March 7, 1944. W. R. CLARK 2,343,253

METHOD OF PREPARING BLANKS FOR PRODUCING CONTAINERS SUCH AS METALLIC CARTRIDGE CASES OR THE LIKE

Filed Feb. 12, 1941

Fig. 1.

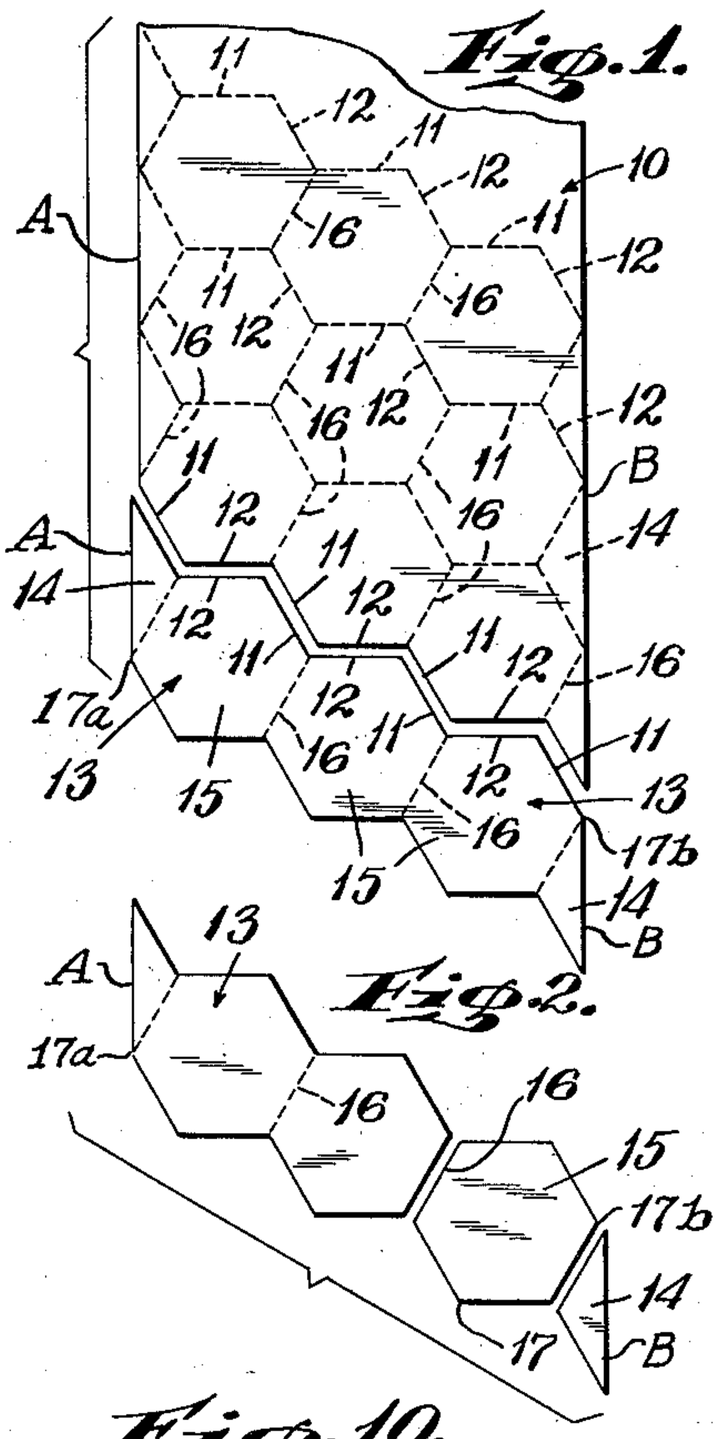


Fig. 2.

Fig. 3.

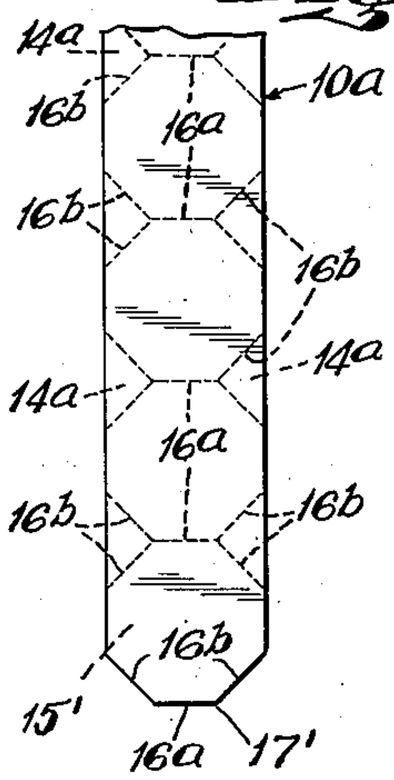


Fig. 4.

