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Sims

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[54] **CONCRETE MIXER BOWL AND METHOD FOR CONSTRUCTING SAME**

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[52] **U.S. Cl.** ..... **259/175;** 29/416; 29/463; 228/170; 228/173; 113/120 QA

[51] **Int. Cl.²** **B21D 51/10**

[58] **Field of Search** ..... 113/120 NA, 120 QA; 29/412–417, 463; 220/4 E, 4 C, 4 D, 5 A, DIG. 24, DIG. 29; 259/161, 175; 228/170, 173

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Attorney, Agent, or Firm—John A. Young

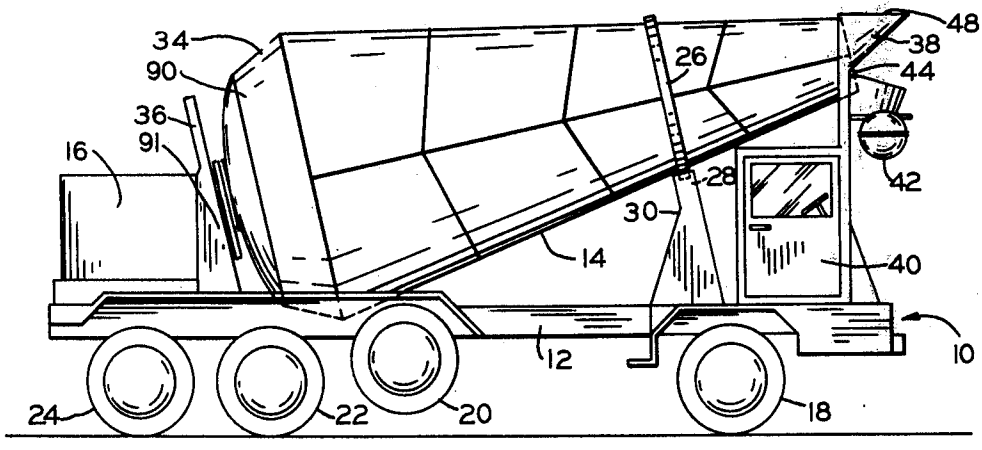
[57] **ABSTRACT**

The invention relates to an improved mixer bowl and method for building such bowl for a cement mixer truck from flat sheet metal stock. The formation of the bowl requires the rolling of previously cut and shaped sections and a subsequent stacking of paired ones of the so-constructed and formed curved sections to make the cone shape of the bowl.

The method comprises the steps of first cutting various sizes and shapes of sheets from a plurality of standard sheet plates of metal such as steel. These sheet metal sections are then rolled into curved sheets which are in matched pairs, joined end-to-end and then stacked to complete the bowl.

The sections are cut with straight sides and when rolled such sides become convexly shaped. By cutting the sections from aligned stock pieces it is possible to reduce scrap while at the same time reducing the number of cuts necessary to produce the total required number of sections. The convexly shaped sides of the rolled sections are interfitted and welded to make the finished bowl.

