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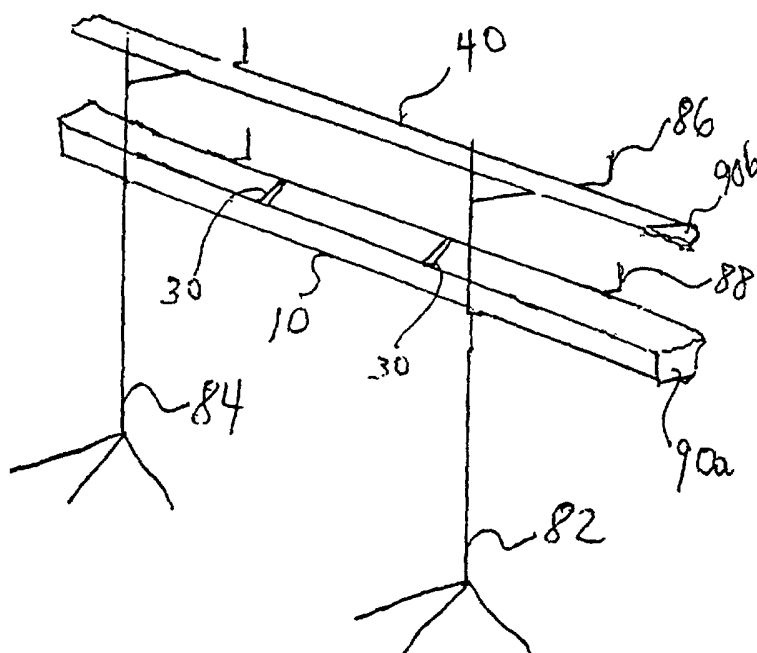
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(54) Title: DIVERSION SYSTEM AND METHOD



(57) Abstract: A shelf extends inwardly to the gutter trough from the front containment wall of a gutter trough to cooperate with a lip of a cavity structure of a hanger to provide structural stability and optional deflector attachment facility in a rain collection and diversion system. The hanger cavity structure has a containment lip a portion of which extends over a portion of the inwardly extending shelf of the front containment wall to allow function water bearing capacity of the trough and a lengthened back trough wall to accommodate hanger placement and deflector inclination. The hanger can include deflector-mating cavities that open toward each other to allow compression attachment of the deflector. In a preferred embodiment, the deflector may be attached to a formed trough in which hangers are positioned to allow movement of the trough-deflector combination as a unit from the machine-site to the installation location on the structure. Associated installation methods are provided.

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# DIVERSION SYSTEM AND METHOD

## Technical Field:

The present invention relates to rain and run-off collection and diversion systems and, in particular, to systems and methods for such systems that exhibit reduced debris accumulation.

## 5 Background of the Invention:

Diversion of rain from buildings is a well-known and beneficial practice. For centuries, architects and builders have understood the benefits of diverting rain to forestall erosion, maintain structural stability, and preserve vegetation. In recent decades, a multitude of systems have been developed to divert rain from structures and homes. Typically, such systems  
10 have been placed beneath or adjacent to the roofline to allow collection and diversion of rain accumulated from across the surface area of the structure roof. Such systems are sometimes called "gutter" systems.

Frequently, rain diversion systems employ gutters that are open channels to collect run-off from the roof. Diversion or gutter systems devised with open-channeled rain gutters tend to  
15 accumulate debris including sticks, leaves and other matter that is swept toward the gutter by the gravity-induced flow of water down the pitch of the roof. Such debris can cause malfunction of the system as well as significant problems with leakage and corrosion. Roof and structural rotting as well as erosion can be precipitated by the consequent accumulation of water without appropriate attendant diversion.

Consequently, a variety of gutter systems of varying complexity have been developed to  
20 inhibit debris accumulation in gutter systems. Simple systems have merely placed screens across open-faced gutter channels. These techniques commonly have their own debris accumulation problems. Other systems employ a deflector described by various terms such as "hood" or "shield" that deflect debris while the gutter accumulates water for diversion to  
25 determined locations. For example, in U.S. Pat. No. 4,757,649 to Vahldieck, a system is described that purportedly preferentially collects water and deflects debris over a continuous double-curved shield through which a spike passes to affix the shield to a back support wall of the gutter. The use of shields and other deflectors is well known, and a variety of prior systems modify the shape of the deflector to purportedly take better advantage of the surface tension

qualities of diverted run off. For example, in U.S. Pat. No. 4,404,775 to Demartini, a system of longitudinal ridges is imposed on a deflector and is said to improve adhesion of the water to the deflector to improve transference to the gutter.

Others have developed systems to support debris deflectors or affix the deflector to the gutter. For example, in U.S. Pat. No. 4,497,146 to Demartini, a rain deflector support is described that purports to support the underside of a rain gutter deflector while positioning the deflector in relation to the gutter.

As diversion systems have become more complicated, so have the associated issues of cost, specialized material stock, and installation efficiency become more unwieldy. For example, most systems that employ a deflector affix the deflector with screws or clips that reduce flexibility of the system or add an extra part (in addition to the hanger) to the assembly. If the deflector cannot be easily unfastened from the gutter, repair and maintenance are complicated.

For a variety of reasons, diversion systems that deflect debris have not been adopted as widely as demand would suggest. There are a variety of reasons for this result. One reason for the minimal market penetration is the use of non-standard widths of metal stock or "coil" for the gutter trough above which the deflector is positioned. Non-standard coil sizes add significantly to the cost and availability of such systems.

There are two principal sizes of coil used to form the gutter channels known in the art as "troughs." For the widely found five inch-wide (5") gutter troughs, standard coil material of 11 and 7/8 inches (11 7/8") is employed (except in the Northeastern U.S. where 5" gutter troughs are formed from 11 and 3/4 inch (11 3/4") stock). For the less widely found, but still common, six inch (6") trough, fifteen inch (15") coil is used.

In almost all deflection systems, when installed, a deflector must be inclined by a degree sufficient to impart velocity to the run-off great enough to impel debris from the deflector. This requires that the back of the trough, proximal to which the deflector is attached, be high enough to provide sufficient incline for the deflector. Debris deflection systems for 5" trough gutters employ non-standard coil for the gutter as a result of taking material from the front of the trough to raise the back wall of the gutter. With known designs, if standard width coil of 11 7/8 inches were used to form the trough, the shift of material around the standard trough form factor (as employed in the art to create the "OG" 5 inch gutter) from the front trough channel

containment wall to the back wall of the trough to provide sufficient deflector inclination leaves insufficient material for the front. This process takes, however, material from the front border area of the trough to create the stiffening front channel edge that provides installation stability and standard hanger affixation capability.

5           The shape of the front of the gutter trough contributes to structural stability and, in some systems, provides an interface for hanger or deflector attachment. In particular, the shape of the border area of the gutter trough can significantly affect gutter stability during installation, an important consideration in any gutter system. Typically, lengths of gutter trough are formed in runs approximately 40 feet long. Without sufficient resistance to deformation, the gutter trough  
10   may fold or crease, particularly when being moved during installation, thus limiting run lengths and increasing installation difficulty. Consequently, 5" gutter troughs with debris deflectors have typically used coil wider than 11 7/8" or 11 3/4" for gutter formation to provide material sufficient to provide a stabilizing front gutter channel configuration with a raised back gutter trough wall to accommodate appropriate inclination of the deflector. Consequently, because of  
15   the higher cost of non-standard material, in particular, deflector-fitted 5" trough gutter systems have cost significantly more than open-faced 5" trough gutter systems crafted from standard sized coil material.

Previous system design, whether with 5" or 6" gutter troughs, has also contributed to unwieldy installation techniques, further increasing the expense of diversion systems that  
20   employ deflection hoods or shields. Some deflection systems form the trough and deflector from one piece of material. More commonly, the trough and deflector are separately formed and joined in place at the structure roof edge. Typically, two forming machines are employed during installation of a two-piece deflection system. One machine is dedicated to gutter trough formation, while the other is configured to form the deflector. The machines are typically  
25   placed side-by-side. The installation team typically first forms trough lengths sufficient to gutter the structure. The troughs are then affixed in place on the structure. After the troughs are fastened to the building, corresponding deflectors are formed and affixed to the in-place troughs. This process requires multiple trips to and from the forming machines as well as at least two trips up a ladder to install separately, the two large pieces of the system. The  
30   described process requires dexterity which, even if applied, cannot ameliorate the difficulty of moving long lengths of deflector that lack structural rigidity unless affixed to, and combined with, the gutter trough.

The inflexible nature of the affixation between hood and trough in prior systems results in several shortcomings. Replacement of deflector sections is made difficult by the inflexible nature of the affixation between deflector and trough. Nail or screw attachment of the deflector is at least semi-permanent, and when the deflector is attached by such means, the system is less easily repaired, serviced, or replaced. Other systems have more sophisticated deflector-attachment techniques, but those systems lack installation flexibility. For example, in U.S. Pat. No. 5,845,435 to Knudson, there is there purportedly described a system having a hood which snaps into particularly configured hangers affixed along the length of the gutter trough. In this system however, the deflector is opened wider to embrace coupling portions of a fastening support device. This is difficult to do with one hand. Installation flexibility is also minimal because, as described in Knudson, the hanger and trough are affixed to the structure before the deflector is attached to the gutter trough. As in other prior systems, this prevents creation of a structurally sound member before the deflector and gutter trough assembly is moved from the machine site to the eventual installation location, an advantage for installation having considerable value in reducing labor cost and inconvenience.

