Dec. 24, 1968 J. R. PEGAN ET AL 3,417,570

RAIN-WATER DISPOSAL SYSTEMS

Filed Feb. 2, 1967

FIG. 1.

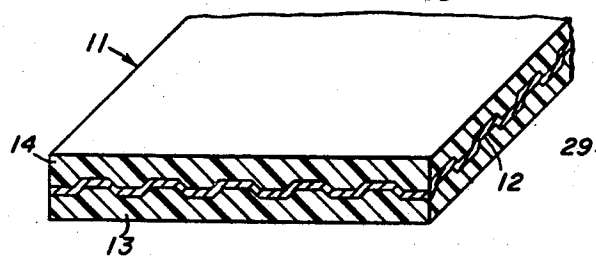


FIG. 6.

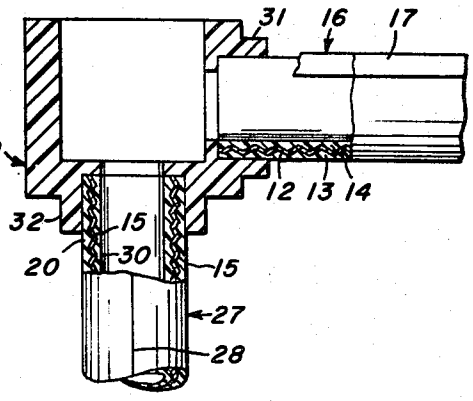


FIG. 2.

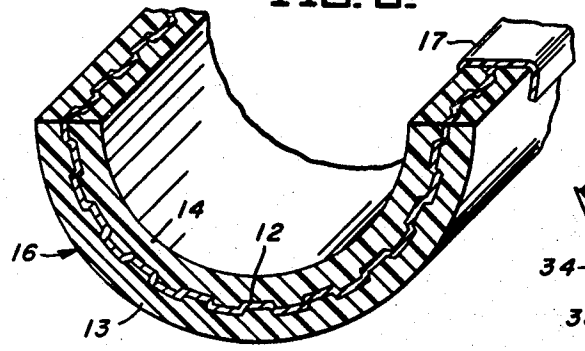


FIG. 7.

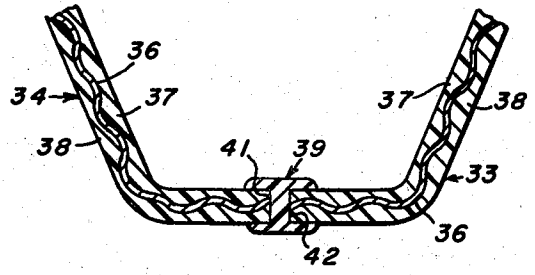


FIG. 4.

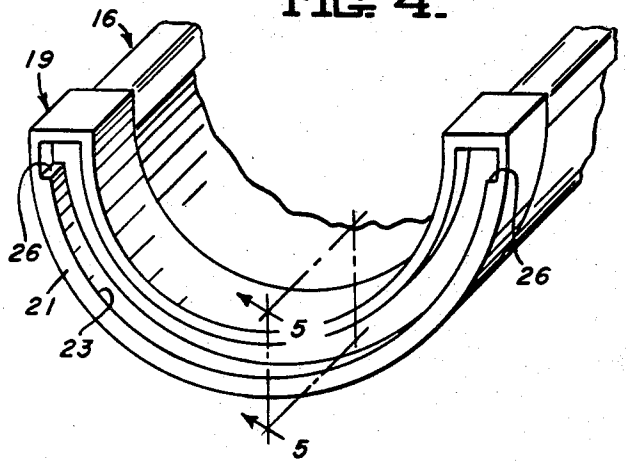


FIG. 8.

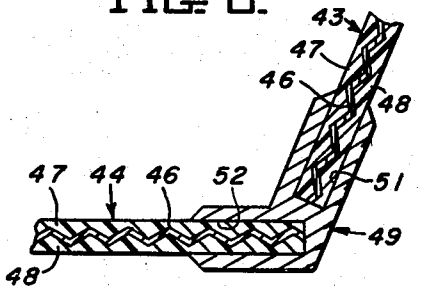


FIG. 9.

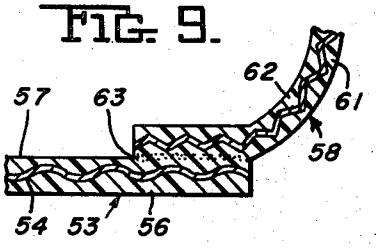


FIG. 3.

