April 26, 1966 D. R. OSBORN, JR., ETAL 3,248,184

SHELL MEMBER AND METHOD OF MANUFACTURE

Filed Jan. 11, 1963

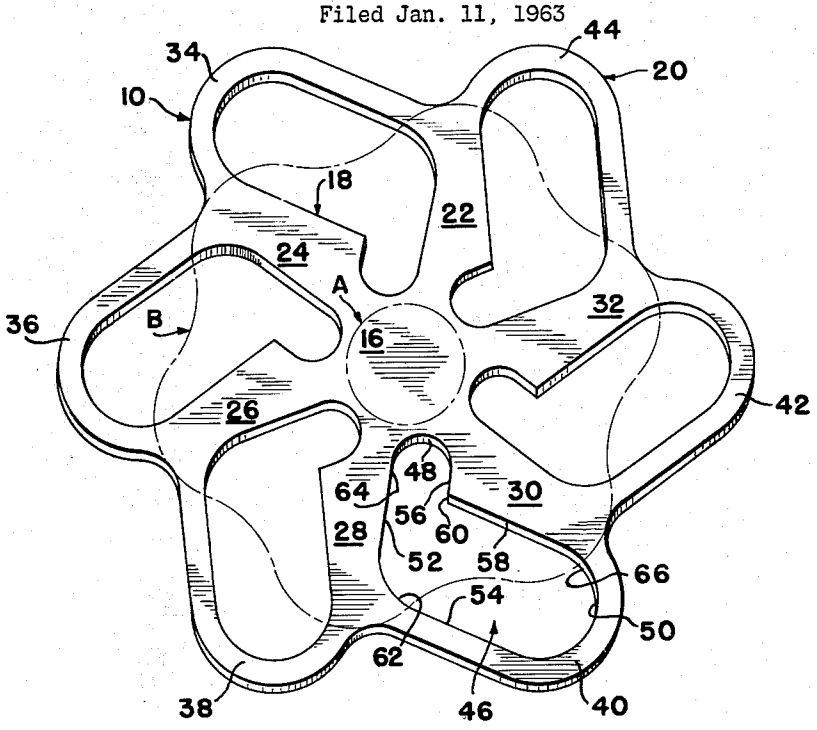


Fig. 1

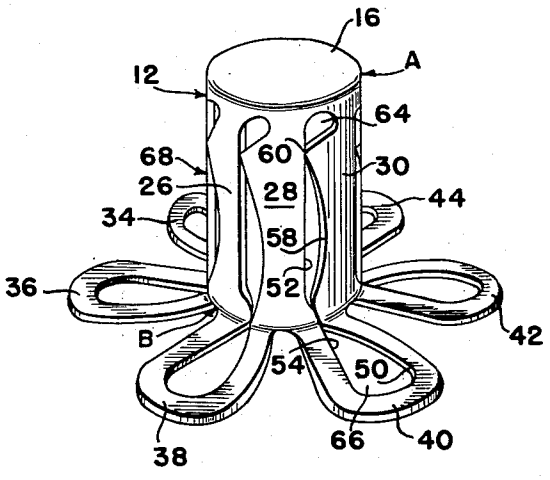


Fig. 2

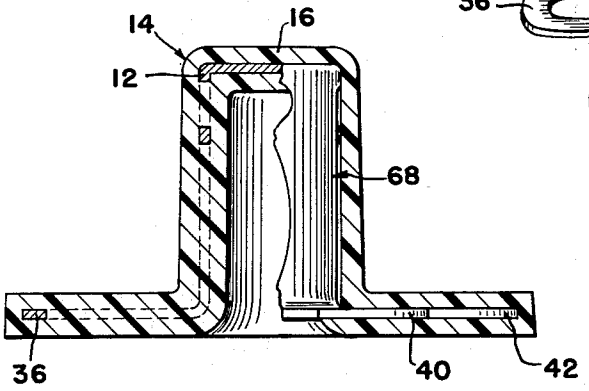


Fig. 3

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United States Patent Office 3,248,184 Patented Apr. 26, 1966

3,248,184

SHELL MEMBER AND METHOD OF MANUFACTURE

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Filed Jan. 11, 1963, Ser. No. 253,236
8 Claims. (Cl. 29—183)

The invention relates to a formed shell-like member which may be utilized as a frame or support member for articles cast of a soft material, such as plastic and the method of manufacture of such members. When such members are utilized as reinforcements in plastic parts it is desirable to have holes through which the plastic flows both inside and outside to interlock with the shell.