Consequently, what is needed therefore, is a rain collection and diversion system that employs standard-sized coil, has structural soundness and strength, and can be partially assembled close to the machine-site while being easily installed.

#### Summary of the Invention

A shelf extends inwardly to the gutter trough from the front containment wall of a gutter trough to cooperate with a lip of a cavity structure of a hanger to provide structural stability and optional deflector attachment facility in a rain collection and diversion system. The hanger cavity structure has a containment lip, a portion of which extends over a portion of the inwardly extending shelf of the front containment wall to allow functional water bearing capacity of the trough and a lengthened back trough wall to accommodate hanger placement and deflector inclination. The hanger can include deflector-mating cavities that open toward each other to allow compression attachment of the deflector.

In a preferred embodiment, the deflector may be attached to a formed trough in which hangers are positioned to allow movement of the trough-deflector combination as a unit from the machine-site to the installation location on the structure. Associated installation methods are provided.

Brief Description of the Drawings:

Fig. 1 depicts a cross-sectional view of a prior art trough of a configuration that is common in the field.

Fig. 2 depicts a cross-sectional view of a trough configured in accordance with a preferred embodiment of the present invention.

Fig. 3 depicts a cross-sectional view of a trough, hanger and deflector assembly in accordance with a preferred embodiment of the present invention.

Fig. 4 depicts a cross-sectional view of a half-round trough, hanger and deflector assembly in accordance with a preferred embodiment of the present invention.

Fig. 5 depicts a cross-section of an enlarged area of the trough, hanger, and deflector depicted in Fig. 3.

Fig. 6 depicts another embodiment of trough, hanger, and deflector devised in accordance with a preferred embodiment of the present invention.

Fig. 7 is an enlarged depiction showing a containment wall border area of a trough configured in accordance with a preferred embodiment of the present invention.

Fig. 8 is an enlarged depiction of a receptive cavity structure of a hanger configured in accordance with a preferred embodiment.

Fig. 9 depicts the border area of a trough and a receptive cavity structure of a hanger configured in accordance with a preferred embodiment of the present invention.

Fig. 10 depicts the border area of a trough and a receptive cavity structure of a hanger configured in accordance with an alternative embodiment of the present invention.

Fig. 11 depicts the border area of a trough and a receptive cavity structure of a hanger configured in accordance with an alternative embodiment of the present invention.

Fig. 12 depicts the border area of a trough and a receptive cavity structure of a hanger configured in accordance with another alternative embodiment of the present invention.

Fig. 13 is an end-on depiction of a forming machine disposed above a second forming machine as employed in a preferred embodiment of the present invention.

Fig. 14 is a plan view of two offset forming machines as employed in a preferred embodiment of the present invention.

Fig. 15 depicts two-armed run-out stands as employed in a preferred embodiment of the present invention.

5 Detailed Description of Preferred Embodiments:

Fig. 1 depicts a cross-sectional view of a prior art trough 5 of standard configuration that is common in the field. As shown in Fig. 1, the depicted trough 5 has a folded edge or shelf along its front containment wall.

Fig. 2 depicts a cross-sectional view of a trough 10 configured in accordance with a preferred embodiment of the present invention. Trough 10 has a front containment wall 12 that has an inwardly projecting shelf 14 that is part of containment wall border area 16 of front containment wall 12. Trough 10 has a back wall 18. As shown, containment wall 12 need not be a planar wall but may take a variety of shapes and configurations to provide a containment function for collected liquid. Between front containment wall 12 and back wall 18, a channel is formed for water collection and diversion bottomed with floor 20. In an embodiment having a rounded or "half-round" trough, it will be recognized that there is no distinct floor 20 and front containment wall 12 and back wall 18 will not have traditional "wall" planar areas but blend into an arcuate floor area.

In a 5-inch embodiment of trough 10 in which there is approximately 5 inches between back wall 18 and the farthest reach of containment wall border area 16, standard material coil of 11 7/8 inches may be employed. As those of skill in the art will recognize, standard material coil may exhibit some variation in width depending upon manufacturer or local custom. Consequently, in a preferred embodiment employing standard material, standard material between 11 5/8 inches and 12 inches in width may be employed to create trough 10 with a 5 inch opening. Certainly other sizes of troughs can be created to advantage by employment of the present invention. For example, the well-known 6-inch trough can be created in conformity with an alternative embodiment of the present invention by use of 15 inch material coil. Containment wall border area 16 may be formed by bending, folding, forming or other of the well-known means for configuring trough 10. A preferred method for creating containment wall border area 16 is with a roller-based machine at the same time that the configuration of trough 10 is created from coil stock. When a 5 inch trough in accordance with a preferred

embodiment of the present invention is created with a roller-based machine, the standard material coil stock is positioned so as to move the furthest reach of the formed back wall between  $\frac{3}{4}$  and 1 inch from the place the furthest reach of the back wall would occupy in formation of a standard OG gutter trough so as to bring greater height to the back wall for deflector inclination during trough formation. As well as using forms in accordance with the present invention, the material is shifted around the form relative to the material placement employed in forming the OG gutter.

Fig. 3 depicts as assembly 15, a cross-sectional view of trough 10 in use with hanger 30 and deflector 40 in accordance with a preferred embodiment of the present invention. The system described can be used either with or without deflector 40.

As shown in Fig. 3, hanger 30 includes optional deflector attachment cavities 32 and 34. In the depicted embodiment, hanger 30 is stamped from metal, but any number of materials and formation techniques may be used to create a hanger 30 having the features described here. For example, hanger 30 may be made of metal or plastic such as Teflon, or higher strength polys. If made of metal, hanger 30 can be forged, stamped, extruded, die cut or cast or other technique familiar to the trade. Hanger 30 includes receptive cavity structure 31 that will be later described in more detail while front containment wall 12 exhibits containment wall border area 16 that will be described in more detail. Fig. 4 depicts a cross-sectional view of a half-round trough assembled with a hanger and deflector in accordance with a preferred embodiment of the present invention.

With reference to Figs. 3 and 5 (which figure illustrates an enlarged portion of Fig. 3 about the area of flex fold 42), deflector 40 is selectably attached to hanger 30 by insertion of flex fold 42 into cavity 34 and insertion of attachment fold 46 into cavity 32. In a preferred compression embodiment, curve 44 provides a ready method to accomplish this selective attachment. Those of skill in the art will recognize that flex fold 42 and attachment fold 46 are first and second long axis perimeters of deflector 40 and need not be "folds" but may be any edge or fold or border of the deflector which may be inserted into the appropriate cavity of the hanger. This selectable attachment feature of deflector 40 as shown in this depiction of a preferred embodiment of the present invention allows assemblage of deflector 40 to hanger 30 before the assembly 15 is installed on a structure.



As shown in conjunction with Figs. 3 and Fig. 5, hanger 30 has optional penetrative prongs 36 shown penetrating back wall 18 of trough 10. As shown more closely in Fig. 5, prongs 36 preferably have a concavity 38 that cooperates with dimple 39 on back wall 18 to preliminarily position hanger 30 for prong insertion through back wall 18 with an appropriate compression tool such as a specialized pliers or other readily available and adapted instrument. Back abutment 41 of hanger 30 is placed against back wall 18 with concavity 38 placed against dimple 39 and the compression tool pushes prongs through the back wall 18. There need not be a specially configured structure for an abutment for hanger 30, the back of the structure of hanger 30 disposed against back wall 18 being the abutment. The prongs are folded by the compression tool against the back of back wall 18 to affix hanger 30. This operation can be performed before attachment of the trough to the structure and may be performed at the machine site or elsewhere to affix back wall 18 in relation to front containment wall 12 while creating a mechanically sound structure ready for attachment of deflector 40. Hanger 30 need not have prongs 36 but their use is advantageous.

As described with continuing reference to Figs. 3 and 5, flex fold 42 of deflector 40 cooperates with cavity 34 to allow a resistance hinge-like action of deflector 40. In particular, deflector 40 may be lifted from hanger 30 by compression of curve 44 of deflector 40 to remove attachment fold 46 of deflector 40 from cavity 32. The forward part of deflector 40 is then lifted from its position as flex fold 42 and cavity 32 allow a spring-like rotational opening of a gap between deflector 40 and hanger 30 through which fastener 50 may be manipulated to install assembly 15 on the structure as fastener 50 is screwed or pounded or otherwise inserted into place. In embodiments with penetrative fasteners, fastener 50 may be a nail or screw or spike or other such projecting fastener, many of which are common in the field. Other techniques for hanging assembly 15 are known in the art. Hanger 30 includes, in a preferred embodiment, indent 48 to mate with ridge 52 of deflector 40 while stop 54 of hanger 30 inhibits deflector 30 from unpredicted separation from hanger 30, particularly during installation or servicing. In a preferred embodiment, fastener 50 slides into a guide slot 56 created in hanger 30 to avoid addition of height or special platforms to hanger 30. The compression fitting of deflector 40 into cavities 32 and 34 allows ready placement of deflector 40 on the trough 10 and hanger 30 combination at the machine-site to allow a single installation trip from machine site to installation site with the combined structure of deflector and trough.

Fig. 6 depicts another embodiment of assembly 15 devised in accordance with the present invention and which employs an extruded hanger 30. Fig. 6 depicts fastener 50 as it would be engaged into a structure. Those of skill in the art will recognize that the disclosed configuration allows the front of deflector 40 to be lifted from hanger 30 to insert fastener 50 into the structure.