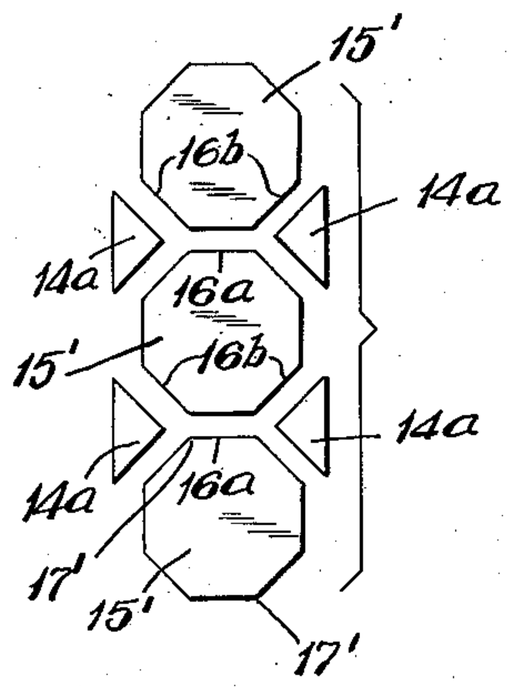


Fig. 5.

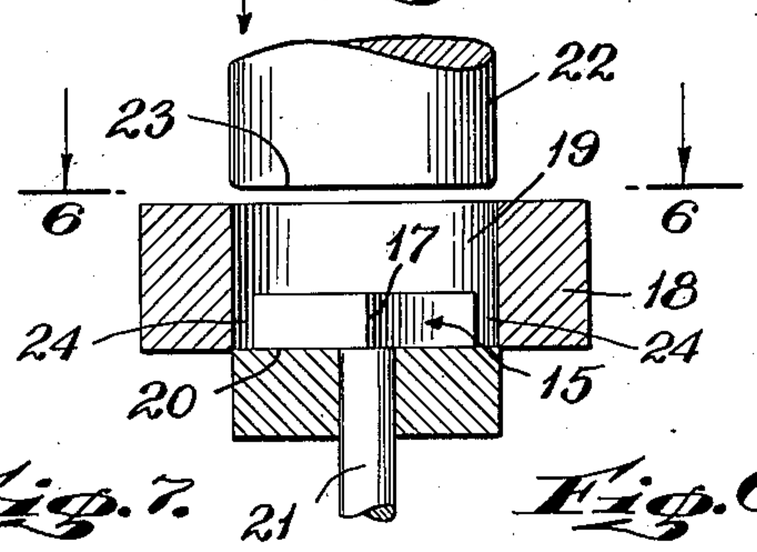
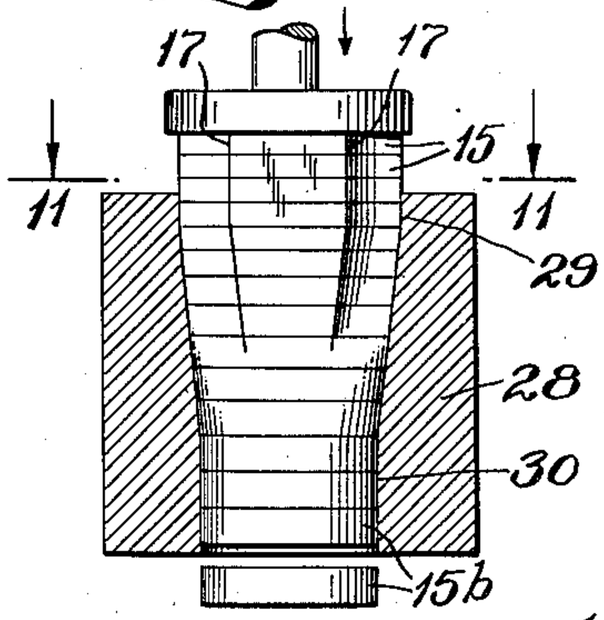


Fig. 7.

Fig. 6.

Fig. 10.