In the past the manfacture of such shells has been a slow and expensive process. When the shells were formed of blanks they required a series of drawing and forming operations and the holes were usually drilled. If the holes were punched in flat steel, for example, and the drawing operations were then performed, the metal fractured during the draw.

By use of the invention, shells can be formed from stamped blanks and drawn or otherwise shaped in one operation to form tubular sections and provide the desired hole shapes without added operations. Other more complicated sections may be formed, such as hat-like sections as illustrated in the drawing. The blank utlized in making the hat-like section is preferably floriform with openings provided therein about the blank center of such a shape and size that the ribbon sections remaining permit the extreme drawn reductions and depths in a single operation and at the same time provide the desired plastic flow holes.

In the drawing:

FIGURE 1 is a perspective view of a floreate blank embodying the invention which is provided as a first step in the manufacture of the shell.

FIGURE 2 is a perspective view of a shell formed to a hat-like shape from the blank of FIGURE 1.

FIGURE 3 is a section view with parts broken away and indicating a typical plastic insert construction utilizing the shell of FIGURE 2 as a reinforcement.

The blank **10** may be formed from flat sheet stock. The material may be a metal suitable for the drawing and bending operations to which the blank is subjected to provide the finished article. The particular blank illustrated is to be drawn in a single operation so as to provide the hat-like shell **12** shown in FIGURE 2. Shell **12** may be utilized as part of the insert **14** shown in FIGURE 3.

The blank **10** is illustrated as being floreate in conformation and is provided with three areas, the center area **16** lying generally within the phantom line A, the intermediate generally annular area **18** being between the phantom lines A and B, and the outer annular area **20** lying outside of phantom line B. In the particular construction illustrated, center **16** is solid, while the intermediate area **18** is formed primarily of integral ribbon elements such as arms **22, 24, 26, 28, 30** and **32** which join the center area **16** adjacent the phantom line A. Each of these arms extends generally radially from the center section **16** although various angles may be utilized as desired in order to provide a suitable ultimate structure. The outer area **20** is formed of ribbon elements **34, 36, 38, 40, 42** and **44**, each of which joins the adjacent outer ends of two of the arms to provide a petal-like configuration. In the particular construction illustrated, arms **28** and **30**, for example, are adjacent arms having their outer ends joined by ribbon element **40**. The

opening **46** defined by these two arms and ribbon element is generally L-shaped with the extreme ends being defined by the inner curved end **48** and the outer curved end **50**. The opening legs are defined by the side **52** of arm **28**, side **54** of ribbon element **40**, and sides **56** and **58** of arm **30** which join the curved ends **48** and **50**. Sides **56** and **58** of arm **30** meet to provide a point **60** and sides **52** and **54** are joined by a curved section **62** in the area where arm **28** is joined to ribbon elements **38** and **40**. Thus the inner leg **64** of opening **46** extends at an angle to a radius from center **16** and the outer leg **66** extends at an opposing angle to a radius from center **16**.

The shell **12** is formed by bending the arms of intermediate area **18** so that they extend in an axially parallel direction from the center **16** to provide a generally cylindrical or tubular section **68**, and in the same operation bending the ribbon elements forming the outer area **20** substantially at the points where they join the outer ends of the arms so that the ribbon elements each provide a loop extending in a plane at an angle to the generally tubular section **68**. In the particular construction illustrated each ribbon element forms a loop by virtue of the fact that the outer ends of the arms are brought together at the end of the tubular section **68** due to the bending of the arms adjacent their inner ends, and the loop openings are provided by the outer legs **66** of openings **46**. The operation in which the shell **12** is formed from the blank **10** is preferably a deep draw in which the arms and outer ribbon elements are deformed to provide the desired structure. In the process of the draw, the point **60** of arm **30** is brought close to or into contact with the side **52** of arm **28**, as illustrated in FIGURE 2, so that a portion of the opening in leg **64** provides a hole adjacent the center area **16**, and another portion of leg **64** together with a portion of opening leg **66** provides another opening area in the tubular section **68**.