Fig. 7 is an enlarged depiction showing containment wall border area 16 of trough 10 of Fig. 3. As shown in Fig. 7, containment wall border area 16 includes containment edge or shelf 52 that extends inwardly to the trough. Either part or all of containment shelf 52 may extend inwardly to the trough and that inward extension may be at an angle or horizontal orientation. In a preferred embodiment, containment wall border area 16 includes rise 53. Containment shelf 52 may be folded, or a single material thickness and may extend horizontally (as shown in the preferred embodiment view of Fig. 7) or at an angle from the horizontal as shown in Fig. 10, or have a vertical extension as shown, for example, in Fig. 11. Part or all of shelf 52 can, but need not, be canted at an angle to match the configuration of containment lip 54 of receptive cavity structure 31 of hanger 30. Consequently, those of skill in the art will recognize that containment lip 54 may take a variety of configurations to cooperate with the variety of configurations of containment shelf 52 within the scope of the invention to extend a portion of containment lip 54 over a portion of containment shelf 52 and thereby, according to the vernacular of the present disclosure, "mate" containment lip 54 with containment shelf 52. The part of containment shelf 52 that extends inwardly to the trough need not be the portion of shelf 52 over which a portion of containment lip 54 extends to mate with containment shelf 52. When a portion of containment lip 54 extends over a portion of containment shelf 52, the elements are mated.

Fig. 8 is an enlarged depiction of receptive cavity structure 31 of hanger 30 in a preferred embodiment. Receptive cavity structure 31 as shown in Fig. 8, includes fulcrum ridge 56 over which, rise 53 of front containment wall border area 16 tents.

Fig. 9 depicts a preferred disposition of containment lip 54 mated with containment shelf 52 to provide functional water bearing capacity for trough 10 while still allowing sufficient standard material coil to provide a back wall 18 of sufficient height to provide necessary inclination for deflector 40. In this preferred depiction, containment lip 54 is mated with containment shelf 52.

Figs. 10, 11, and 12 depict alternative arrangements for the mating between containment lip 54 and containment shelf 52 and they are included only as example embodiments and not as limitations for the scope of the present invention. Fig. 10 depicts an alternative embodiment of the invention showing containment shelf 52 as angled upward and containment lip 54 as angled downward as shelf 52 and lip 54 are mated. In other alternative and exemplar but not to be construed as limiting embodiments, containment lip 54 may be horizontal while containment shelf 52 is angled or containment lip 54 may be angled while containment shelf 52 exhibits a horizontal character or each may be independently angled or horizontal.

Fig. 11 shows another alternative embodiment of the present invention in which containment lip 54 extends over a vertical extension portion of containment shelf 52. This is another example of the mating of containment lip 54 and containment shelf 52.

Fig. 12 shows yet another alternative embodiment of the present invention in which containment lip 54 has an extension that deflects downward over a portion of containment shelf 52. Containment lip 54 and containment shelf 52 are mated in the depiction of Fig. 12.

The present invention provides numerous advantages during installation of the system. A preferred method for installation includes formation of deflector 40 with a machine placed above a forming machine dedicated to formation of trough 10. Fig. 13 depicts forming machine 72 disposed above forming machine 70 in the bed 74 of a truck. The machines need not be placed on the truck bed that is merely shown as an exemplar setting. Preferably, a track is employed that allows forward and backward movement of upper machine 72 relative to the bottom machine 70 for maintenance of the lower machine 70 as will be recognized by those of skill in the art. Machine 70 is configured to form lengths of trough 10 configured in accordance with the present invention, while machine 72 is configured to form lengths of deflector 40 configured in accordance with the present invention.

In a preferred method in accordance with the present invention, material cradles 74 and 76 of the respective machines 70 and 72 are loaded with coil. Trough machine 70 consumes coil material 75 of 11 7/8 inches in width in an application configured to produce troughs 5 inches in width. Other widths of coil may also be used. Cradle 76 of deflector machine 72 is loaded with coil material 77 of between 7 5/8 inches and 8 inches to produce deflectors. Other widths may be used for larger or smaller configurations. Emergent from machine 70 are lengths 78 of trough 10. Emergent from machine 72 are lengths 80 of deflector 40.

As shown in Fig. 15, two-armed run-out stands 82 and 84 having upper arms 86 and lower arms 88 provide work placement for lengths of deflector 40 and trough 10. End caps 90a are placed in appropriate locations. In a preferred embodiment, end caps are two-piece, with piece 90a fitted to troughs 10 and piece 90b fitted to deflector 40.

5 A preferred method for installation of the present system proceeds as follows. As length 78 of trough 10 is run from machine 70, end caps 90a are installed where appropriate, outlet sites are punched and outlets installed for joinder with downspouts, miters are cut and cavity structure 31 of hanger 30 is brought into place to mate containment lip 54 of hanger 30 with containment shelf 52 of trough 10. Hangers 30 are punched through the back wall 18 of  
10 trough 10 and prongs 36 are crimped. These steps can be performed either at the machine or with the assistance of the run-out stands. Hanger fitted trough 10 is rested on run-out stands.

Corresponding length 80 of deflector 40 is run from machine 72 and is installed with end caps 90b and miters are cut appropriate. Length 80 of deflector 40 is placed on length 78 of trough 10 as deflector attachment cavities 34 and 32 are used to retain deflector 40. In  
15 alternative methods, cavity 34 is used to retain deflector 40 for conveyance to the installation location on the structure but, where some distance is involved, use of both cavities 32 and 34 keeps deflector 40 more securely retained. In either case, the entire assembly may then be transported to a location on a lower level such as ground, for example, corresponding to the eventual installation location on the structure. The process is repeated until all assemblies of  
20 trough, hangers and deflector have been processed.

Two installers are then employed on ladders or other riser to position each length of assembled trough, hangers, and deflector into place against the structure where the assembly is fastened into place in at least two locations. This is simplified by the feature of the present invention that allows compression fitting of the deflector into the appropriate cavities of hanger  
25 30. The process of two-installer positioning continues around the structure. One installer takes up a position on the roof of the structure or ladder and completes the affixation of the fasteners 50. This can be readily performed by one person due to the compression fitting of deflector 40 that allows opening the assembly to reach fastener 50. Once fasteners for a length of the assembly have been affixed, deflector 40 is compressed to fit flex fold 42 and attachment fold  
30 46 of deflector 40 to cavities 34 and 32 respectively of deflector 40. As the roof or ladder positioned installer proceeds with this procedure of fastener affixation, the second installer forms downspouts and attaches them to the structure.

Although the present invention has been described in detail, it will be apparent to those skilled in the art that the invention may be embodied in a variety of specific forms and that various changes, substitutions and alterations can be made without departing from the spirit and scope of the invention. The described embodiments are only illustrative and not restrictive and  
5 the scope of the invention is, therefore, indicated by the following claims.

## CLAIMS

1. A water diversion system for receiving water runoff from a structure, the water diversion system comprising:

a. a trough having a planar mounting wall and a front containment wall between which is formed a water-receptive channel, the front containment wall having an inwardly-projecting containment shelf;

b. a hanger having a back end and first, second and third receptive cavities, the first receptive cavity having an outwardly-projecting containment lip and the hanger being disposed between the planar mounting wall and the front containment wall of the trough, with the outwardly-projecting containment lip mated to the inwardly-projecting containment shelf and the back end of the hanger being disposed against the inside of the planar mounting wall of the trough; and

c. a deflector having first and second long axis perimeters being compressibly fitted into the second and third receptive cavities of the hanger.

2. The system of claim 1 in which the trough is composed of contiguous material.

3. The system of claim 2 in which the trough is composed of contiguous material stock between 11 5/8 and 12 inches in width.

4. The system of claim 1 in which the water-receptive channel and the front containment wall are arcuate in configuration.

5. The system of claim 1 in which the first, second and third receptive cavities of the hanger are comprised of configured prongs.

6. The system of claim 1 in which the hanger has a retention stop that inhibits separation of the deflector from the hanger.

7. A water diversion system for receiving water runoff from a structure, the water diversion system comprising:

a. a trough having a planar mounting wall and a front containment wall between which is formed a water-receptive channel, the front containment wall having an inwardly-projecting hanger cavity-mating edge;

b. a hanger disposed between the planar mounting wall and the front containment wall of the trough, the hanger having a back end and a first receptive cavity and a second receptive cavity and a primary receptive cavity structure that has an outwardly-projecting retention lip, the primary receptive cavity structure disposed in conjunction with the inwardly-projecting hanger cavity-mating edge of the front containment wall to dispose a portion of the outwardly-projecting retention lip to extend over a portion of the inwardly-projecting cavity-mating edge of the containment wall while the back end is disposed in contact with the inner surface of the planar mounting wall of the trough; and

c. a deflector being inserted into the first receptive cavity of the hanger and being compressibly inserted into the second receptive cavity of the hanger.

8. The system of claim 7 in which the primary receptive cavity structure has a prominence over which a portion of the containment wall transits prior to extension into the inwardly-projecting hanger cavity-mating edge of the containment wall.

9. The system of claim 7 in which the hanger is extruded.

10. The system of claim 7 in which the hanger is stamped.

11. The system of claim 7 in which the primary receptive cavity structure comprises a prong.

12. A rain diversion system comprising:

a trough having a back wall and a front containment wall having a border area having an inwardly-extending containment shelf;

a hanger having a back end disposed against the back wall of the trough and a forward end disposed at the front containment wall of the trough, the hanger having at its forward end, a cavity structure having an outwardly-extending containment lip mated to the inwardly-extending containment shelf and the hanger having first and second receptive cavities, the first cavity opening away from the back wall of the trough; and

a deflector, the deflector being placed in the first receptive cavity and compressibly placed in the second receptive cavity of the hanger.

