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2,961,663

SINK RIM GUARD FORMED OF SHEET METAL

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3 Sheets-Sheet 1

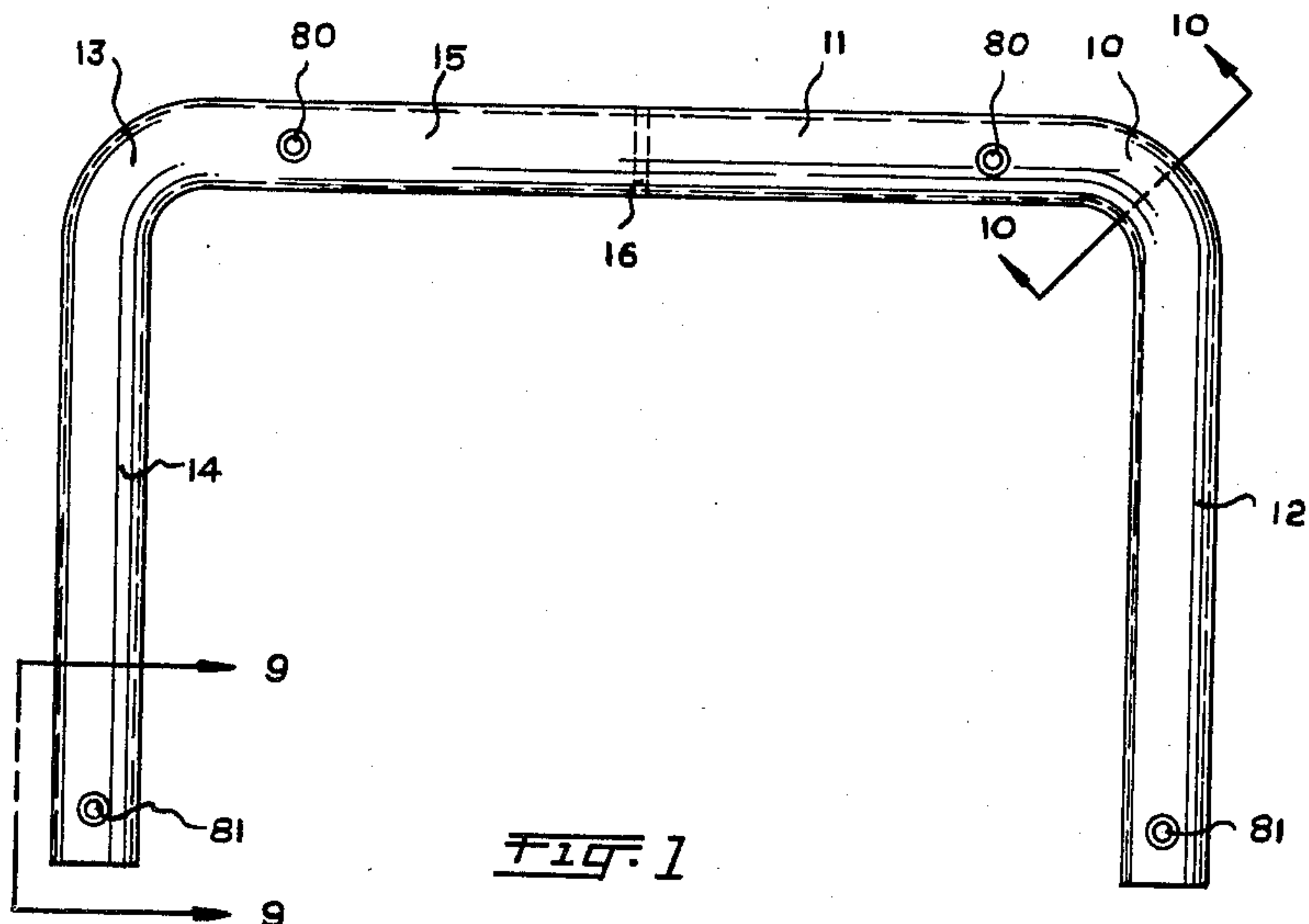


FIG. 1

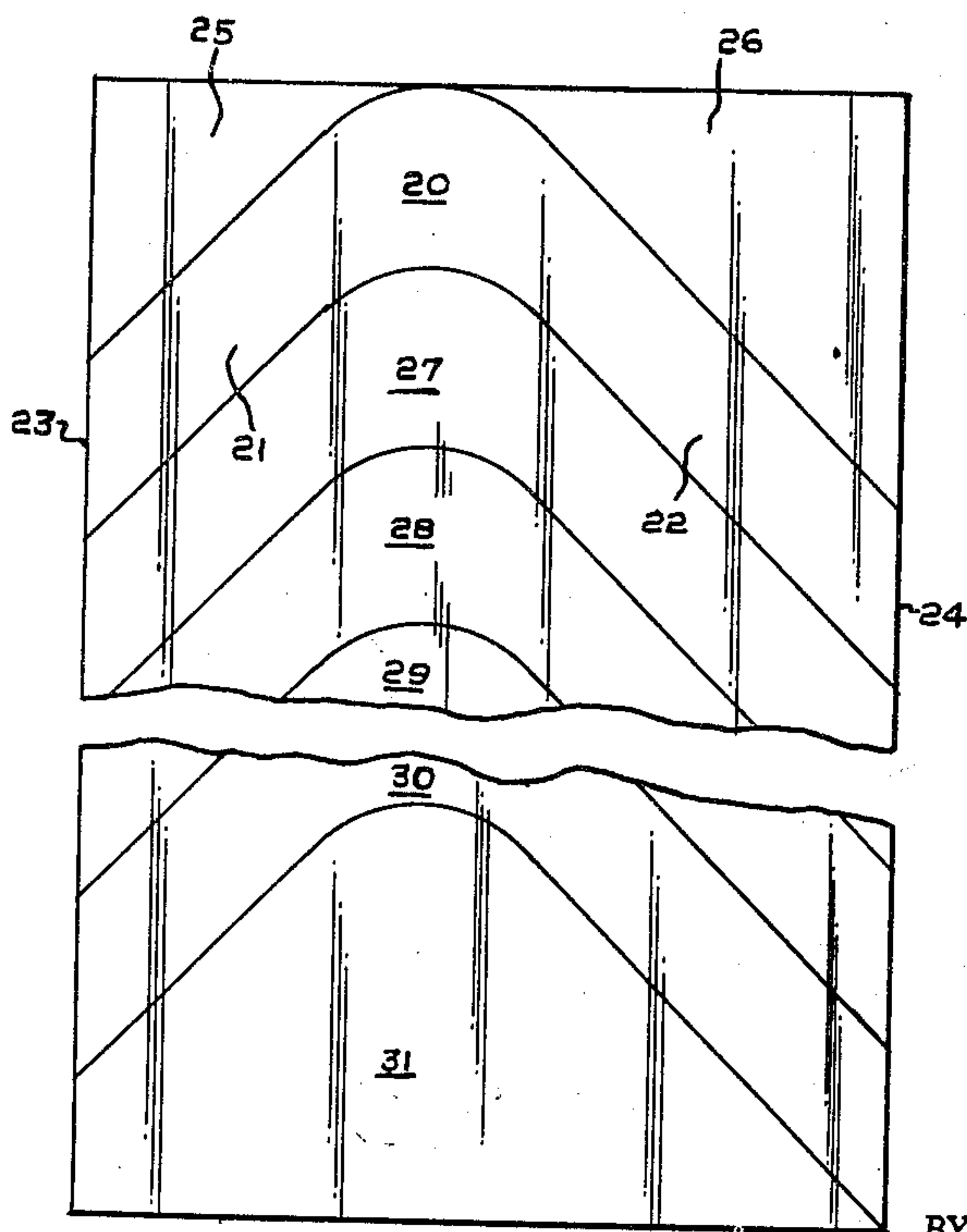


FIG. 2

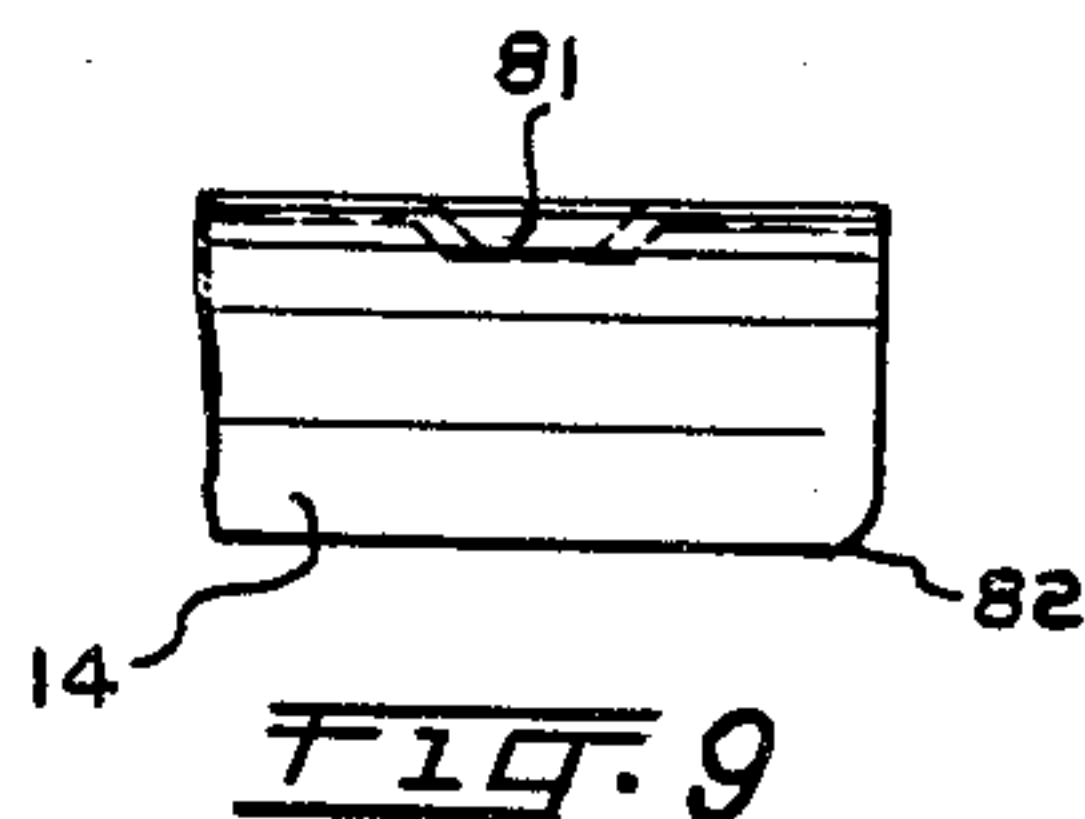


FIG. 9

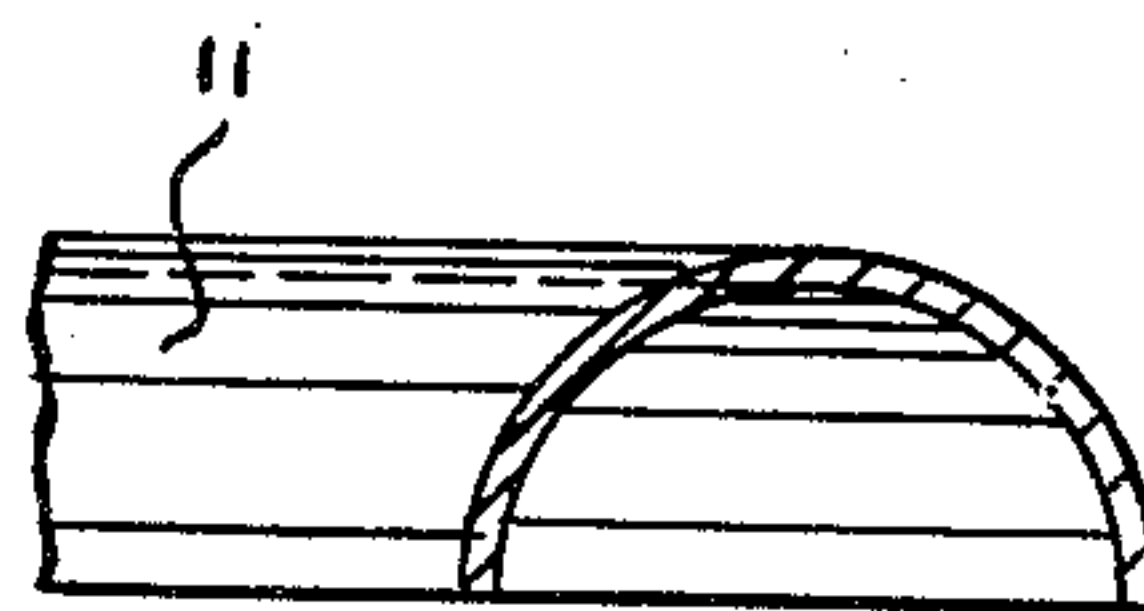