6 Claims, 7 Drawing Figures



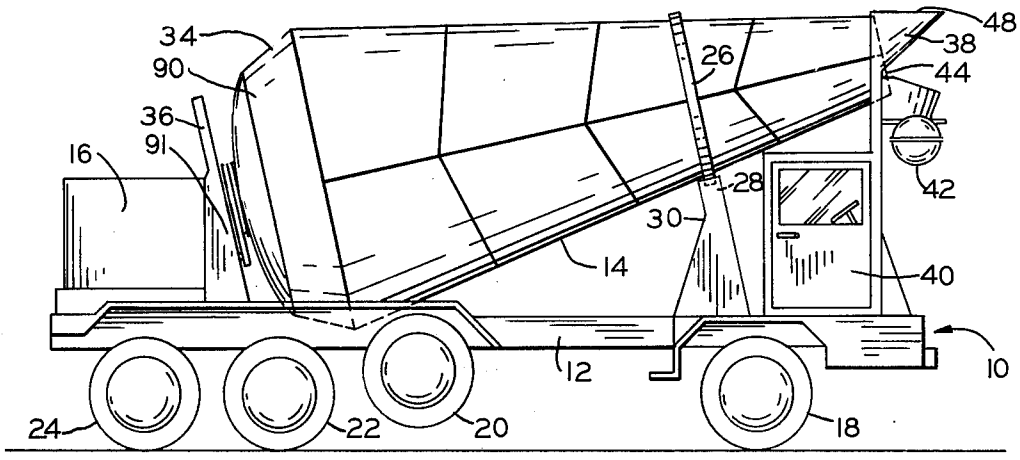


FIG. 1

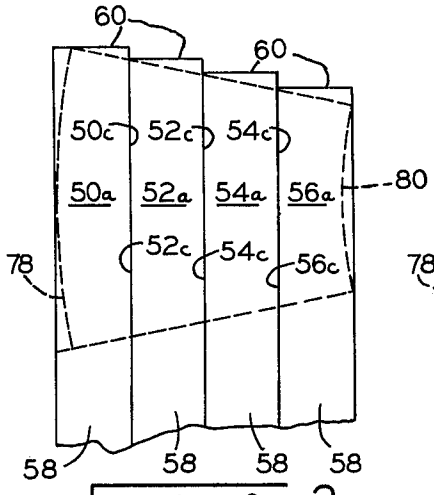


FIG. 2

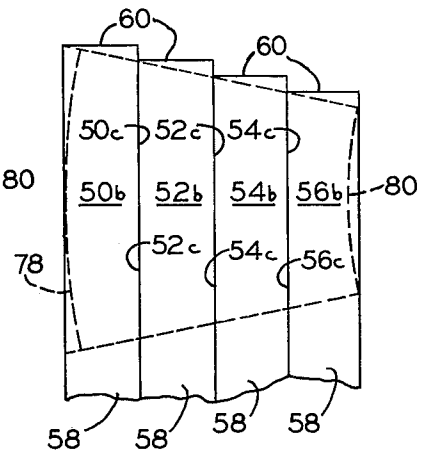


FIG. 3

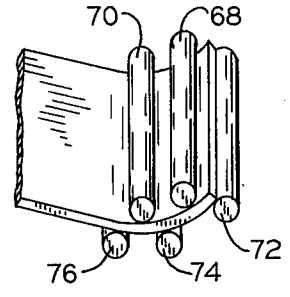


FIG. 4

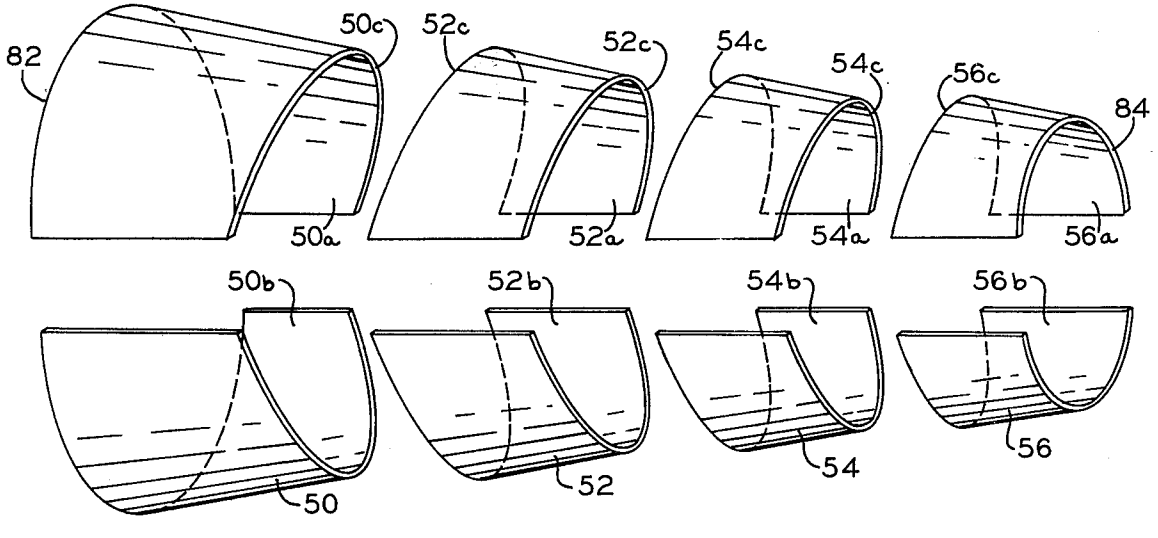


FIG. 5

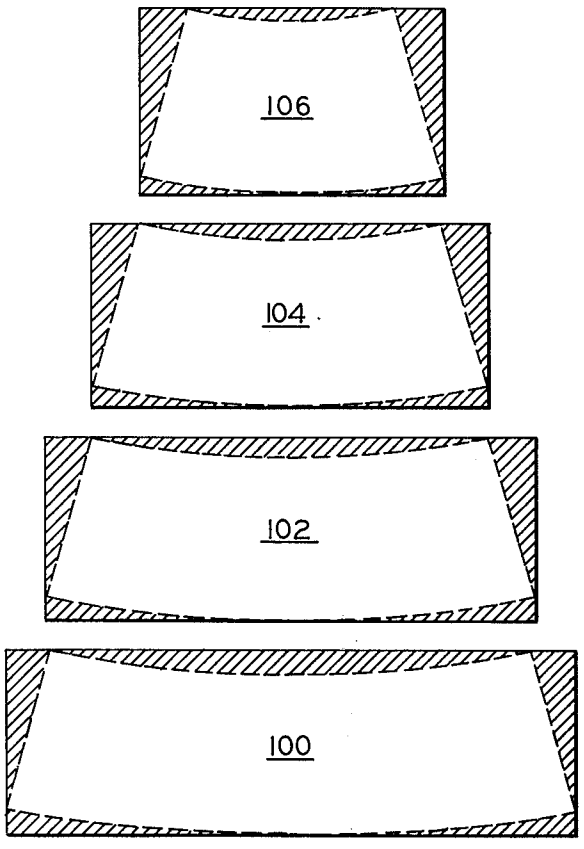


FIG 6
OLD WAY

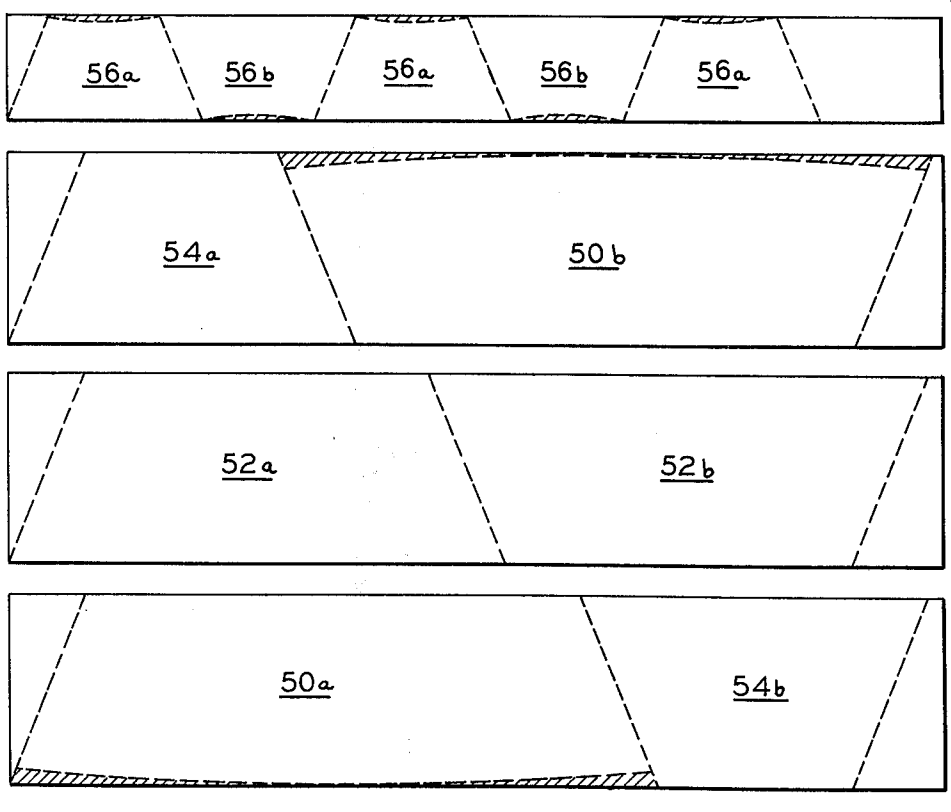


FIG 7

CONCRETE MIXER BOWL AND METHOD FOR CONSTRUCTING SAME

BACKGROUND OF THE INVENTION

The shape of the rotatable mixer bowl in a cement mixer truck is instrumental in maintaining the fluidity of the contents. The rotation direction in conjunction with fins attached inside the bowl causes stirring of the contents and discharges the contents out through the top of the bowl. The bowl is "built up" from semicircular cross section members which are assembled into a cone shape or other closed figure shape to form the desired bowl configuration.

The metal plates from which the bowl sections are formed are standard sheet metal stock.