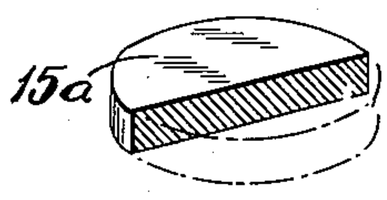


Fig. 8.

Fig. 9.

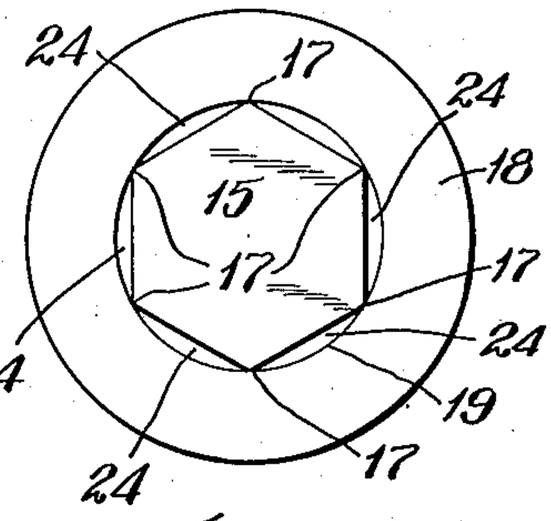


Fig. 13.

Fig. 11.

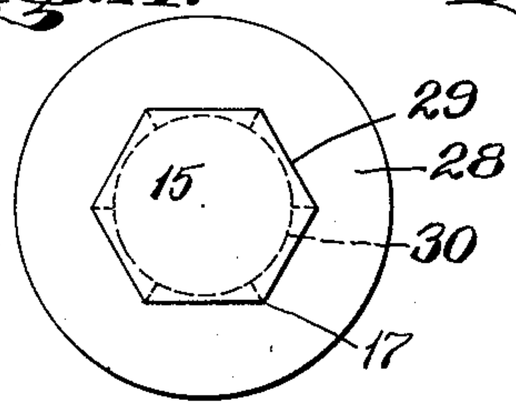
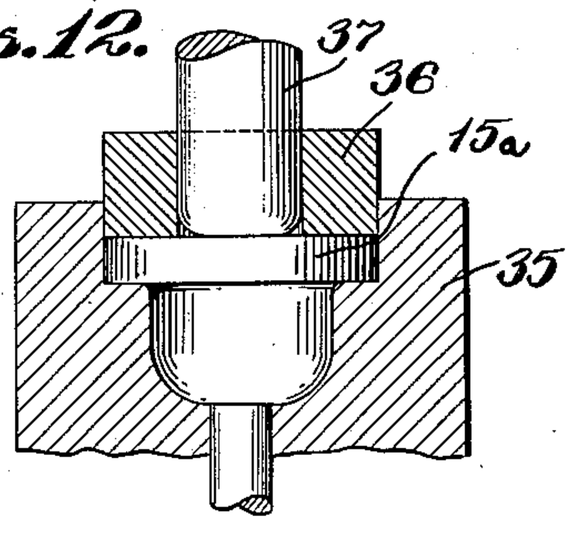
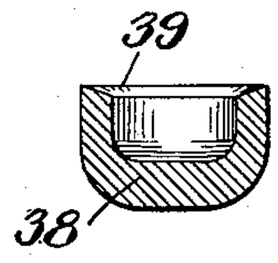


Fig. 12.





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UNITED STATES PATENT OFFICE

2,343,253

METHOD OF PREPARING BLANKS FOR PRODUCING CONTAINERS SUCH AS METALLIC CARTRIDGE CASES OR THE LIKE

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Application February 12, 1941, Serial No. 378,592

6 Claims. (Cl. 29—148)

This invention relates to metallic articles and to methods of preparing the same. More particularly it relates to ordnance articles and to the methods of manufacturing the same.

In the preparation of cups for use in making cartridge casings, it has been customary to stamp circular blanks from sheets of metal and then form the cartridge cups from these circular blanks. Such practice of stamping circular blanks has been very wasteful inasmuch as 40% to 50% of the primary sheet from which the blanks are stamped remains as scrap or waste metal which must be reprocessed into sheet form for further use. There is at the present time an alarming shortage of productive capacity necessary to reprocess the scrap primary metal and such reprocessing must be avoided as much as possible.

It is a principal object of this invention, therefore, to provide novel methods of providing blanks from primary sheets which reduces the waste or scrap to as low as 5% to 6% of the said primary sheet.