FIG. 10

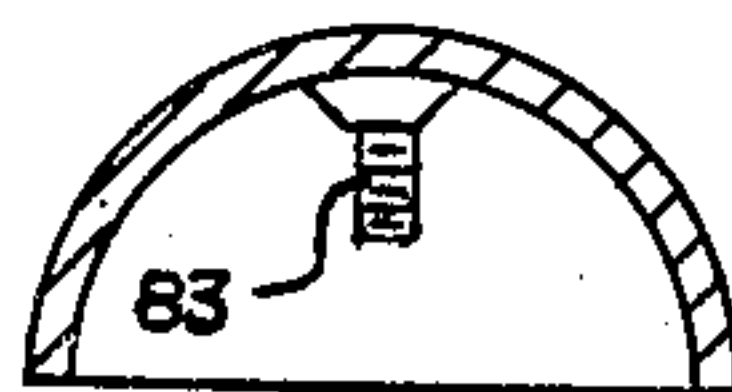


FIG. 12

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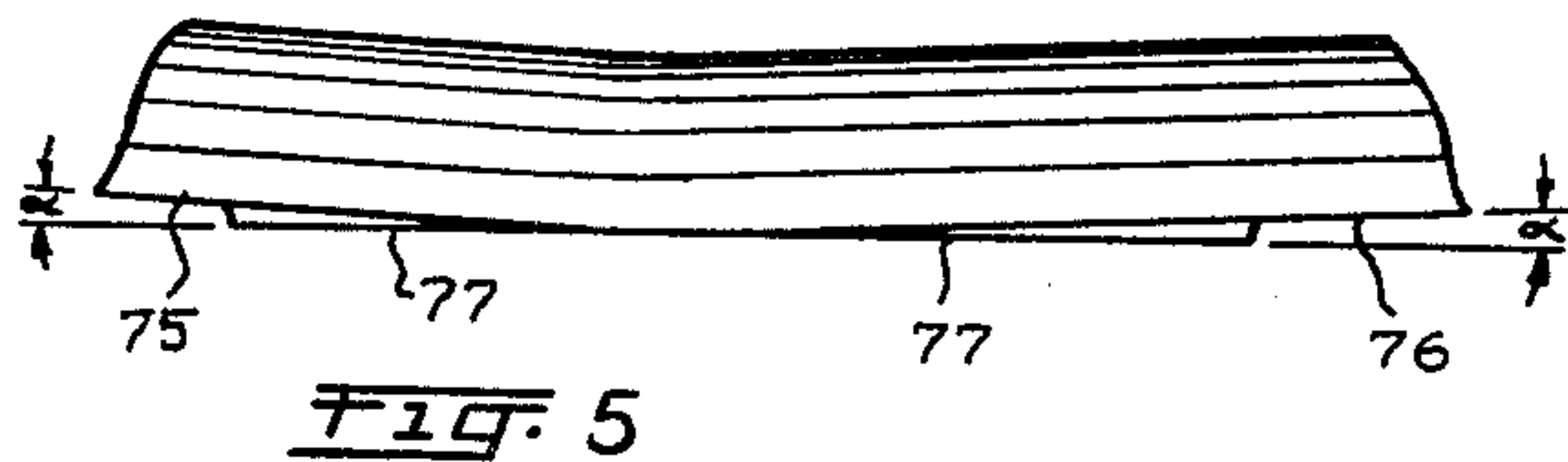
