cross-sectional view of the gutter assembly taken along line **3A-3A** of **FIG. 1**;

[0021] **FIGS. 3B and 3C** are cross-sectional and perspective views of the gutter assembly for illustrating the flow of water;

[0022] **FIGS. 4A and 4B** are side views of a gutter assembly illustrating a method for coupling at least two sections;

[0023] **FIG. 5** is a view of a gutter system according to the present disclosure;

[0024] FIGS. **6**A-D illustrate several views of an end piece in accordance with the present disclosure;

[0025] FIGS. **7**A-D illustrate several views of a connector in accordance with the present disclosure; and

[0026] **FIG. 8** illustrates a method of making a gutter assembly according to one embodiment of the present disclosure.

## DETAILED DESCRIPTION

[0027] Preferred embodiments of the present disclosure will be described hereinbelow with reference to the accompanying drawings. In the following description, well-known functions or constructions are not described in detail to avoid obscuring the invention in unnecessary detail. Throughout the drawings, like reference numerals represent like elements.

[0028] A gutter assembly and method for making same are provided. The gutter assembly of the present disclosure facilitates the removal of water and debris from the roof of a building structure while protecting the structure and maintaining an aesthetically pleasing appearance.

[0029] **FIG. 1** is a perspective view of a gutter assembly attached to the outer edge of an eaves surrounding a building in accordance with the present disclosure. The gutter assembly **10** includes an inner channel **12** for directing the flow of water and debris received from a roof and an outer channel **14** for supporting the inner channel **12**. As can be seen from **FIG. 2**, the inner channel **12** is disposed within the outer channel **14** at a predetermined angle, or pitch, to direct the flow of water and debris to a downspout **16**. The predetermined angle of the inner channel **12** eliminates the need to slope the entire gutter assembly and allows the outer channel **14** to be placed flush with the roof line and level to the ground. In this manner, the fascia board **24** of the building is not exposed to weather thus preventing damage, e.g., wood rot. Additionally, since the gutter assembly of the present disclosure is not manually sloped by an installer, installation time is reduced, and therefore, installation cost is reduced.

[0030] Referring to **FIG. 3A**, a cross-sectional view of the gutter assembly **10** is illustrated. The inner channel **12** has a substantially arcuate cross-section for facilitating the flow of water and debris; flat bottomed gutters have the tendency to retard water flow due to the increased coefficient of friction of the broader surface area. As can be seen in **FIGS. 3B and 3C**, the inner channel **12** will be sloped to direct the flow of water. Preferably, the angle or pitch of the inner channel **12** will be determined based on a length L of the gutter assembly section. Each section of the gutter assembly includes an upstream end **26** and a downstream end **28**. When determining the angle of the inner channel **12**, the upstream end **26** will include a minimum height h**1** between the inner channel **12** and an upper edge of the outer channel **14** to ensure a passage is created for the collection of water and debris. Furthermore, a maximum height h**2** will be incorporated on the downstream end **28**. Height h**2** will depend on how many sections of the gutter assembly are used in a particular run, the details of which will be described below.

[0031] The outer channel **14** is generally U-shaped and includes a front face **18**, a bottom wall **20**, and a back wall **22**. It is to be appreciated that front face **18** may be of any configuration and is not limited to the configuration shown throughout the figures. Back wall **22** is generally planar to mate flush with fascia board **24** of the building structure.

[0032] In one embodiment, the back wall **22** of outer channel **14** includes an elongated edge **30** which will be bent over one edge **32** of the inner channel **12** securing the inner channel to the outer channel **14** and for forming a nailing strip **34**. A fastener **36**, e.g., a self-tapping screw, may then be driven through edge **30** piercing the inner channel **12** and back wall **22** securing the gutter assembly **10** to the fascia board **24**. In another embodiment, front face **18** includes a second elongated edge **38** which will be bent over a second edge **40** of the inner channel **12** to prevent water and debris from entering a passageway **42** between the inner channel **12** and the outer channel **14**. Preferably, the second edge **40** of the inner channel **12** will be fastened to the outer channel, e.g., by crimping, welding, etc., to further support the inner channel **12**. Once secured to the fascia board **24** via the nailing strip **34**, the inner channel will support the outer channel obviating the need for long nails to penetrate the front face **18** and the back wall **24** as in conventional gutters.