13. The system of claim 12 in which the hanger is comprised of metal.

14. The system of claim 12 in which the hanger is plastic.

15. The system of claim 13 in which the hanger is extruded metal.

16. The system of claim 13 in which the hanger is stamped metal.

17. The system of claim 12 in which the hanger has an orifice through which the shaft of a fastener projects to penetrate the back wall of the trough.

5 18. A water diversion assembly comprising:

a. a trough having a planar mounting wall and a front containment wall between which is formed a water-receptive channel, the front containment wall having an inwardly-projecting containment shelf;

10 b. a hanger having a back end and first, second and third receptive cavities, the first receptive cavity having an outwardly-projecting containment lip, the second receptive cavity being configured to open away from the planar mounting wall and third receptive cavity being configured to open toward the planar mounting wall and the back end of the hanger being disposed in contact with an inner surface of the planar mounting wall while the outwardly-extending containment lip is mated to the inwardly-projecting containment shelf; and

15 c. a deflector having first and second long axis perimeters, the first long axis perimeter being inserted into the second receptive cavity of the hanger.

19. A water diversion system for receiving water runoff from a structure, the water diversion system comprising:

20 a. a hanger having a backend and a receptive cavity structure, the receptive cavity structure having an outwardly projecting containment lip, the receptive cavity structure being partially bounded by a fulcrum ridge toward which the containment lip projects;

25 b. a trough having a planar mounting wall against the inside of which is disposed the backend of the hanger, the trough having a front containment wall that extends into a front border area that passes over the fulcrum ridge and extends in an inwardly-projecting containment shelf mated with the outwardly projecting containment lip of the receptive cavity structure of the hanger.

20. A hanger for use in a water diversion system, the hanger comprising a fulcrum prominence bounding on one extent, a receptive cavity partially closed by a containment lip projecting toward the fulcrum prominence.



21. The hanger of claim 20 in which the containment lip projects perpendicularly toward the fulcrum prominence.

22. The hanger of claim 20 in which the hanger is comprised of stamped metal.

23. The hanger of claim 20 in which the hanger is comprised of extruded metal.

5 24. A water diversion system comprising:

a hanger comprising a fulcrum prominence bounding on one extent, a receptive cavity partially closed by a containment lip projecting toward the fulcrum prominence; and

a trough having a front containment wall that extends into a front border area that passes upwardly and over the fulcrum prominence of the hanger and subsequently passes inwardly into a containment shelf mated with the containment lip.

25. A method for installing a rain diversion system on a structure, the method comprising the steps of:

forming with a first machine, a trough having a front containment wall and a back wall, the containment wall having an inwardly-extending containment shelf;

15 providing a hanger having an abutment, a penetrative projection, first and second deflector receptive cavities, and a containment lip and disposing the hanger in relation to the containment wall to mate the containment lip of the hanger with the containment shelf of the containment wall of the trough; and

20 disposing the abutment of the hanger against the inner surface of the back wall of the trough by forcing the penetrative projection of the hanger through the back wall of the trough to affix the hanger between the back wall and the containment wall of the trough.

26. The method of claim 25 further comprising the step of forming with a second machine, a deflector having a first fold and a second fold and disposing the first fold of the deflector in the first deflector receptive cavity of the hanger.

25 27. The method of claim 25 further comprising providing an orifice in the hanger through which a fastener is disposed.

28. The method of claim 25 in which the step of disposing the hanger in relation to the containment wall to mate the containment lip of the hanger with the containment shelf of the containment wall of the trough is performed before the trough is attached to the structure.

29. The method of claim 25 in which the step of forming with a first machine, a trough having a front containment wall and a back wall includes positioning material coil stock so as to move the furthest reach of the formed back wall between  $\frac{3}{4}$  and 1 inch from the place the furthest reach of the back wall would occupy in formation of a standard OG gutter trough.

5 30. The method of claim 26 further comprising disposing the second machine above the first machine.

31. The method of claim 26 in which the step of disposing the first fold of the deflector in the first deflector receptive cavity of the hanger is performed before the trough is attached to the structure.

10 32. A method for installing a rain diversion system on a structure, the method comprising the steps of:

forming with a first machine, a trough having a front containment wall and a back wall, the containment wall having an inwardly-extending containment shelf;

15 providing a hanger having an abutment, a penetrative projection, and a containment lip and disposing the hanger in relation to the containment wall to mate the containment lip of the hanger with the containment shelf of the containment wall of the trough; and

disposing the abutment of the hanger against the inner surface of the back wall of the trough by forcing the penetrative projection of the hanger through the back wall of the trough to affix the hanger between the back wall and the containment wall of the trough.

20 33. The method of claim 32 further comprising providing an orifice in the hanger through which a fastener is disposed.

34. The method of claim 32 in which the step of disposing the hanger in relation to the containment wall to mate the containment lip of the hanger with the containment shelf of the containment wall of the trough is performed before the trough is attached to the structure.

25 35. The method of claim 32 in which the step of forming with a first machine, a trough having a front containment wall and a back wall includes positioning material coil stock so as to move the furthest reach of the formed back wall between  $\frac{3}{4}$  and 1 inch from the place the furthest reach of the back wall would occupy in formation of a standard OG gutter trough.

30 36. A method for installing a rain diversion system on a structure, the method comprising the steps of:

forming with a first machine, a trough having a front containment wall and a back wall, the containment wall having an inwardly-extending containment shelf;

providing a hanger having an abutment, first and second deflector receptive cavities, and a containment lip and disposing the hanger in relation to the containment wall to mate the containment lip of the hanger with the containment shelf of the containment wall of the trough; and

disposing the abutment of the hanger against the inner surface of the back of the trough to place the hanger between the back wall and the containment wall of the trough.

37. The method of claim 36 further comprising the step of forming with a second machine, a deflector having a first fold and a second fold and disposing the first fold of the deflector in the first deflector receptive cavity of the hanger.

38. The method of claim 32 in which the step of disposing the hanger in relation to the containment wall to mate the containment lip of the hanger with the containment shelf of the containment wall of the trough is performed before the trough is attached to the structure.

39. The method of claim 32 in which the step of forming with a first machine, a trough having a front containment wall and a back wall includes positioning material coil stock so as to move the furthest reach of the formed back wall between  $\frac{3}{4}$  and 1 inch from the place the furthest reach of the back wall would occupy in formation of a standard OG gutter trough.

40. The method of claim 37 further comprising disposing the second machine above the first machine.

41. The method of claim 37 in which the step of disposing the first fold of the deflector in the first deflector receptive cavity of the hanger is performed before the trough is attached to the structure.

42. A method of creating a gutter system comprising the steps of:

forming with a first machine, a trough having a channel for collection of water; and forming with a second machine placed above the first machine, a deflector.

43. A method for installation of a hooded gutter system, the method comprising the steps of:

a. forming a trough with a first forming machine, the trough having a containment shelf;

b. providing a hanger having a receptive cavity and first and second attachment cavities, the first and second attachment cavities opening toward each other and the receptive cavity having a containment lip;

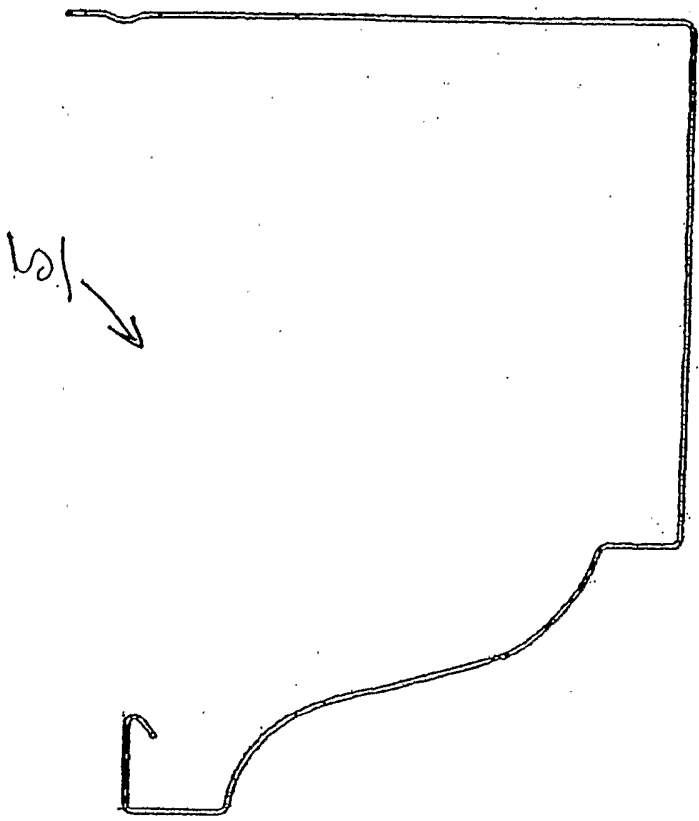
c. mating the containment lip with the containment shelf;

d. forming a deflector with a second forming machine disposed above the first forming machine;

e. fitting the deflector into the first attachment cavity to create a system assembly;