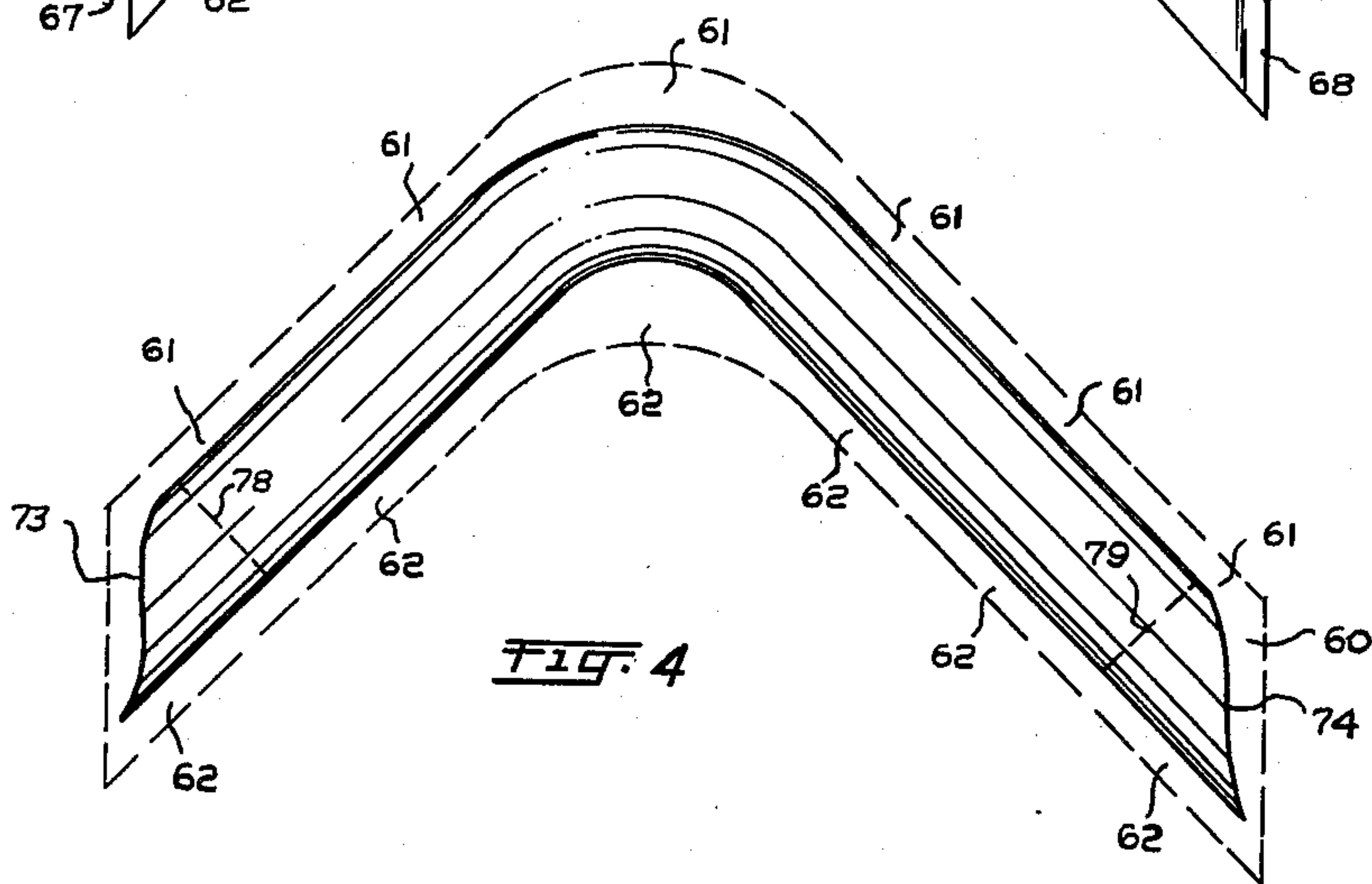
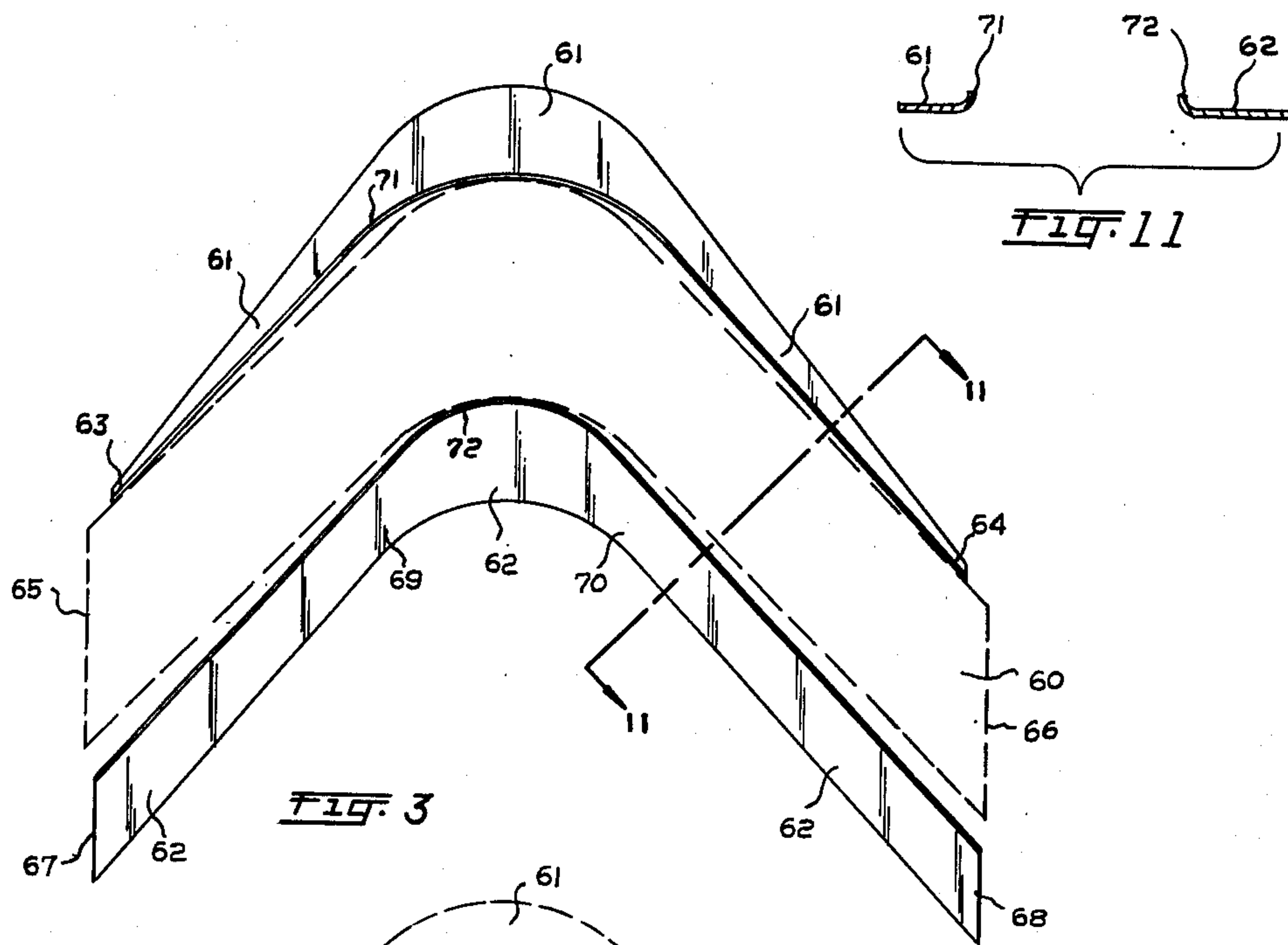
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SINK RIM GUARD FORMED OF SHEET METAL