The savings entailed by the practice of the methods embodied in this invention are enormous. For example, it has been found that in the production of 100,000 twenty mm. cartridge cases, practice of the processes of this invention saves reprocessing of some 20,000 lbs. of metal per day. In any expansion, say to three times the capacity just mentioned, the savings in avoiding reprocessing of some 60,000 lbs. or 30 tons of metal daily are enormous.

It has been found that where, for example, the ratio of thickness of blank to diameter is not greater than 1 to 20, that polygonally shaped blanks, preferably hexagonal or octagonal, can be worked into blanks having circular cylindrical form or other form with continuously curved edges without destroying the utility of the blanks for use in manufacturing cartridge cups or the like.

The ability to use polygonally shaped blanks permits the severance of a maximum number of metal blanks from a primary sheet and reduces scrap to as low as 5% or 6% of the total sheet.

To effect this great economy, the sheets are divided and separated into strips along zigzag lines corresponding to the outlines of a plurality of contiguous polygons arranged in echelon. The so separated strips are each then further divided into separate polygonally shaped blanks. Each of these blanks is then subject to treatment in suitable dies or the like which act on the blank in such manner as to force metal from the body of the blank to form segmental portions between the apices of the original polygons so that the resultant blanks have a continuously, regularly curved perimeter free of sharp points or facets. Such blanks are then treated in usual dieing operations to form cartridge cups or the like. Since the perimeters of the blanks are continuously and regularly curved as a result of the treatment described, they present smooth unbroken edges when upturned in the cup-forming, dieing operations and require no trimming of any kind.

It is another object of this invention to provide methods of treating polygonally shaped blanks preliminary to cup forming operations so as to form blanks having continuously regularly curved edges whereby the necessity of trimming to provide uniform cup edges is eliminated.

It is another object of this invention to provide methods of forming polygonally shaped blanks into blanks having regularly continuously curved edges without trimming and by utilization of metal from the individual bodies of the blanks to effect the said curved edges. Such utilization of metal has been found not to destroy the utility of the so treated blanks for cup formation.

To the accomplishment of the foregoing and such other objects as may hereinafter appear, this invention consists in the novel product and methods hereinafter described and then sought to be defined in the appended claims, reference being had to the accompanying drawing which shows, merely for the purposes of illustrative disclosure, preferred embodiments of the practices of the invention, it being expressly understood that variations may be made in practice without digressing from the inventive idea.

In the drawing, in which similar reference characters denote corresponding parts:

Fig. 1 is a fragmentary plan view of a main sheet of material such as metal, on which has been superposed the pattern of stampings into which the main sheet is to be divided and the figure also illustrates the severance of strip from the main sheet;

Fig. 2 illustrates a further step in the process of preparing the blanks, and particularly the severance of polygonal blanks from the said main strip;

Fig. 3 illustrates a modified means of laying out a primary sheet for severance into polygonal blanks;

Fig. 4 illustrates the manner of severance of the polygonal blanks from the primary sheet or strip of Fig. 3;

Fig. 5 illustrates one type of means for shaping the individual polygonal blanks into blanks having regularly, continuously curved edges, and illustrates in particular a vertical section of a die for so shaping said blanks;

Fig. 6 is a plan view taken along line 6—6 of Fig. 5 and viewed in the direction of the arrows;

Figs. 7, 8 and 9 illustrate various cross sectional shapes which the blank treated in the die of Fig. 5 may have;

Fig. 10 illustrates a second type of means for shaping the individual polygonal blanks into blanks having regularly, continuously-curved edges, and illustrates in particular a vertical section of a second form of die;

Fig. 11 is a plan view taken along line 11—11 of Fig. 10 and viewed in the direction of the arrows;

Fig. 12 illustrates in sectional elevation a cup forming die in which the blanks of Fig. 7, 8 or 9 may be treated to form a cartridge cup or the like; and

Fig. 13 illustrates in vertical section, a cartridge cup formed by the die illustrated in Fig. 12.

Referring now to the drawing, 10 denotes a main sheet of metal, such as brass or any other suitable metal or alloy.

This sheet 10 is first severed in suitable apparatus (not shown) along the zigzag lines 11, 12 into strips 13. The zigzag lines may be conveniently described as consisting of lines defining pairs of adjacent edges 11, 12 of each of a plurality of polygons 15 arranged in echelon and contiguous to each other along another edge 16 of each of said polygons, or more broadly as lines defining outer edges of a plurality of polygons arranged in echelon and contiguous to each other. The wider the sheet the more polygons may be arranged in echelon. The scrap metal pieces 14 represent a very low percentage of the total sheet 10, amounting to as low as 5.5% of the total sheet. This percentage varies with the width of the original sheet.