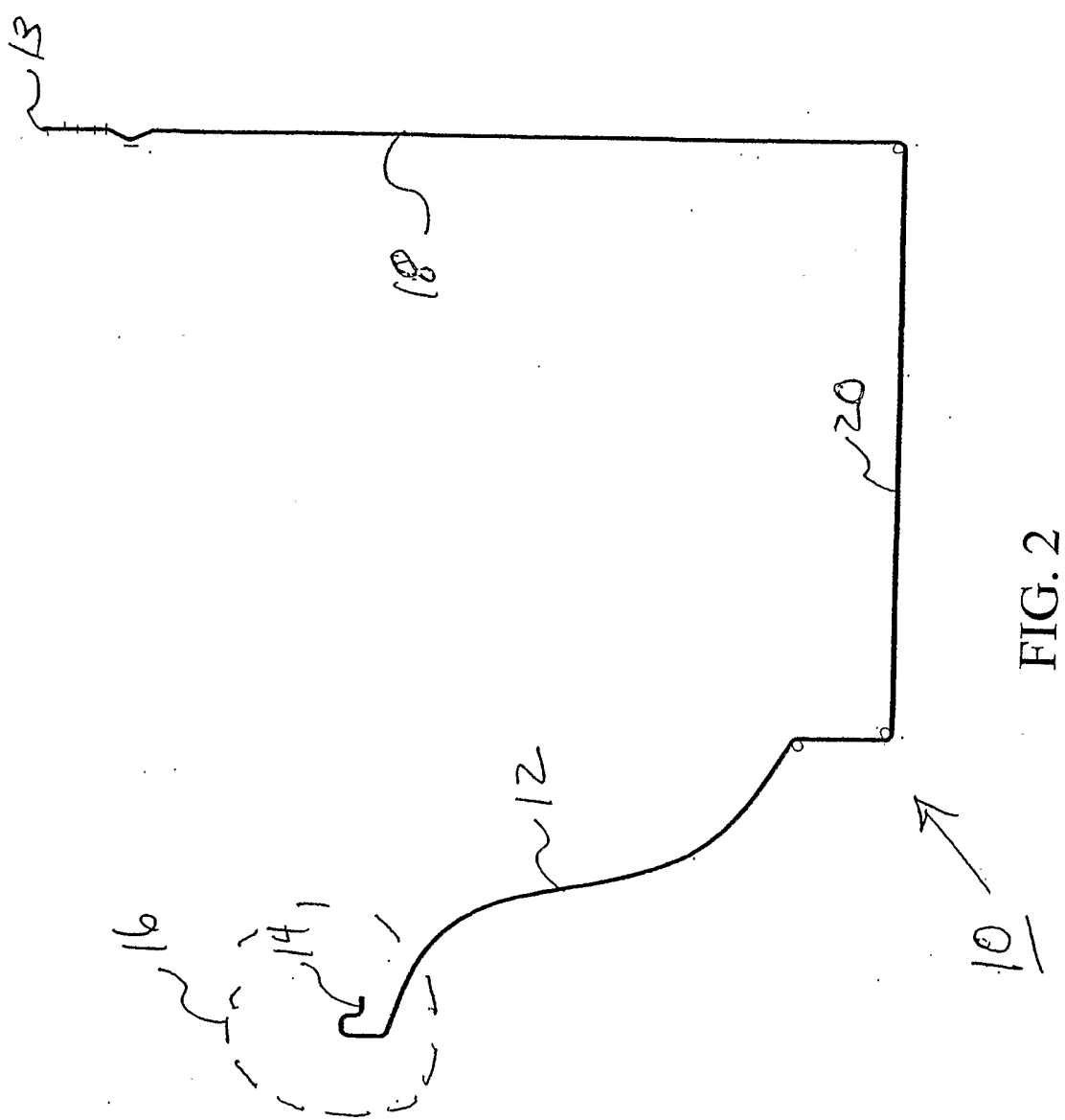
f. transporting the system assembly to an installation site; and

g. affixing the system assembly to the installation site.