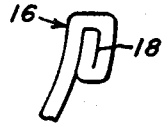
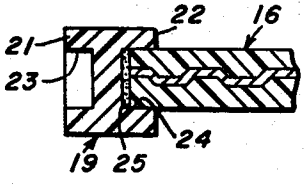


FIG. 5.



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3,417,570

RAIN-WATER DISPOSAL SYSTEMS

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Continuation-in-part of applications Ser. No. 490,798, Sept. 28, 1965, Ser. No. 559,259, June 21, 1966. This application Feb. 2, 1967, Ser. No. 613,590

4 Claims. (Cl. 61—15)

ABSTRACT OF THE DISCLOSURE

This invention relates to new and improved rain-water disposal systems comprising lightweight, corrosion-resistant composite gutters and downspouts of enhanced strength and impact resistance, comprising a strengthening and reinforcing flat rolled and embossed metal core, and non-metallic layers overlying and bonded to the core, and to methods of fabricating and assembling the same.

RELATED APPLICATIONS

This application is a continuation-in-part of prior, copending applications Ser. No. 490,798, now Patent No. 3,351,025 and 559,259, filed, respectively on Sept. 28, 1965 and June 21, 1966, both in the names of John R. Pegan and Charles E. Newcomb.

BACKGROUND OF THE INVENTION

Conventional prior art rain-water disposal systems for architectural building construction have most often been constructed of relatively heavy gauge metals, as galvanized carbon steel.

Protective coatings, as zinc galvanized coatings, are effective for protecting the corrosion-susceptible metal, and further paint coatings such as are most frequently applied to the fabricated systems lend further weather-resistance. However, such coatings are not effective to protect the metal over very protracted periods of time. Moreover, the cost of painting and re-painting such constructions is quite high, often exceeding the initial cost of the materials and installation.

Copper has almost disappeared as a material of construction of gutters and downspouts due to its high cost.

Aluminum has been used in much of such construction due to its corrosion-resistance, but it too, must be painted for esthetic reasons, and also requires frequent re-painting to maintain a pleasing appearance.

Recently available plastic-coated metals have been used to a minor extent, but these materials essentially comprise relatively thin coatings of plastic over the usual, heavy gauge metals—thus such articles made of these materials are expensive and, moreover, are susceptible to quick corrosion when the thin plastic overlay is eroded or scratched.

Solid section plastic gutters and downspouts, such as those made of extruded rigid vinyl plastics have recently been introduced, but their low impact resistance and consequent tendency to shatter under impact at low temperatures has precluded their wide-spread adaption, particularly in cold climates. Other, even more weather-resistant and color-fast plastics, such as acrylics, have not been used in such construction due to their higher cost.

It is, further, highly desirable that gutter and downspout sections and assemblies thereof be amenable to quick and easy fabrication either on the construction job site itself or in a local tinsmith shop, so that installations can be tailored to particular job requirements, and to avoid high shipping costs associated with transporting preformed, bulky sections over long distances.

Accordingly, it is an object of the present invention to provide new and improved lightweight, low cost, corrosion-resistant, composite gutters and downspouts of enhanced weatherability and impact strength, and prolonged life.

It is another object to provide new and improved rain-water disposal systems comprising assemblies of gutters and downspouts, as aforesaid, and methods of fabricating the same.

The invention

In accordance with the foregoing objects, a preferred embodiment of the invention comprises composite gutter and downspout sections comprising a strengthening and reinforcing core of an embossed, flat rolled carbon steel, and layers of a vinyl- or acrylic-based resin overlying and bonded to the steel core and covering the embossments thereof to provide substantially smooth article surfaces.

The foregoing and other objects of the invention will be more fully understood by reference to the following description and the accompanying drawings, wherein:

FIGURE 1 is a perspective view of a segment of one form of composite stock material used in the construction of the articles of the invention;

FIGURE 2 is a perspective view, partly in cross-section, of a segment of one form of gutter in accordance with the invention;

FIGURE 3 is a fragmental end elevational view of one form of gutter edge construction used to protect exposed metal edges;

FIGURE 4 is a perspective view of one form of gutter section connector, and attached gutter section;

FIGURE 5 is a cross-sectional view, taken along line 5—5 of FIG. 4;

FIGURE 6 is a schematic, elevational view, partly in cross-section, of one form of connector box, showing connected gutter and downspout sections in accordance with the invention;

FIGURES 7 and 8 are cross-sectional, fragmentary elevational views of other forms of the inventive gutter, particularly adapted to job site fabrication, and

FIGURE 9 is a fragmentary, cross-sectional view of a further embodiment of a gutter of the invention, showing use of multiple composite stock materials.