The said strips 13 are each then divided into the individual polygonally shaped blanks 15 by severance from the strip along the continuous lines or edges 16. It will be noted from Fig. 1 that the blanks 15 have hexagonal shape. It will be noted further that the division of the strips 13 from the sheet is such that when the strip is separated into hexagons 15 one apex only 17*a*, 17*b* respectively of the two outermost hexagons 15 lie at the opposite marginal edges A, B of the strip while the edges or sides of the said hexagons adjoining the respective apices are at an angle with the said marginal edges. These blanks 15 could be used directly for the manufacture of cartridge cups but if so used, the upper edge of the formed cartridge cup would be irregular and would require additional trimming or machining to remove the scallops with necessary waste of the metal trimmed off.

An alternative method of providing such blanks is to sever individual blanks 15', from strips 10*a* (Fig. 3) along the lines 16*a* and 16*b* in the manner indicated in Fig. 4 The percentage of scrap metal pieces 14*a* is higher than that of pieces 14 of Figs. 1 and 2 though considerably lower than if circular blanks are directly cut. In the latter case the scrap skeleton may run as high as 40% of the original sheet. Blanks 15' are shown as octagons.

To eliminate the necessity for trimming or machining, the blanks 15 or 15' obtained in one of the ways described are now treated in one of several ways to round the edges and in the embodiment shown produce cylindrical disks 15*a* without trimming and by working the body of the metal in such manner as to provide fill therefrom forming segments which fill out the facets of the polygonal shape changing it to a continuously regularly curved or cylindrical disk having circular or other desired form.

One manner of effecting this result is to place each blank 15 or 15' in a die 18 having a circular wall 19 and a diameter substantially equal to that between opposite pairs of apices 17 or 17' of the polygonal blank. The die has a flat convex or concave bottom 20 and a bore therein through which an ejector plunger 21 may be suitably operated. A presser plunger 22 movable into and out of the die 18 through its open top is provided. This plunger may have either a flat pressure surface 23 or the said surface may be convex or concave depending on the shape of the bottom 20, corresponding shapes preferably being used.

With a blank 15 or 15' in place in the die 18, sufficient pressure is applied to the pressure plunger 22 so that its engaging surface acting on the surface of the blank 15, forces metal from the body of the blank to fill substantially all the segmental clearances 24 between the original facet edges of the polygonal blank and the wall 19 of the die. Upon removal of the blank 15*a* from the die, it has a regular curved perimeter corresponding to that of the wall 19 and, while thinner in regions of its body, is suitable for immediate use in forming a cartridge cup. Since its edge is now regularly curved, the cartridge cup which can be formed therefrom has a regular smooth top edge which does not require trimming.

Another manner of treating the polygonally shaped blanks is to provide a hollow die 28. This die has an entering zone 29 shaped to polygonal form matching that of the blank 15 or 15'. The zone 29 gradually merges into a curved or cylindrical zone 30 corresponding in shape to the ultimate shape of the desired finished blanks. This zone 30, in the embodiment shown, has circular cross section. The blanks 15 or 15' are piled at the entry to zone 29 and forced through the two zones of the die emerging from the zone 30 as blanks 15*b* having the required cylindrical shape. During passage through the die, flow of metal from the apices 17 of the disks 15 to form the circular edge is effected. To prevent thickening of the regions of the edges sufficient friction is provided in the die and long cylindrical portion thereof and counter pressure may be exerted on the pile from the emerging end of the die 28. The cylindrical disks or blanks 15*b* formed in this way are now ready for use in preparing cartridge cups.

Other methods of treating the polygonal blanks to reduce them to cylindrical shape 15*a* may be employed. For example, they may be piled and forced through a set of swaging dies with enough force applied to either end of the pile to force the metal to flow circumferentially in the blank rather than to thicken up the same.

The blanks 15*a*, 15'*a* or 15''*a* or 15*b* formed in one of the ways just indicated are then transferred to a forming die 35 which with punch members 36, 37 serves in well known manner to shape them into the form of cartridge cups 38. These cups 38 as will be noted have substantially uniform edges 39 that are free of scallops,

serrations, facets or other irregularities by reason of the pre-treatment of the said blank 15 to form the continuously curved blanks 15*a*, 15'*a*, 15''*a*, or 15*b*.