In the past, it was the practice to construct mixer bowls from sectors, each sector constituting complementary semicircular halves with inclined straight edges which were joined together. Such sectors were then stacked and welded together to make the prescribed shape. The previous process entailed first cutting and then bending each sector half into a semicircular cross section shape and in so doing, the edges or seams of the sectors which were confronting each other along the major dimension of the bowl would change in shape from convex to planar in bending the section from a flat configuration to a semicircular configuration. It was the prior practice to compensate for this change in shape of the confronting edges by constructing the edges as originally as arcuate forms so that, when the section is bent into a semicircular shape, the arcuate edges would then assume a curved planar cut. The confronting planar cuts of the respective sectors were then welded to form the seams joining the sectors which make up the bowl.

The problem in constructing the bowl entails taking into account the change in edge configurations when the flat cut sections are bent from a flat configuration to a curved configuration and joined together to make circumferential sectors. The sectors are next stacked and permanently welded, edge-to-edge so that the stacked and welded together sectors will make a complete bowl.

The procedure is more complicated than it appears in that the original flat sheet metal stock is a starting point from which the sections are first cut and there is an obvious need, of course, to conserve the metal stock, deriving the maximum utilization of stock and minimizing the scrap and the number and extent of the cuts.

OBJECTS OF THE INVENTION

It is a principal object of the present invention to provide an improved method for constructing a concrete mixer bowl from flat sheet metal stock by a method which minimizes the total number of cuts necessary in producing the individual sections which are assembled into sectors, such sectors then being stacked so that the individual circumferential sectors then form a closed container.

Another object is to construct such a bowl so that minimum scrap is generated in the process of converting the flat elements first to curvilinear elements and then joining said elements into circumferential sectors.

The described method entails novel cutting patterns which minimize both the number of cuts necessary and the quantity of generated scrap.

It is a further object of the present invention to produce a more economical method for making concrete mixer bowls by reducing the number of cuts required for each flat shaped sheet metal stock section and eliminating the previously followed practice of requiring that each confronting edge of the sections at the time of joining, must be planar once the sections are bent from flat to curved shape for joining.

An important feature of the present invention is that the circumferential sectors formed from complementary pairs of curved sections are joined with other sectors through edge seams which are at obtuse angles to the diameter, promoting the strength of the bond between successive stacked sectors. Therefore, the strength of the mixer bowl is increased in a torsional sense, i.e., force can be transmitted from one circumferential sector to the next more effectively throughout the length of the bowl.

It was the previous practice to cut all of the edges from the original flat metal stock so that after bending to a semicircular shape each of the cut edges would be geodesically "straight."This necessitated not only a considerable number of cuts but a substantial and unacceptable waste of material since the cuts generated excessive and unusable scrap metal. The overall result was that the bowl construction, because of the time consuming nature of the cutting and bending operations, accounted for considerable cost in the manufacture of front end discharge mixer units of the type shown in U.S. Pat. No. 2,859,949 (Willard) issued Nov. 11, 1958 entitled "Forward Discharging Transit Concrete Mixer." For a long period of time it had been thought to be the "only" useful method. The present invention intends to accomplish greater economies by total revision of the system for making the individual sector shapes from which the bowl is constructed and it supersedes the previous method for making concrete mixer bowl constructions by producing bowls which are structurally more durable as well as more economical.

It should be understood, of course, that the new techniques, procedures and methods are both material and time savers and are adapted for the construction of the containers not only for concrete mixer bowls but for containers in general and are not limited to conical configurations but other configurations as well.

Other objects and features of the present invention will become apparent from a consideration of the following description which proceeds with reference to the accompanying drawings wherein a selected example embodiment is chosen by way of illustration of the invention and not in limitation thereof.

DRAWINGS

FIG. **1** is a side elevation view of a front end discharge truck having a bowl mounted thereon in accordance with the present invention;

FIGS. **2** and **3** are top views illustrating in full line the flat sheet metal stock which is the starting point for constructing the bowl sections;

FIG. **4** illustrates the bending operation by which the flat cut sections generated from FIGS. **2** and **3** are shaped semicircumferentially;

FIG. **5** illustrates in isometric exploded view the semicircular elements as they appear before being first joined circumferentially and then end-to-end to form the complete bowl;

FIG. 6 illustrates the previous method of cutting the respective sections or elements from the flat sheet metal stock; and,

FIG. 7 illustrates in enlarged view the pattern of cutting in accordance with the present invention in which shared cut lines are used in a way which maximizes the utilization of the flat sheet metal stock as it is first cut into the sections and then bent in the manner shown in FIG. 4 to produce the joinable sections as shown in FIG. 5.