Turning now to the drawings, and particularly to FIG. 1 thereof, the numeral **11** denotes generally a composite stock material comprising an embossed metal core **12** and overlying, nonmetallic layers **13** and **14** bonded to the metal and covering embossments thereof to form substantially smooth stock surfaces.

Core **12** is a flat rolled metal, preferably steel because of its high strength and flexural modulus. Plain carbon steel is preferred due to its low cost, but other rollable iron base alloys may be used, as may be other metals, particularly aluminum. Metals of about 3 to 20 mils thickness are most useful, especially about 3 to 10 mils for carbon steel.

The metal is embossed in any pattern, regular or irregular, which is productive of substantial stiffness enhancement of the metal, but embossment is preferably such that the embossment dimensions are small as compared to the finished article dimensions, so that the thickness of the overlying layer **13** and **14** need not be excessively great yet provide substantially smooth stock surfaces. For example, when carbon steel, within the above-mentioned thickness range, is embossed upwardly of 3 or 4 times its flat rolled thickness with embossment dimensions of ⅛ inch and under, plastic layers, such as rigid polyvinyl chloride, may be applied to depths of about 8 to 12 mils with the production of visually smooth stock surfaces.

Layers **13** and **14** of the stock material may be composed of any suitable, formable non-metallic material effective to protect the underlying metal and to lend additional structural strength to the metal. However, plastic resins, particularly thermoplastic or "B-stageable" thermosetting resins (those which can be partially cured to a formable condition and then formed and further cured to final rigid condition after forming) are preferred. Weather-resistant, color-fast resins are most useful, in order to provide long-term article life and good appearance without painting or re-painting. Vinyl resins, as rigid polyvinyl chloride, are especially useful, due to their possession of the above properties, and, also, due to their low cost. Acrylic resins (those derived from methyl methacrylate monomer) and modified acrylic resins, as, for example, styreneacrylic copolymers, alpha methyl styrene copolymers with methyl methacrylate, and modified, high impact acrylics, acrylic-containing mixtures, blends and alloys, as those containing butadiene or polyvinyl chloride, are also especially useful for similar reasons. Other plastics may be used. If desired, in case of those plastics having lesser weatherability properties, finish surface coats of more weather-resistant materials may be applied.

The contemplated materials, due to the reinforcing capability of the embossed metal core **12**, utilize relatively lesser amounts of plastic than is required in solid plastic articles of equivalent strength and stiffness, thus affording the possibility of use of relatively more expensive plastics, while holding the cost of the finished article lower than would be the case were the entire article made of the expensive plastic.

The stock **11**, after cutting to predetermined lengths and widths, may be formed, as by heat and pressure, to a desired gutter configuration, for example, as denoted generally by numeral **16** in FIG. 2.

In the case of thermoplastic materials **13** and **14**, the forming operation is substantially all that is required to produce the finished gutter section. In the case of B-staged thermosetting resins, the formed section is cured to final condition, either simultaneously with the forming step, or by a separate, subsequent final cure.

Exposed metal edges of the formed gutter section, if corrodible, as carbon steel, are preferably protected against corrosion—and consequent staining of the installation and environment—for example, as also illustrated in FIG. 2, by application of a sealing strip **17** which, for instance, may be simply an adhesively- or heat-applied plastic, e.g. vinyl, tape. Alternatively, edge portions of the gutter may be folded, either before, during, or after forming the gutter section, in a manner suitably protective of the metal edges, as illustrated at **18** in FIG. 3.

Successive gutter sections **16** are secured together in end-to-end fashion in any desired configuration to form a gutter system. Such end-to-end connection may be effected quickly and easily by use of connecting means as illustrated in FIGS. 4 and 5, wherein the numeral **19** denotes generally a connector comprising a body having opposed faces **21** and **22** (FIG. 5) provided with grooves **23** and **24**, each of a configuration conforming to that of end portions of the gutter sections **16** to be connected. If the gutter edges are folded, as shown in FIG. 3, the grooves **23** and **24** may be provided with indented portions **26** to accommodate the edge folds.

The grooves **23** and **24** may be interconnected to form a single slot for reception of opposed gutter ends, and connectors **19** may be formed of plastic, e.g. molded or extruded rigid plastics, as vinyl, etc., or of cast or extruded metal, such as aluminum. In each instance, joint strength and rigidity may be enhanced by use of an adhesive bonding agent, for example as illustrated at **25** in FIG. 5.