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3 Sheets-Sheet 2



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2,961,663

SINK RIM GUARD FORMED OF SHEET METAL

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This invention relates to an improved sink rim guard or the like.

In the manufacture of articles of this type various problems have been encountered when attempting to form the same from sheet metal by a drawing operation. In general, such articles have a curved corner portion of comparatively small radius with the result that the metal tends to rupture at the outer face of the corner and to wrinkle or upset at the inner face thereof, when subjected to the necessary drawing stresses. Since the metal also is being formed into a curved cross-section, which preferably has a substantially uniform thickness throughout, this normal bending stress, when superimposed upon the drawing stress, requires a careful holding of the blank while being subjected to the combined stressings. Moreover, since waste of sheet material is to be avoided, especially when working with the more expensive materials, such as stainless steel, a particularly important requirement is that the blank should not contain more material than is needed, but at the same time should contain adequate material for holding purposes while the above combined forming stresses are being applied.

In view of the foregoing and other requirements, it has generally been the practice heretofore to form sink rim guards and the like by casting or forging operations, rather than by a sheet metal drawing operation. This, in turn, has resulted in more expensive production costs. Accordingly, it is a purpose of my invention to overcome difficulties of the type above mentioned when manufacturing articles of this class and to provide a relatively inexpensive and improved product.

An object of the invention is to provide an improved elongated article drawn from sheet metal and having both an axial and a transverse curvature along at least a portion thereof.

Another object is to provide an improved elongated transversely curved article drawn from sheet metal and having an arcuate corner and integral leg portions extending from that corner and with the length of those leg portions greater than the radius of curvature of the corner.

Another object is to provide an improved article drawn from sheet metal and entailing a reduced amount of waste of the sheet from which it is formed.