[0033] In one embodiment, the gutter assembly will be manufactured in sections. Referring to **FIGS. 4A** and B, a first gutter assembly section **10-1** and second gutter assembly section **10-2** are shown in an exploded view. In this embodiment, each of the first and second gutter assembly sections **10-1**, **10-2** are constructed with a length of the inner channel **112** longer than a length of the outer channel **114**. In this manner, the first and second gutter assembly sections **10-1**, **10-2** will telescopically mate to form a single length of the gutter assembly. The first gutter assembly section **10-1** will include an outer channel **114-1** as described above and an inner channel **112-1** angled within the outer channel **114-1**. Here, the maximum distance h**2** of the down stream end will be set to accommodate the mating of the inner channel with additional gutter assemblies. The second gutter assembly section **10-2** will includes an outer channel **114-2** as described above and having the sane dimensions as outer channel **114-1** so when mated together the gutter assembly will appear to be a single continuous piece. The inner channel **112-2** of the second gutter assembly section **10-2** will have a large minimum distance h**1** on the upstream side as to telescopically mate with the inner channel **112-1** of the first gutter assembly section **10-1**. Once mated, the downstream end of inner channel **112-1** will lie in contact with the upstream end of inner channel **112-2**. Optionally, a back flow prevention device **44** may be installed where the inner channels meet. For example, the back flow prevention device **44** may be a rubber gasket, a small amount of silicon or any other known device or material which is water-proof. It is to be appreciated that the length of a gutter assembly section should not be limited to any particular length but

may be prefabricated in a variety of lengths so in combination may achieve a desired length of an installer.

[0034] Referring to **FIG. 5**, a gutter system **200** embodying the principles of the present disclosure is illustrated. Gutter system **200** includes at least one gutter assembly **10**, an end cap **246**, an end piece **248** and a downspout **250**. In operation, water from rain, melting snow etc, and debris would run down the roof into the inner channel of the gutter assembly **10** and would flow in the direction as indicated by the arrows. The water and debris would discharge into the end piece **248**, down the downspout **250** and carried away from the building.

[0035] Referring to **FIGS. 6A and 6B**, several embodiments of an end piece according to the present disclosure are shown. Each of the end pieces **248-1**, **248-2** are formed with a plurality of pieces having compound angles forming a funnel-like effect. End piece **248-1** includes a first half **252** and a second half **254** symmetrically formed about a spout **256**. Preferably, first and second halves **252**, **254** will have a substantially arcuate shape to telescopically mate with a downstream end of an inner channel of a gutter assembly as illustrated in **FIGS. 6C and 6D**. End piece **248-2** includes a first end piece **258**, a second end piece **260**, a first side piece **262** and a second side piece **264**. Similarly to end piece **248-1**, the first and second end pieces **258**, **260** will preferably have a substantially arcuate shape to telescopically mate with a downstream end of an inner channel of a gutter assembly. It is to be appreciated that both embodiments of the end piece **248-1**, **248-2** will have a funnel-like effect and will facilitate the removal of water from the gutter assembly.

[0036] The gutter system may further include a connector or elbow **268** for coupling the end piece **248** to the downspout **250**. The connector **268** is illustrates in **FIGS. 7A through 7D**. Referring to **FIG. 7A**, the connector **268** includes a coupling section **270** for coupling the connector to the spout **256** of the end piece **248**. The coupling section **270** will have a circumference slightly larger than the circumference of the spout **256** to ensure a snug fit and no leakage. The connector **268** will further include a plurality of rigid sections **272**, **274**, **276**, **278** wherein each rigid section is coupled to the next rigid section by a flexible member **280**. Preferably, each rigid section is generally cylindrical with a top and bottom cut at an angle. The flexible member may be some form of circular rubber gasket, pliable sheetmetal, etc. As can be seen from **FIGS. 7B-7D**, the connector **268** can take on virtually any shape by twisting an appropriate rigid section as indicated by the arrows.

[0037] It is to be appreciated by those skilled in the art that the gutter assembly and system described herein can be constructed of any commonly used materials including sheet metal, aluminum, plastic or vinyl.

[0038] In one embodiment, the inner and outer channel of the gutter assembly are manufactured as two separate pieces using conventional sheet metal forming machines employing rollers and bending mechanisms. The two separate pieces are then joined together as described above by crimping, welding, etc.

[0039] In another embodiment, the inner and outer channels of the gutter assembly are integrally formed from a single flat sheet of material. Referring to **FIG. 8**, a method for forming a gutter assembly from a single sheet of material is illustrated. It is to be appreciated that the method is performed by a specially adapted gutter forming machine. Initially, a single flat piece of material **800**, e.g., sheet metal, aluminum, etc., is provided (step a) having a first half **802** and a second half **804** divided by a longitudinal axis **806**. A series of rollers **808**, **810**, **812**, **814** interact with the sheet material **800**. Rollers **808** and **810** interact with the first half **802** of the material **800** to form the outer channel of the gutter assembly and rollers **812** and **814** interact with the second half **804** to form the inner channel (step b). Once the inner and outer channels **12**, **14** are formed, the inner channel **12** is folded over and into the outer channel **14** completing the gutter assembly **10**.

[0040] In a further embodiment, the gutter assembly is extruded from plastic as a single unitary piece.