DETAILED DESCRIPTION OF THE INVENTION

Referring to FIG. 1, a self-propelled concrete mixer truck designated generally by reference numeral 10 includes a frame 12 which supports a bowl 14 and a rear mounted engine 16 for propelling the vehicle 10 and turning the bowl 14. The truck may be supported on ground engaging wheels 18, 20, 22 and 24 and the bowl is mounted for rotation through a support ring 26 on bearing wheels 28 which are received on an inclined support bracket 30. The end 34 of the bowl is supported on bracket 36 adjacent the engine 16 and is driven through the engine 16 in some appropriate manner as by a gear drive, the details of which are disclosed in copending application Ser. No. 348,209 "Chain Tensioning Device" filed Apr. 5, 1973. As shown in FIG. 1, the mixer bowl 14 is mounted on the vehicle 10 so that discharge end 38 projects over the cab 40; thus, when chute 42 is swung outwardly and angularly into place the aggregate discharges from the interior of the bowl 14 through the opening 44 and into the chute 42 and is directed as a discharge in the full view of the driver within the cab 40. Likewise, when the mix is charged to the mixer bowl 14 through the inlet chute 48 such charging is also facilitated because the charging end of the chute is at the forward or cab end of the vehicle 10.

The invention has to do most particularly with the constructing of the bowl 14 so that it can serve its functions containing, mixing, transporting and eventually discharging the aggregate or mixer at the building site.

Referring to FIGS. 2 and 3 the bowl is built up from 4 circumferential sectors 50, 52, 54 and 56 each such sector being composed of matched section pairs 50*a*, 50*b*, 52*a*, 52*b*, 54*a*, 54*b* and 56*a* and 56*b*. Considering first the section pairs 50*a*, 50*b*, each such section is first cut from sheet metal stock 58 which is formed in strips. The pattern of cutting is indicated in FIGS. 2 and 3 being such that the sheet metal strip is aligned with abutting edges and stepped at ends 60 to minimize end loss from the strip. The strips are cut along the dotted lines so that the abutting edges of the strip stock 58 constitute the adjoining edges of the respective sectors 50–56 such edges being indicated by reference numerals 50*c*, 52*c*, 54*c* and 56*c*. All such edges 50*c*–56*c* of the sectors 50, 52, 54 and 56 are formed as straight cut lines but in the process of being bent from a flat configuration shown in FIG. 2 to that of FIG. 4 by means of the bending rollers 70, 72, 74, 76 these straight line edges are formed as convexly and concavely curved surfaces whereas the edges 78 of sections 50*a* and 50*b* and edges 80 of sections 56*a* and 56*b* which are cut curvilinearly from the flat stock, upon rolling the sections to a semicircular shape such edges will become planar circular edges 82 and 84 as indicated in FIG. 5.

After first cutting the sections in the manner indicated by the dotted line in FIGS. 2 and 3 and rolling (or bending) such cut sections in the manner indicated in FIG. 4, the semicircular matched sections are then assembled into sectors as indicated in FIG. 5 and the confronting edges of sections 50*a*, 50*b*, 52*a*, 52*b*, 54*a*, 54*b* and 56*a*, 56*b* are welded together and the joining edges 50*c*, 52*c*, 54*c* and 56*c* of sectors 50–56 are welded together to form the complete cone.

In all, only 20 cuts are required to produce the sections indicated in FIG. 2, and, referring to FIG. 7, because the same cut is effective for making complementary section cuts, only a total of 15 cuts are needed for each of the complementary sections 50*a*, 50*b*, 56*a*, 56*b*. As indicated in FIG. 7, the layout of the sections is such that the boundary cut for one of the sections is common to another section.

As can be seen, there is minimal scrap generated from the sheet metal stock and can be directly compared with the previous way of cutting the section in which there are curvilinear trapezoidal sections cut for each of the sectors as indicated in FIG. 6 and then after bending, each of the curvilinear sides become planar. That is, the top and bottom edges of each of the so-indicated sections in the prior art method of FIG. 6 after having been rolled in the manner indicated in FIG. 4 will produce a nonobtuse angle as compared with the obtuse generated angle as compared with the obtuse generated angles of the section sides as indicated in FIG. 5.

There is a distinct advantage in the present invention wherein the edges 50*c*, 52*c* of sectors 50 and 52 and the other adjoining sides intersect at interfitting obtuse angles since the torsional load is transferred from one end of the drum throughout its length and such torsional load is to be transmitted from one section to the next throughout the length of the cone, and the obtuse angles provide a non-shearing interlocking seam which is better able to transmit the torsional forces from one conical section to the next conical section.