Other objects and advantages will become apparent as the description proceeds and when considered in conjunction with the accompanying drawings in which:

Fig. 1 is a plan view of a completed sink rim guard ready for installation;

Fig. 2 is a plan view of a sheet of stock material showing the arrangement for forming blanks therefrom;

Fig. 3 is a diagrammatic view showing the planar relation of a standard blank to the residual blank-holding portions thereof;

Fig. 4 is a diagrammatic view showing the planar relation of a standard blank to the article drawn therefrom;

Fig. 5 is an elevation view taken toward the inner face

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of the corner in the drawn article and prior to subsequent finishing of the drawn article;

Fig. 6 is a diagrammatic vertical section through one form of drawing press suitable for carrying out the method and showing the general relation of the blank, blank-holder platen, and die members, prior to the drawing operation;

Fig. 7 is a view similar to Fig. 6 and showing the several parts at the conclusion of the drawing operation;

Fig. 8 is a plan view of the lower die member taken along line 8—8 of Fig. 6;

Fig. 9 is a detail view taken along line 9—9 of Fig. 1;

Fig. 10 is a sectional view taken along line 10—10 of Fig. 1;

Fig. 11 is a sectional view of the residual blank-holding portions taken along line 11—11 of Fig. 3; and

Fig. 12 is an elevation view of one end of the finished article showing a modification of securing means therefor.

In carrying out the invention, I first cut from an elongated sheet or coil of stock metal, a number of identically shaped blanks. Each blank has a planar area sufficient to provide the body portion of the member to be drawn, as well as two blank-holding portions of sufficient size to enable the press platen to hold the article in predetermined position during the drawing operation and to supply the necessary volume of metal to the body portion of the member to prevent rupture of the same during that operation. When the blank is to form articles having non-symmetrical lengths of legs, the same blank may be used in the press for forming either right or left handed articles, merely by placing the blank in the press in normal or inverted position, as desired. Each blank moreover is cut from the sheet in nested relation to its adjacent blanks thus to minimize both waste and handling operations. In conducting the drawing operation, the blank is held in registry with the area of the press by means of a movable blank-holding platen which permits slippage of the blank-holding portions as needed but without modifying the initial register of the blank with respect to the dies. Upon approaching the final closing of the dies, the residual blank-holding portions are sheared from the formed article by means of the engagement of the two dies of the press. Thereafter, the dies are separated and the drawn article is removed and subjected to finishing operations and further fabrication as when a plurality of the articles are joined to form a composite article, such as a three-sided sink rim guard.

Referring now to Fig. 1, I have shown as illustrative of the invention, a sink rim guard ready for installation upon a conventional service sink made of porcelain finished metal with holes in its rim for attachment of the guard. Such a guard serves both a utilitarian purpose in preventing damage to the rounded edge of the sink, as by striking of buckets or cleaning implements thereagainst, as well as ornamental purposes. In particular, the guard is required to have a close fit with the arcuate edge of the sink to prevent collection of dirt or the like on the sink rim surface. One satisfactory form of guard therefore may comprise a composite article formed of a right hand member having an arcuate corner portion 10 with an elongated integral leg portion 11 extending tangentially therefrom in one direction and an elongated integral leg portion 12 extending tangentially therefrom in the other direction, both leg portions lying in the same plane and corresponding to the plane of the top edge of the sink to which the article is to be attached, and of a left hand member having a similar arcuate corner 13 and integral leg portions 14 and 15. The confronting leg portions 11 and 15 are rigidly joined to each other, as by welding along weld line 16. Since the shape of conventional sinks frequently does not employ equal

lengths of the three sides requiring the rim guard, I have shown in Fig. 1 and have disclosed herein guard members whose leg portions are of unequal length. However, as will be apparent to those skilled in the art, the invention is equally well adapted to the manufacture of articles having legs of equal length, in which case the use of right and left hand members is not necessary.

Merely as one example of the invention the composite member of Fig. 1 may be formed of high luster stainless steel having a thickness of about 0.049 inch, curved transversely throughout its length into semi-circular hollow form with a wall radius of about 1.155 inch, and having the arcuate corners 10 and 13 formed with their center lines on a 3.750 inch radius. The length of the legs of each member joined in the composite member may be about $6\frac{1}{8}$ inches for the shorter leg and about 11 inches for the longer leg. It will thus be seen that drastic requirements must be met in fabricating an improved guard of this type and, so far as I am aware, all such guards heretofore available have been formed only by forging or casting operations due to the aforementioned difficulties encountered in attempting to make the guard of sheet metal.

In the following description for simplicity, I refer only to the method of manufacturing the right hand members of the composite article, although it will be obvious that the same teaching is equally applicable to the manufacture of the left hand member. Considering now Fig. 2, an elongated sheet of metal is provided as stock for the blanks and is cut by any suitable cutting apparatus as the sheet is fed thereto. The initial cut is made at one end of the sheet to provide the standard blank 20 having two elongated leg portions 21 and 22 whose axes are at right angles to each other and with the leg portion 21 being shorter than leg portion 22. The outer edges 23 and 24 of the respective leg portions correspond to the edges of the sheet from which the blanks are cut and the portions 25 and 26 of the sheet comprise waste which may conveniently be termed "stock waste." The convex side of the arcuate corner in blank 20 is formed on a prescribed radius depending upon the transverse dimension required in the leg portions of the blank and the concave side of the corner is formed on the same radius, but these two radii are not concentric. Thus, it will be seen that the transverse dimension of both legs is equal; that the blank has a substantially broadened dimension along the line including the centers of the two circles; and that the immediately adjacent blank 27 nests against the blank 20 and involves no wastage of stock material. In fact, a great number of successive blanks indicated by 28, 29 and 30 may be cut from the sheet without further wastage until the end of the sheet is reached, at which time the portion 31 adds to the "stock waste." As will be seen, by using a very long sheet in coiled form for example, the percentage of "stock waste" represented by the sum of portions 25, 26 and 31 may be reduced to a low value.