The hat-like conformation of shell **12** thus has the center **16** and the tubular section **68** providing a crown and the ribbon elements forming the loops providing a brim-like section. In some instances it may be desirable to provide only a tubular section. This may be readily accomplished by utilizing the integral ribbon construction with slightly different detailed conformations and draw dies.

The shell **12** of FIGURE 2 is illustrated in FIGURE 3 as forming the reinforcement portion of the plastic insert **14**. It may be noted that the plastic is cast or otherwise formed about the insert and is extruded or flowed through the various openings formed from the openings **46** of the blank **10**. The shell **12** may also be utilized as a reinforcement insert in other elements, and in some applications may be utilized as the entire final structure.

An article of manufacture and method of making the article has been disclosed utilizing an integral ribbon blank construction which can be drawn to extreme depths in one operation and will provide desired hole shapes without added operations. The blank can be drawn or otherwise formed in this manner without fracturing at a higher production rate than heretofore. Since the process is accomplished by the steps of forming the blank and then reshaping the blank in one operation, the multiple steps of previous constructions are materially reduced.

In the claims:

1. A sheet blank of metal adapted to be deep drawn into a finished hat-shaped support member having at least two right angles on the ouer periphery thereof, said blank comprising a solid center section, an intermediate section having a plurality of ribbon arms extending generally radially outward from said center section, each of

said arms having one side on a radius from said center section and the other side defined by non-radial segments intersecting to provide a point extending toward the radial side of the arm adjacent thereto, and an outer section having ribbon elements joining the outer ends adjacent of said arms.

2. A sheet blank of metal adapted to be deep drawn into a finished hat-shaped support member having at least two right angles on the outer periphery thereof, said blank comprising a floreate member having a plurality of generally L-shaped openings radially spaced about the center thereof with the shorter legs of said L-shaped openings being radially inward of the longer legs of said L-shaped openings.

3. The blank of claim 2, each of said L-shaped openings having at least one leg extending at an angle to a radius originating at the center of said member.

4. The blank of claim 3, each of said L-shaped openings having both the legs thereof extending in opposing angular relation to the radius line originating from the center of said member.

5. A sheet blank of metal adapted to be deep drawn into a finished hat-shaped support member having at least two right angular portions formed by the outer periphery, said hat-shaped support member comprising a generally hat-shaped material supporting member having a plurality of openings therethrough for integral molding with a flowable material, said material supporting member having a crown section formed as a cylinder and a plane section substanially perpendicular to said crown section with said openings extending through both of said sections and defined at least in part by ribbon-like elements.

6. A sheet blank of metal adapted to be deep drawn into a finished hat-shaped support member having at least two right angles on the outer periphery thereof, said blank comprising a center section and a generally annular intermediate section with ribbon arms extending from said

center section and a generally annular outer section having ribbon loop elements joining adjacent of said elements, said arms being bent adjacent said center section to extend in axially parallel and circumferentially spaced relation at selected distances from said center section to form a generally tubular section, said outer section loop elements being bent adjacent said intermediate section into a planar conformation substantially perpendicular to said generally tubular section.

7. The strengthening member of claim 6, said ribbon elements being deformed to define loops extending radially outward from said arms in said planar conformation.

8. The method of forming a hat-shaped metal support member adapted to rigidify a hat-shaped finished plastic member, the steps comprising forming a floriform perforated blank having angular disposed ribbon arms joined at the center and the outer ends thereof joined by ribbon elements, and in one continuous operation bending said arms adjacent the center points to a generally parallel disposition to form a perforated cylinder section with the outer ribbon arm ends juxtaposed at one end of the cylinder section and bending the arms at the outer ends so that the ribbon elements form radially extending loops in a plane at substantially a right angle to the cylinder section.

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