Downspout sections, denoted generally in FIG. 6 by the numeral **27**, are similarly formed in composite manner, with metal core **15** and overlying layers **20** and **30**, to a desired circular or polygonal cross-sectional form. The tubular downspout sections may be provided with

a lap, butt or crimped seam joint **28**, whereby opposed edges are joined in a suitably water-tight manner, or the downspout may be formed by other means, as by lip-welding and subsequent exterior coating of an inside-coated embossed metal core, as described in co-pending application Ser. No. 613,480.

In FIG. 6, the numeral **29** denotes generally a connector box for connecting a gutter section **16** and a downspout section **27**. Apertured flanges **31** and **32**, conformed in aperture, respectively, to the water-carrying section of gutter **16** and downspout **27**, are adapted to receive and retain extremity portions of the same, for example, by means of a tight, resilient press-fit, supplemented, if desired, by the use of a suitable adhesive bonding agent, or other securing means, as set-screws, etc.

The gutter of the invention may be produced in a variety of forms and by various methods. For example, as shown in FIG. 7, a fabricated gutter section may comprise a pair of panels denoted generally by the numerals **33** and **34**, each comprising an embossed metal core **36** and non-metallic layers **37** and **38**.

The panels **33** and **34** are connected by an elongated, channel connector member, denoted generally as **39**, and having slots **41** and **42** for reception and retention therein, with adhesive and sealing means as desired, of opposed edge portions of the panels. Member **39** is preferably rigid, as extruded plastic or metal, e.g. aluminum.

Another gutter embodiment is illustrated in FIG. 8, wherein a pair of side panels **43** (only one shown) are connected to a bottom panel **44**, each comprising an embossed metal core **46** and non-metallic layers **47** and **48**, as aforesaid. Elongated angular or curved connectors **49** are used for this purpose, each comprising a pair of slots **51** and **52** for reception and retention of juxtaposed panel edge portions.

Embodiments, such as those of FIGS. 7 and 8, utilizing slotted-channel connected panels, are especially useful for on-site fabrication.

When channel connector means, as connectors **39** or **49**, are used in the fabrication of gutter sections, the connectors are preferably terminated short of the gutter section extremities to present unencumbered extremity peripheries for ready connection, as by means of connector frames **19** or similar connector means. Such gutter extremities may be closed or capped by use of a cap plate similar to connector **19**, but having a closed section face, grooves on one side for reception of a gutter end, and flat on the other side.

A further embodiment of gutter construction and fabrication is illustrated in FIG. 9, wherein a gutter bottom panel, generally denoted as **53**, comprises an embossed metal core **54** and overlying non-metallic layers **56** and **57**, as aforesaid. A pair of gutter side panels **58** (only one shown), each comprising an embossed metal core **59** and overlying non-metallic layers **61** and **62**, are affixed to the bottom **53**, as by a welded, plastic-to-plastic lap seam **63**. A heavier material may usefully be selected for bottom panel **53**, utilizing, for example a metal in the upper end of the thickness range aforementioned for core **54**, and, if desired, layers **56** and **57** may also be thicker than layers **61** and **62**.

The novel articles of the invention are referred to as channel shaped articles or bodies in the sense of including both open-section and closed-section conduits for the conveying of fluids.

Still other embodiments and modifications, within the scope of the principles of the invention herein disclosed and claimed, will be apparent to those skilled in the art.

What is claimed is:

1. A weather-resistant plastic-surfaced composite rain water disposal article of enhanced impact resistance comprising an elongated channel shaped body comprising a strengthening and stiffening core consisting of a sheet of flat rolled and embossed carbon steel having a flat rolled

thickness from about 3 to about 20 mils and the embossments having a depth of at least three times the flat rolled metal thickness, layers comprising a non-metallic thermoplastically formable resin overlying and bonded to both sides of the core and covering the core embossments to a depth sufficient to provide substantially smooth article surfaces, and corrosion-resistant means overlying exposed steel edges of the article to protect said edges against corrosion.

2. An article in accordance with claim **1**, wherein the thermoplastically formable resin comprises polyvinyl chloride.

3. An article in accordance with claim **1**, wherein the thermoplastically formable resin comprises an acrylic plastic.

4. An article in accordance with claim **2**, wherein the polyvinyl chloride layers overlie the core embossments to an extent of at least about 8 mils.

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JOHN E. MURTAGH, *Primary Examiner.*

U.S. Cl. X.R.

52—16, 309; 138—145, 153; 161—125