Referring now to Figs. 6 to 8, the method of the invention may be carried out in any suitable metal drawing press of the blank-holder type and in which the cooperating die members are adapted to shear the residual portions of the blank from the shaped article. Since conventional presses of this type are well known and form no part of the present invention, the primary elements of the same are shown only diagrammatically in Figs. 6 and 7, it being understood that actuation of these press elements may be effected by conventional means, as shown, for example, in Ernst Patent 2,290,743. As seen in Fig. 6, a lower die member 40 is suitably mounted in stationary position and is provided with a plurality of apertures through which plungers 41, 42, 43 and 44 are adapted to reciprocate. These plungers are secured at one end to the blank-holder platen 45 having an aperture 46 centrally disposed therein. At their opposite ends the plungers are opposed by a suitable means, not

shown, such as a hydraulic fluid under pressure, a heavy compression spring or the like, serving to hold the platen 45 in raised position and to require a positive force to move it into contact with the lower die member 40.

An upper die member 47 having a main pressing plunger 48 connected to a double-acting hydraulic piston, not shown, is disposed above the platen 45. This upper die member is adapted, as well known in the press art, to engage a blank disposed above the aperture 46 and to force that blank against the platen, and thereafter to move the platen downwardly into engagement with the stationary lower die member.

Referring now to Fig. 8, the lower die member is provided with a male die 50 having the configuration of the inner surface of the sink guard rim and including an arcuate corner portion 51 and two tangentially extending leg portions 52 and 53. Preferably, the leg portions are of equal length; are symmetrically arranged; and are somewhat longer than the longest leg portion to be formed from the blank. Thus, by suitable positioning of the blank in normal or inverted arrangement both right and left hand articles may be formed with the same lower die member. Extending along the convex side of the arcuate corner 51 and along the entire length of both legs of the male die is a sharp corner 54 for a purpose later to appear. Extending along the concave side of the same arcuate corner and of the same legs is a similar sharp corner 55, as seen in Fig. 6. Both of these corners are spaced from the plane of the flat portion of die 40 a distance slightly greater than the thickness of blank-holder platen 45.

Contained within the upper die member 47 is a recess 56 corresponding to the shape of the male die member in the lower die 40 and having sharp edges 57 and 58. The size of the recess 56 forming the female portion of the cooperating dies is such that upon full downward movement of the upper die the edges 57 and 58 will move into close engagement with the respective edges 54 and 55 in the male die and shear any material of the blank found between those cooperating die edges. It will be understood, however, that the edges 54 and 55 of the male die member are separated from the main body 50 of that member by a distance suitable for accommodating the thickness of the shaped article, and that the size of the recess 56 is such as to accommodate the shaped article when held between the female and male portions of the die members.

With the foregoing in mind, my method may be conducted in the following manner. A standard shaped blank of sheet metal, as indicated at 60 in Figs. 3, 4, 6 and 8, (not necessarily drawn to scale) is laid upon the upper surface of blank-holder platen 45 above the aperture 46 therein. Since my invention does not require heat treatment of the blank and may be practiced by cold drawing of the sheet metal, I prefer to use a conventional lubricating compound on the blank at this stage of operation. Suitable registering means, not shown, such as small pins affixed to the platen and engageable in corresponding holes in the lower surface of the upper die member may be employed to register the blank with respect to aperture 46 when desired. The upper die 47 is then moved downwardly clamping the blank 60 between the die and the platen 45, and subsequently moving that platen downwardly against its resisting force.

As the lower surface of blank 60 contacts the uppermost centerline of the stationary male die 50 a transverse bending of the entire blank begins to take place. At this time, the blank is held in frictional engagement between the platen and upper die throughout a first, or forward blank-holding portion 61, and a second, or rearward blank-holding portion 62, as seen in Fig. 4. As further downward movement of the platen and upper die occurs, more metal is required in the region of the convex side of the arcuate corner of the dies and upsetting of the blank-holding portions 61 and 62 begins, be-

ing much more pronounced in the area of the forward blank-holding portion 61. As the drawing stress, reinforced by the bending stress, becomes more pronounced, the ends 63 and 64 of the forward blank holding portion are contracted in width and are moved inwardly from their initial position at the ends 65 and 66 of the standard blank. Similarly, and to a lesser extent (as seen diagrammatically in Fig. 3) the ends 67 and 68 of the rearward blank-holding portion 62 are slightly moved inwardly and a distinct necking inwardly in the regions adjacent the line of tangency of the leg portions with the arcuate corner, as at 69 and 70 occurs. This movement of metal, as described, can, of course, take place when the tension stresses in the metal blank exceed the frictional force exerted on that blank by the blankholder platen 45, all as known in the art. It will be understood, however, that in order to accomplish this method of operation sufficient planar areas in both the forward and rearward blank holding portions 61 and 62 must be provided, otherwise a rupturing or wrinkling of the shaped article is likely to occur. In addition, however, if excessive planar areas are so provided, an excessive amount of waste, conveniently termed "residual blank waste" will occur.