PRIOR ART

FIG. 1



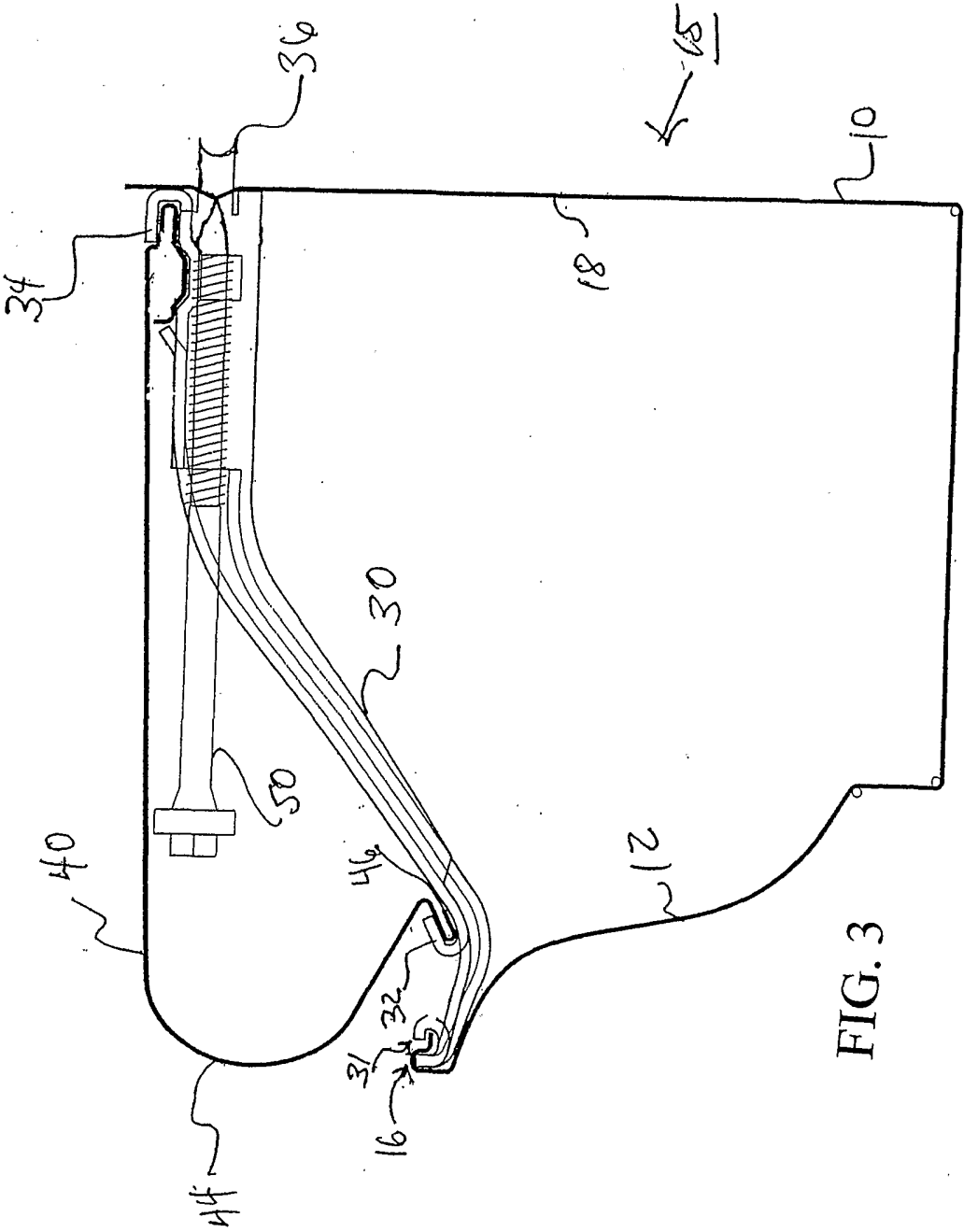


FIG. 3

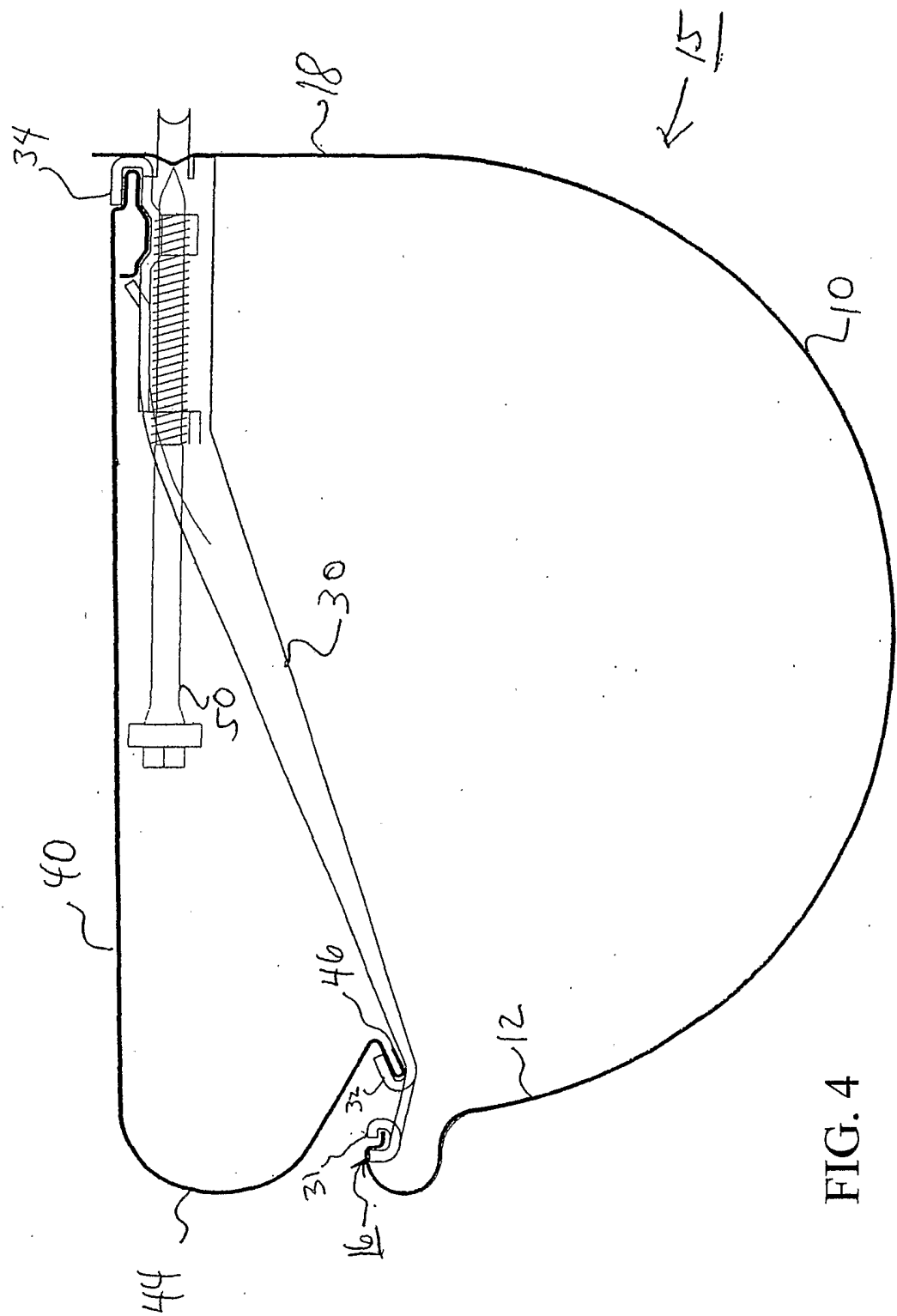


FIG. 4



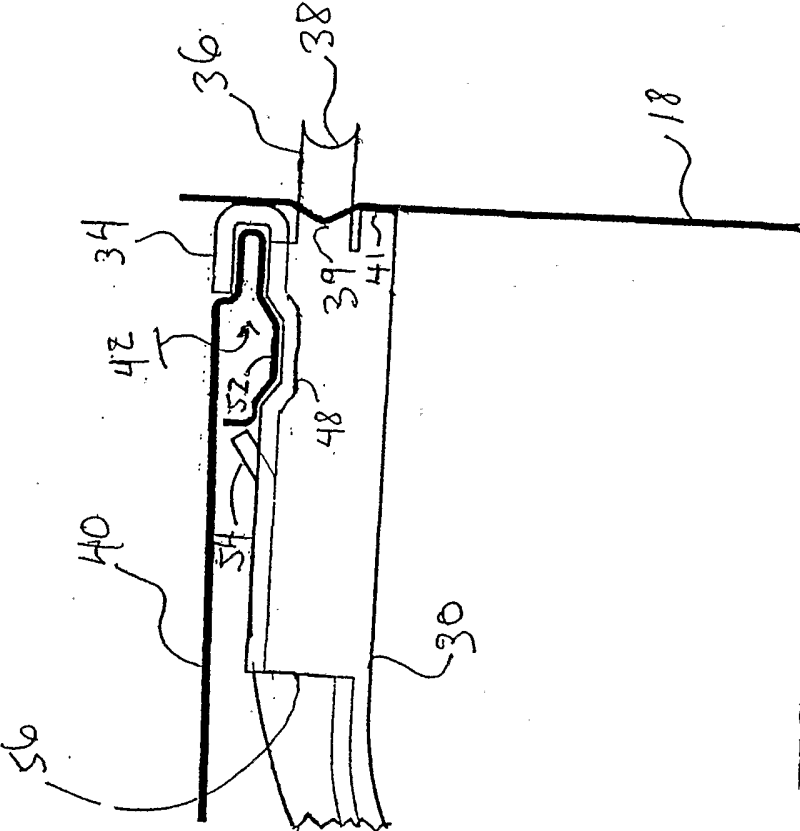


FIG. 5

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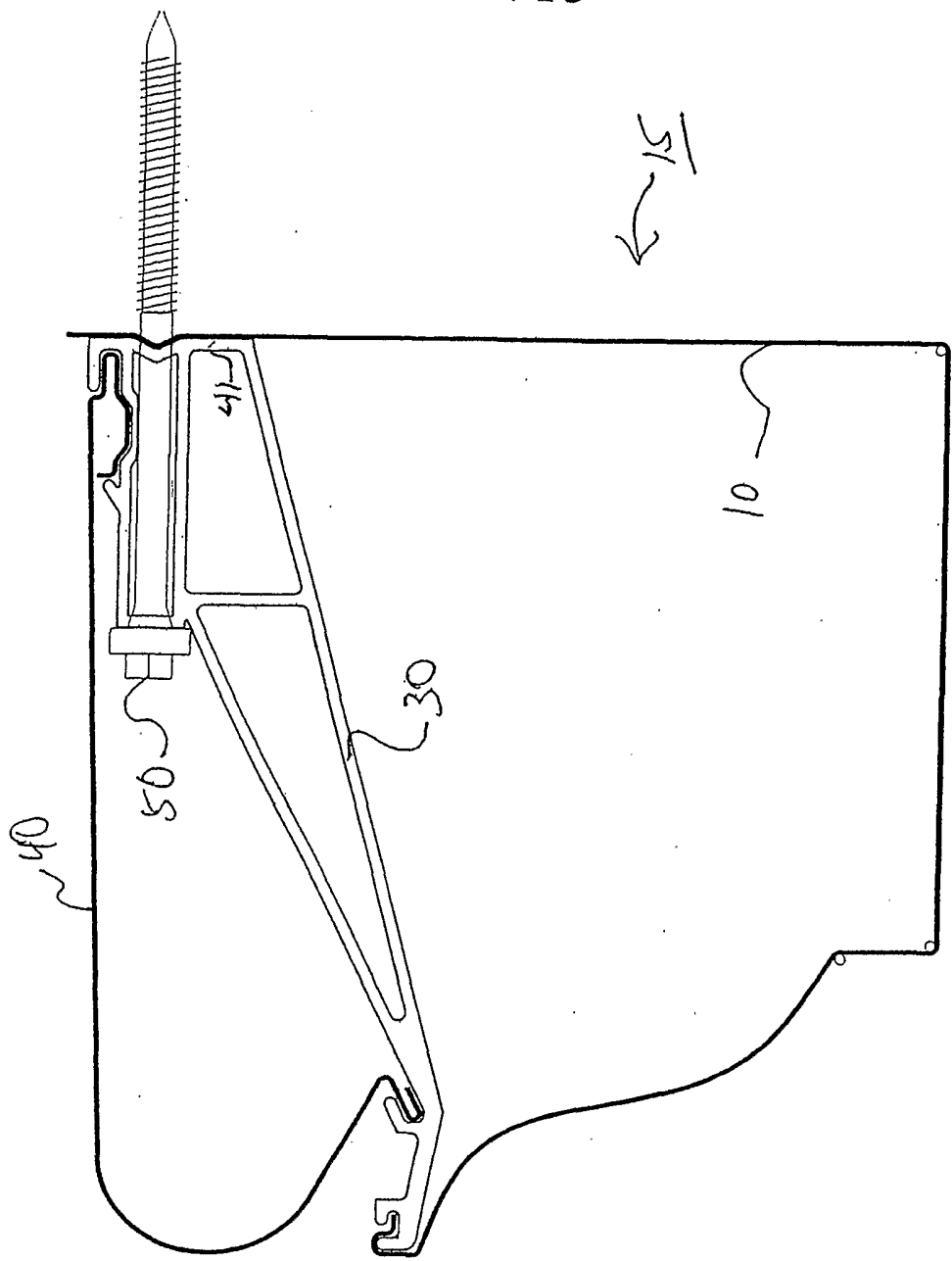