Unlike the previous method for constructing a bowl, utilizing a greater number of cuts and generating excessive scrap as indicated in FIG. 6, the same amount of sheet metal indicated in FIG. 7 can be used to greater advantage and with greater efficiency by making the cut pattern indicated in FIG. 7 and producing the so-described sections and then making such sections into sectors and next assembling or stacking the sectors to form the bowl.

OPERATION

To construct the bowl 14 sheet metal plates are placed side by side as indicated in FIGS. 2, 3 and 7 and cuts are performed as indicated by the dashed line 60, 78 and 80 to generate the sections from which the bowl sectors are first constructed and then assembled into the bowl.

Only the largest and smallest of the sectors have curvilinear outer edges so that when the sections are rolled to the arcuate shape in the manner indicated in FIG. 4, such curvilinear edges are developed as planar curve surfaces and the originally formed rectilinear edges develop an obtuse angle as indicated in FIG. 5. The side edges of the complementary sections are then welded or joined together so that such complementary sectors are thereby formed into circumferential sections as indicated in FIG. 5; and, the respective sectors are then welded end-to-end by welding confronting edges 50*c*, 52*c*, 54*c* and 56*c* and forming the complete bowl with the convexly curved surfaces interfitting to

form a reliable interlocking joint which is a superior driving joint.

The lowermost section (largest diameter sector) of the bowl (FIG. 1) is secured to base ring **90** which transfers the driving force from the engine **16** through a transmission **91** to the base ring **90** and to the bowl **14** which is mounted at its lower end and is rotatably supported on bracket **30** through rollers **28.**

In operation, the bowl is rotated in one direction as it receives the original charge of gravel, sand, concrete, water, etc. through the chute **48** and is counter-rotated so that with the aid of internal vanes, it will produce discharging of such material through the outlet chute **52,** such chute being controllable in length, angle and elevation so that, by so controlling the chute and the steering wheels **18** it is possible to carefully control the point of discharge of the mixer.

The bowl is one of the most expensive items to produce on the truck and because of the material saving and labor saving resulting from the fewer number of cuts and reduced scrap, there is a substantial economy in the manufacture of the bowl directly resulting from the use of the present invention.

It should be appreciated, that the invention is susceptible to making numerous different shapes of bowls in addition to conical bowls and such changes of shapes are reasonably contemplated by the present invention, and are intended to be included within the scope of the appended claims as equivalents of the invention.

It is reasonably to be expected that those skilled in the art can make numerous revisions and adaptations of the invention and it is intended that such revisions and adaptations will be included within the scope of the following claims as equivalents thereof.

What is claimed is:

1. A process for making a concrete mixer bowl container comprising the steps of: cutting complementary pairs of rectilinearly sided sections from flat sheet metal stock, bending such sections into arcuate shapes and simultaneously develop edges which are in a plane non-normal to the axis of rotation of the bowl, joining said complementary pairs of such sections to form complete conical circumferential sectors having at least one convexly shaped edge, interfitting intermediate confronting edges which are complementary convexly shaped edges of said complete circumferential sectors to form a larger conical sector and permanently joining the confronting convexly shaped surfaces of respective conical sections to form a container.

2. The process in accordance with claim **1** including the step of: abutting the edges of a plurality of flat sheet metal strips, and performing the cutting operations whereby cut lines on said strips form common boundary surfaces for more than one section.

3. The process in accordance with claim **1** wherein selected ones of said sections are cut from sheet metal stock with a convexly shaped surface to provide a planar edge of said sections as such sections are formed from a flat to a curvilinear shape.

4. A process for forming a conical bowl for concrete mixers and the like comprising the steps of: cutting from flat sheet metal stock a plurality of complementary pairs of sections having inclined sides and at least one straight edge, bending such sections whereby the original straight edge is formed into a convex edge which is non-normal to the axis of the conical bowl axis of rotation, joining the respective inclined edges of complementary pairs of said sections to form a partial conical sector, interfitting the convexly shaped edges of such conical sectors to form a complete conical shape for the bowl, and welding such vertically inclined edges together to form a complete conical enclosure.

5. The process in accordance with claim **4** including the step of forming at least one edge of the section constituting the lowermost bowl section of arcuate configuration so that such edge is of planar configuration at the time of forming the lowermost section from flat to curved shape.

6. A concrete mixer bowl constructed in accordance with the process of claim **4.**

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