When the dies are fully closed upon each other, as seen in Fig. 7, the residual portions of the forward blank-holding portion 61 and of the rearward blank-holding portion 62 are simultaneously, and while under substantial tension forces, severed from the shaped article which is held between the male and female dies. As noted in Fig. 11, the action of the edges 57 and 58 cooperating with edges 54 and 55 is such as to form a short and sharp upwardly directed shoulder 71 and 72 along these respective portions. After this shearing takes place, the upper die 47 is retracted, the shaped article and the residual blank-holding portions are removed, and a new cycle of operation is begun.

Various characteristic features of my improved method of forming the shaped article will be noted from the drawings. As seen in Fig. 4, the extreme ends 73 and 74 of the article are drawn into an S-shaped configuration. Also as seen in Fig. 5 the lower edges 75 and 76 of the shaped article, upon being removed from the dies, adopt a slight cant as indicated by angle α . The value of this angle is normally about 2° when drawing stainless steel. However, the forward edge 77 of the shaped article lies in a flat plane. Moreover, as seen in Fig. 3, the residual portion 61, as well as the residual portion 62, tend to pull their outermost ends toward each other when the tension exerted by the dies is relieved.

Having thus described the method of drawing the unfinished metal article, various steps may then be taken to bring the article to final commercial form as seen in Fig. 1. For example, the unfinished article, as seen in plan in Fig. 4, may be placed in a suitable jig in which the extreme ends may be cut off along dotted lines 78 and 79, these ends forming a third and minor amount of waste which may be termed "finishing waste." Simultaneously, while in this jig suitable countersunk holes 80 and 81 (Fig. 1) may be bored in the article for later reception of mounting bolts during installation of the sink rim guard. By a separate operation the sharp lower corners of the article, after cutting along the line 79, may be bevelled off as seen in Fig. 9 at 82, thus, to give a snag-proof configuration. A right-hand article and a left-hand article when thus treated may then be placed in a welding jig with the abutting ends of legs 11 and 15 in contact, and thereafter may be welded as by means of a conventional inert gas welding to form a composite three-sided guard. By manipulation in a suitable vise the side walls of the article are squeezed to remove any remaining cant of one lower edge with respect to the other lower edge of the article. Burnishing of the weld metal, abrading of any sharp edges, and polishing of the entire

article then completes the fabrication of the sink rim guard.

As seen in Fig. 10, the guard throughout its length has a semi-circular hollow form which will mate with the convex rim of the sink, even at the arcuate corners of that sink rim. When the structure to which the article is to be attached has an arcuate shape other than a semi-circular form, the curvature of the article is modified accordingly by using dies of a different configuration. Various means for attaching the guard to the sink may be employed. In Fig. 9, for example, a countersunk hole 81 into which a bolt may be passed for engagement in the hole in the sink rim is shown. I prefer, however, to attach on the underside of my improved guard a threaded stud 83 which can engage with the sink rim. Such a stud may be welded, brazed or silver soldered to a stainless steel rim guard as desired and when used will not require the forming of the holes 80 or 81 in that guard. Thus, the smooth external appearance of the guard may be preserved.

With the foregoing in mind, it will be seen that by means of the present invention I am enabled to produce an article of the class described in a rapid and uniform manner and without any appreciable percentage of waste which would otherwise add to the cost of the article. The gross amount of the above-defined "stock-waste" plus the "residual-blank waste" plus the "finishing waste" is found to be substantially lower than that resulting from other processes of manufacture with which I am familiar. Since the sheet of stock material is comparatively thin, the total weight of metal constituting the waste is relatively small.

The method of manufacture may be conducted by a single operator, if desired. The length of the legs of the shaped article may be varied within wide limits without departing from the invention merely by cutting the blanks from a sheet of stock material of appropriate width and the transverse curvature of the shaped article may be widely varied by use of different male and female dies. These capabilities inherent in the method of the invention therefore permit the manufacture of many types of shaped articles without departing from the invention, the invention being in no way limited solely to the manufacture of the improved sink rim guard.

While I have shown particular embodiments of the invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications can be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A hollow sink rim guard formed of sheet metal and having a first straight portion, a second straight portion, a third straight portion, a first arcuate corner portion intermediate the first and second straight portions, and a second arcuate corner portion intermediate the second and third straight portions; said first straight portion, first arcuate corner portion and the portion of said second straight portion adjacent said first arcuate corner portion being of one piece of metal, said third straight portion, second arcuate corner portion and the portion of said second straight portion adjacent said second arcuate corner portion being of another piece of metal, said two pieces of metal being joined together and completing said second straight portion; said guard having a substantially uniform curved transverse cross-section throughout its length and with said first and said third straight portions being substantially parallel to each other, the length of each of said straight portion being greater than the centerline radius of either of said arcuate corner portions, and means projecting from said guard into the hollow space therein for fastening said guard to the upper rim of a sink in close engagement therewith.

2. A guard as described in claim 1 wherein said means

projecting into said space comprises a stud attached to the interior surface of said guard.

3. A guard as described in claim 1 wherein said means projecting into said space comprises a bolt separate from said guard and mounted within an aperture in said guard. 5

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