FIG. 6

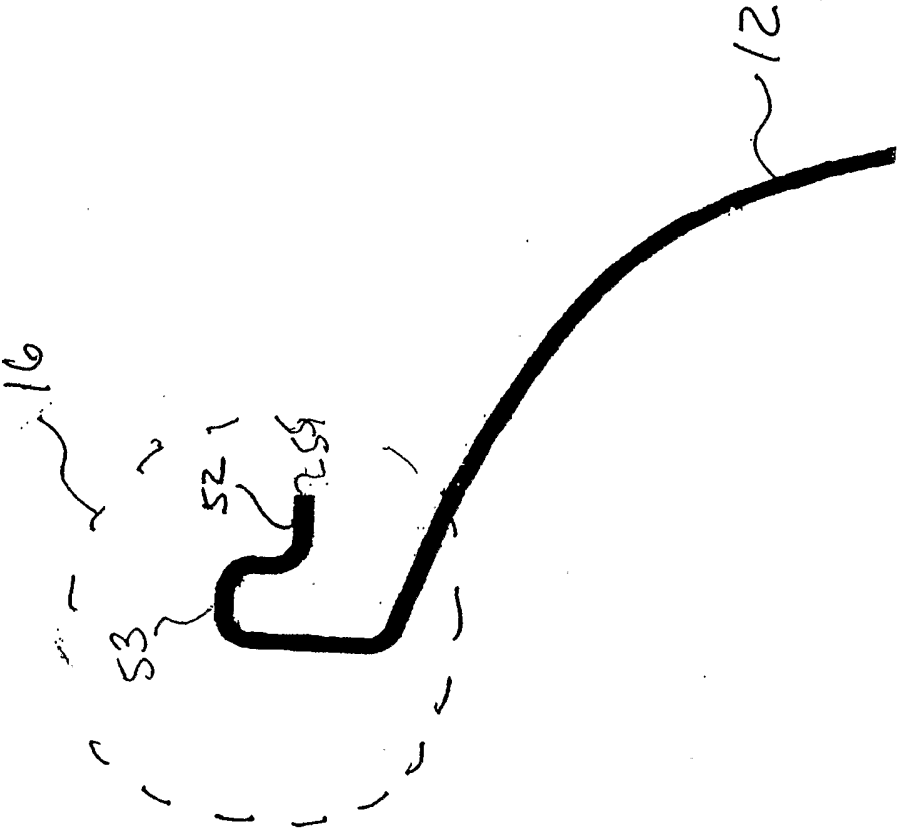


FIG. 7

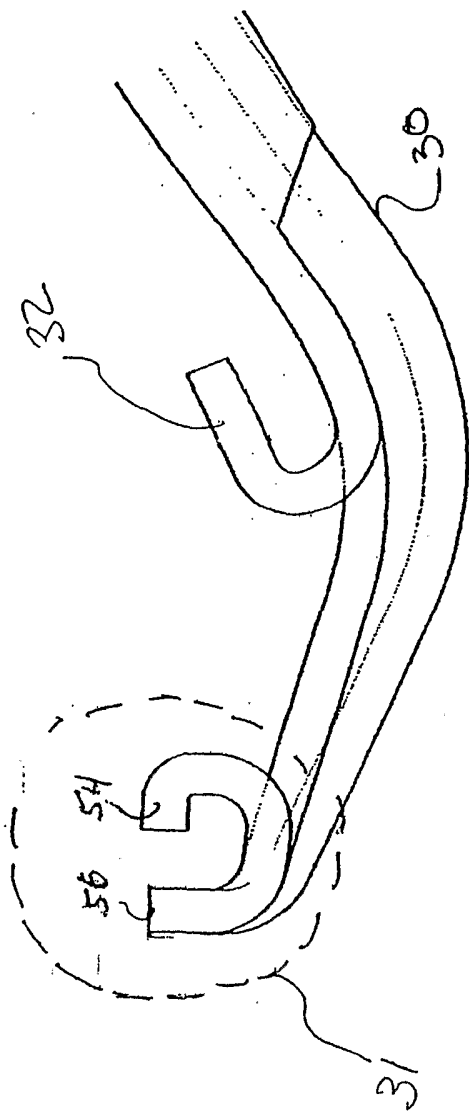


FIG. 8

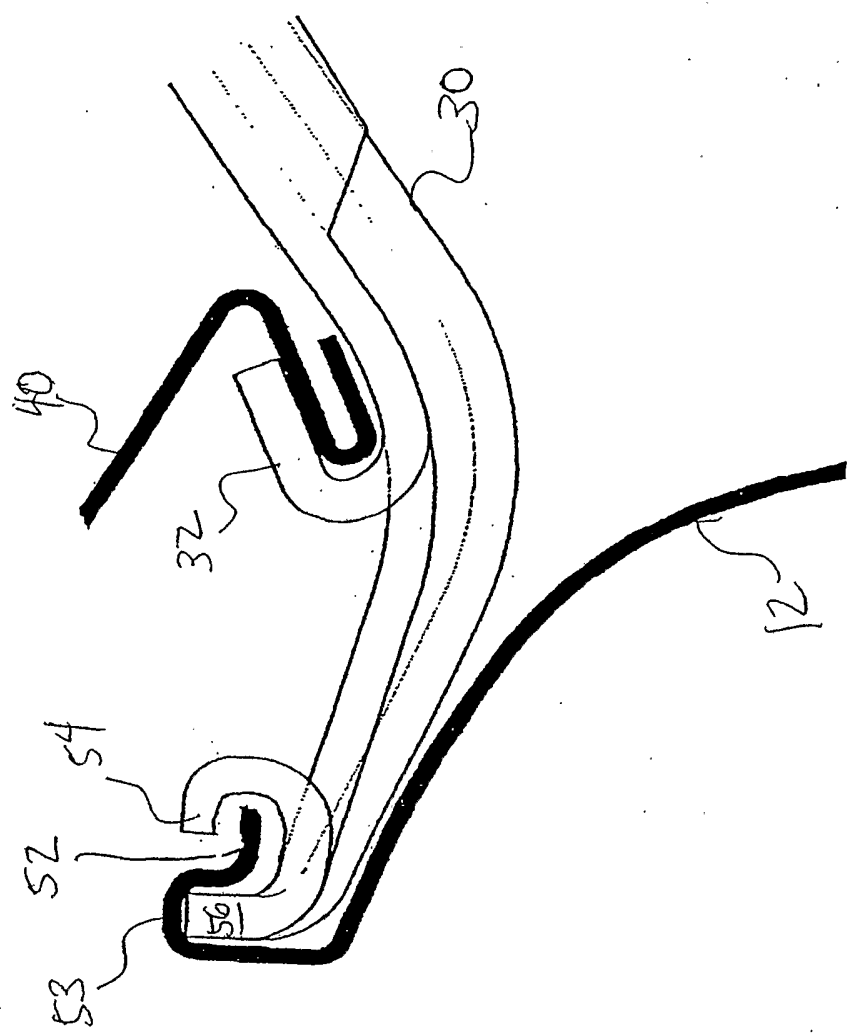


FIG. 9

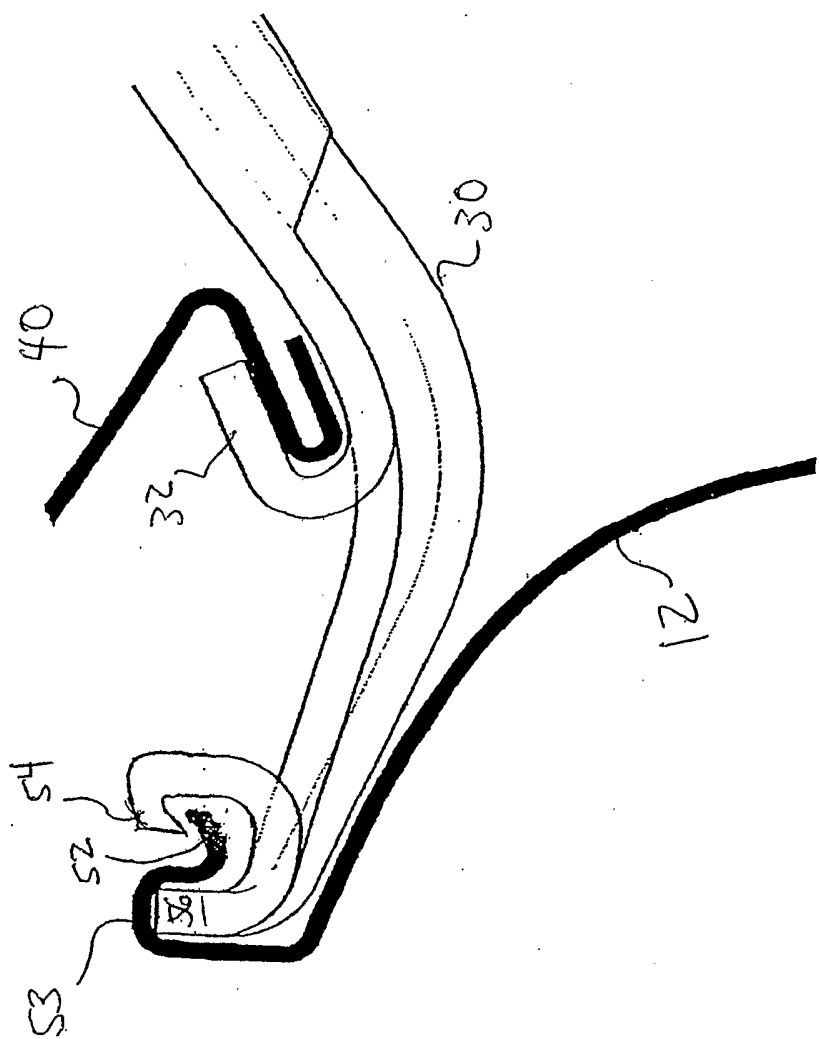


FIG. 10

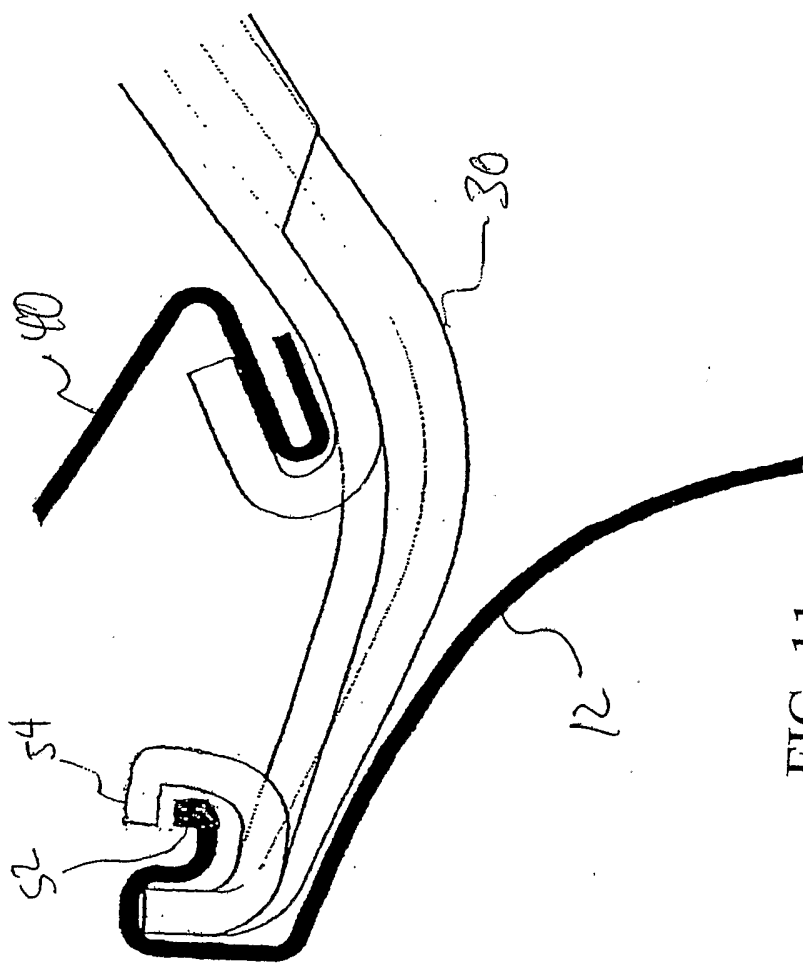