[0041] In still a further embodiment, the various components of the gutter assembly and system are manufactured from conventional polyvinyl chloride (PVC) type components. PVC should be understood to include all analogous materials, including, but not limited to: CPVC, PVCA, PVCCA, PVCV and PCWC. All such materials must have characteristics permitting a fusion of the materials together upon application of any commercially available PVC liquid fusion compounds, in a chemical welding process, to thereby form a single integrated unit after the parts have been chemically welded together. The liquid fusion compound actually fuses all of the components together into a single integrated piece. Thus, no cracks or leaks are possible because of this weld between the various components. This connection method also enhances the stability and structural integrity of the entire gutter system to increase its self-supporting characteristics.

[0042] The gutter assembly and system of the present disclosure may further include a heating mechanism disposed in the passageway **42** between the inner channel **12** and outer channel **14**. An exemplary heating mechanism would be a heat trace cable **282** (**FIG. 3C**) as commercially available from Nelson Heat Trace of East Granby, Conn. The heating mechanism will keep the gutter assembly above a predetermined temperature limit, e.g. 32 degrees F., to prevent the formation of ice or accumulation of snow. The heating mechanism may be activated by a switch located inside the building or may be activated automatically by a thermostat or low limit temperature device located external to the building. Since the heating mechanism will be disposed in the passageway **42**, the heating mechanism will be protected from weather and water, thereby preventing a possible short.

[0043] A gutter assembly, system and method for making the same has been described. The gutter assembly including an inner and outer channel will facilitate the removal of water and debris from a building structure while maintaining an aesthetically pleasing appearance. Since the inner channel of the gutter assembly is sloped, the outer channel may be installed flush to the roof line thus protecting the structural integrity of the building. Furthermore, since the gutter assembly does not have to be installed with a slope, the gutter assembly can be installed more quickly than conventional gutters thereby reducing installation time and costs.

[0044] While the disclosure has been shown and described with reference to certain preferred embodiments thereof, it will be understood by those skilled in the art that various

changes in form and detail may be made therein without departing from the spirit and scope of the disclosure as defined by the appended claims.

What is claimed is:

**1**. A gutter assembly comprising:

an inner channel for directing flow of water and debris; and

an outer channel for supporting the inner channel, wherein the inner channel is disposed within the outer channel at a predetermined angle.

**2**. The gutter assembly as in claim 1, wherein the inner channel has a substantially arcuate cross-section.

**3**. The gutter assembly as in claim 2, wherein the outer channel is substantially U-shaped.

**4**. The gutter assembly as in claim 1, wherein the predetermined angle is based on a length of the outer channel.

**5**. The gutter assembly as in claim 1, wherein the outer channel includes a front face, a bottom wall and a back wall, wherein the back wall is coupled to a structure for supporting the assembly.

**6**. The gutter assembly as in claim 1, wherein the inner channel and outer channel are integrally formed from a flat sheet of material.

**7**. The gutter assembly as in claim 1, wherein the inner channel and outer channel are formed from sheet metal, aluminum, plastic or vinyl.

**8**. The gutter assembly as in claim 1, wherein a heating mechanism is disposed between the inner channel and outer channel.

**9**. The gutter assembly as in claim 5, wherein the back wall of the outer channel includes a first elongated edge, the first elongated edge being folded over a first edge of the inner channel for securing the inner channel to the outer channel.

**10**. The gutter assembly as in claim 9, wherein the front face of the outer channel includes a second elongated edge, the second elongated edge being folded over a second edge of the inner channel for securing the inner channel to the outer channel.

**11**. The gutter assembly as in claim 1, wherein the inner channel is of a longer length than the outer channel and wherein the inner channel telescopically mates with the inner channel of at least one additional gutter assembly.

**12**. The gutter assembly as in claim 11, further comprising a back flow prevention device disposed between the mating inner channels for preventing the flow of water into the outer channel.

**13**. The gutter assembly as in claim 1, further comprising an end piece for directing water from the inner channel to a downspout, wherein the end piece is substantially funnel shaped.

**14**. The gutter assembly as in claim 13, further comprising a connector for coupling the end piece to the downspout, wherein the connector includes a plurality of rigid sections coupled by a plurality of flexible members.

**15**. The gutter assembly as in claim 1, wherein the inner channel and outer channel are extruded as a single unitary piece.

**16**. A method for making a gutter assembly, the method comprising the steps of:

providing a single flat sheet of material;

forming a first channel in a first half of the sheet of material, the first channel being U-shaped including a front face, a bottom wall, and a back wall;

forming a second channel in a second half of the sheet material, the second channel being substantially arcuate shaped; and

folding the second channel over and into the first channel.

**17**. A gutter assembly comprising:

an inner channel for directing flow of water and debris, the inner channel having a substantially arcuate cross-section; and

a substantially U-shaped outer channel for supporting the inner channel, wherein the inner channel is disposed within the outer channel at a predetermined angle for directing the flow of water and debris to one end of the assembly.

* * * * *