These cups 38 thereafter may be treated in well known manner in drawing dies or otherwise to produce the required cartridge casings.

While this invention has been described specifically with reference to the preparation of cartridge cups, it is to be understood that the method of first severing polygonal blanks from sheets in the manner described and then subjecting said blanks to operations transforming them into blanks having continuously uniformly curved edges by causing flow of metal from the body of the polygonal blanks may be utilized wherever it is desired to prepare seamless metallic casings having edges which are uniform and which do not require trimming. There is no intention, therefore, of limitation either to the exact details of process described or to the single application described. Other modifications and uses within the scope of the appended claims are contemplated. For example, while the blanks 15 and 15' are shown respectively as hexagons and octagons, other polygonal forms of blanks are contemplated as within the scope of this invention.

I claim:

1. That improvement in the preparation of metallic blanks for the production of casings comprising providing sheets of metal, dividing said sheets into strips along zigzag lines defining outer edges of a plurality of hexagons arranged adjacent each other in echelon, separating individually hexagonally shaped blanks from said strips, so that in each strip one apex only of each of the two outermost blanks separated therefrom lies in its respective marginal edge of said strip, while the edges of said blanks adjacent respective of said apices are at an angle with the respective marginal edges of said strip, and operating on each of said hexagonal blanks individually to cause metal from the blank to fill out the straight edges of the hexagon and transform the said blank into one having a substantially circular perimeter.

2. That improvement in the preparation of metallic blanks for the production of casings, comprising providing sheets of metal and separating said sheets into biased strips along lines defining outer opposite edges of a plurality of hexagons arranged adjacent each other in echelon and separating individual hexagonal blanks from said strips, so that in each strip one apex only of each of the two outermost blanks separated therefrom lies in its respective marginal edge of said strip, while the edges of said blanks adjacent respective of said apices are at an angle with the respective marginal edges of said strip.

3. That improvement in the preparation of metallic blanks for the production of casings comprising providing sheets of metal, separating said sheets into strips along zigzag lines defining pairs of adjacent edges of each of a plurality of hexagons arranged in echelon, contiguous to each other along another of the edges of each of said hexagons and with one apex only of each of the two outermost hexagons lying in the respective opposite margins of said sheet and with the edges of said outermost hexagons adjacent respective of said apices each at an angle with the respective margins, separating each of said strips into individual hexagonally shaped blanks along the contiguous edges so that minimum waste of material is effected, and shaping each of said blanks to cause metal of each blank to fill out the straight edges of its polygonal shape and transform said blank into one having a continuously curved perimeter.

4. That improvement in the preparation of metallic blanks for the production of casings comprising providing thin, polygonally shaped discs of metal and moving said discs under pressure in one direction completely through a die having a polygonal zone therein corresponding in shape to said discs, to and completely through a zone of said die having a continuously curved wall, whereby flow of metal from the apices of each of said discs to the polygonal sides thereof is effected and said discs emerge from said die with an entire, continuously curved peripheral shape corresponding to that of said continuously curved wall.

5. That improvement in the preparation of metallic blanks for the production of casings comprising providing thin, hexagonally shaped discs of metal and moving said discs under pressure in one direction completely through a die having an hexagonal zone therein corresponding in size to that of said discs, to and completely through a zone of said die having a circular wall of smaller diameter than that of said first-named zone whereby flow of metal from the apices of each hexagonal disc to the hexagonal sides thereof is effected and said discs emerge from said die with an entirely circular peripheral surface corresponding to that of said circular wall.

6. That improvement in the preparation of metallic blanks for the production of casings comprising providing a sheet of metal having parallel opposite marginal edges, separating said sheet into strips biased with respect to said edges along zig-zag lines defining outer opposite edges of a plurality of hexagons arranged adjacent to each other in echelon, and separating individual hexagonal blanks from each said strip along contiguous edges of the said hexagons, the bias of said strips and their lengths being such that one apex only of each of the two outermost hexagonal blanks severed therefrom lies in the respective marginal edge of each said strip while the edges adjacent to each of said apices are at an angle with the respective marginal edges.

WALTER R. CLARK.

CERTIFICATE OF CORRECTION.

Patent No. 2,343,253. March 7, 1944.

WALTER R. CLARK.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, first column, line 47, for "continuous" read --contiguous--; page 3, first column, line 36, claim 1, for "individually" read --individual--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of April, A. D. 1944.

Leslie Frazer

(Seal) Acting Commissioner of Patents.