FIG. 11

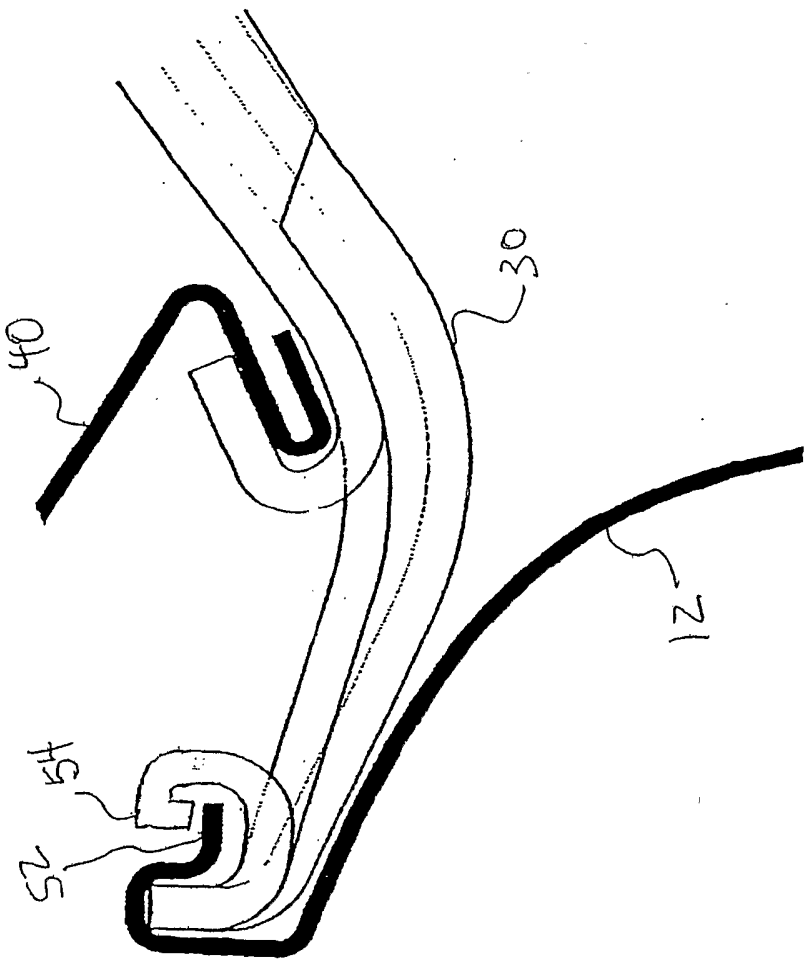


FIG. 12



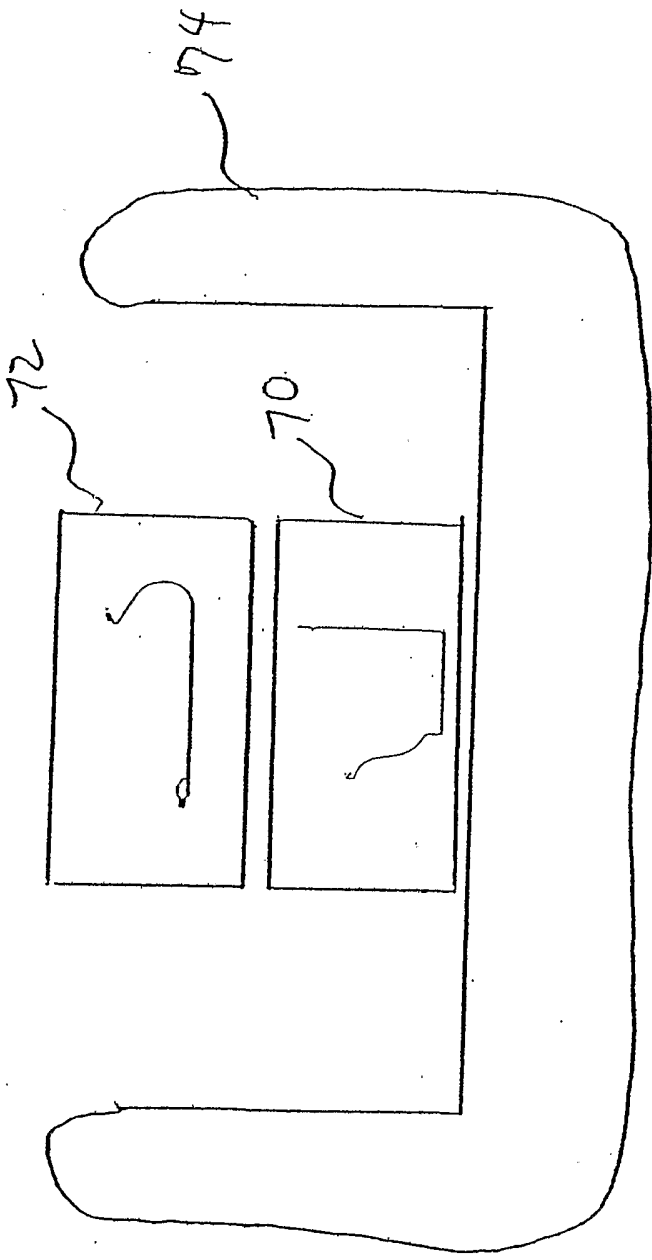


FIG. 13

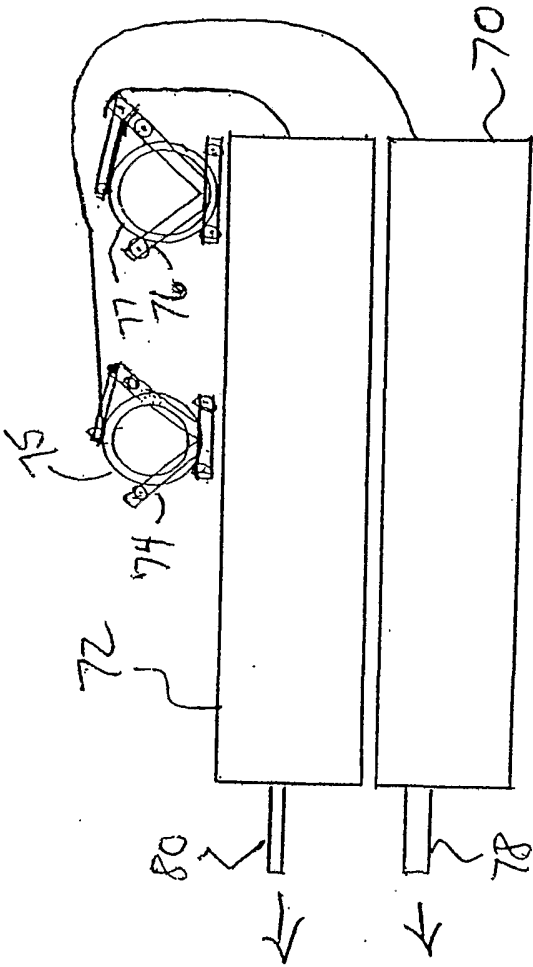


FIG. 14

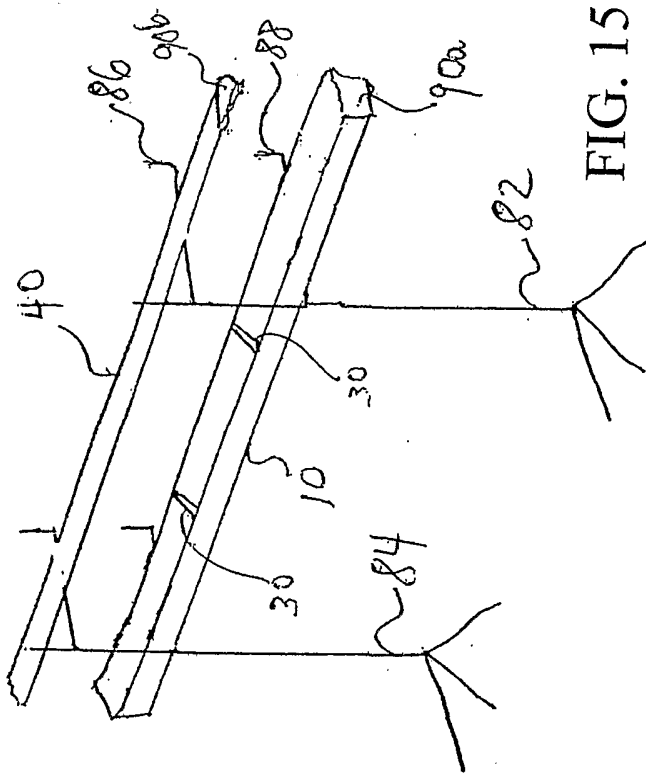


FIG. 15