Jan. 17, 1961 V. A. McCHESNEY 2,968,270

APPARATUS FOR FORMING RECEPTACLES

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FIG. 2.

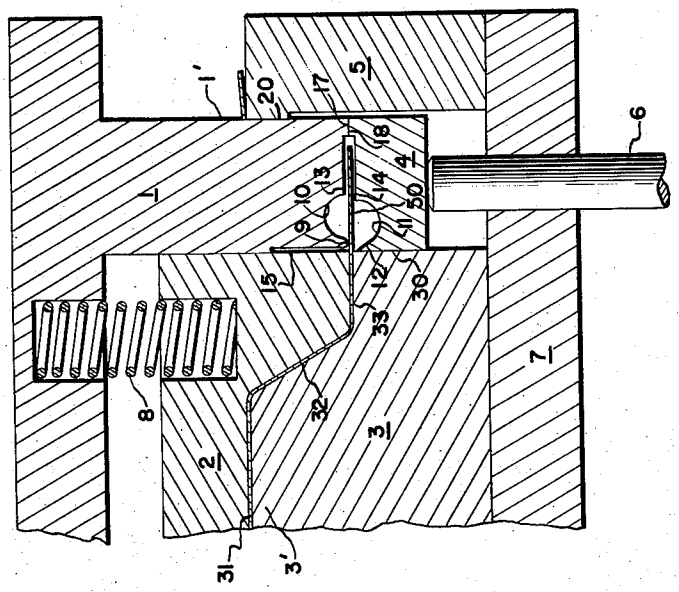
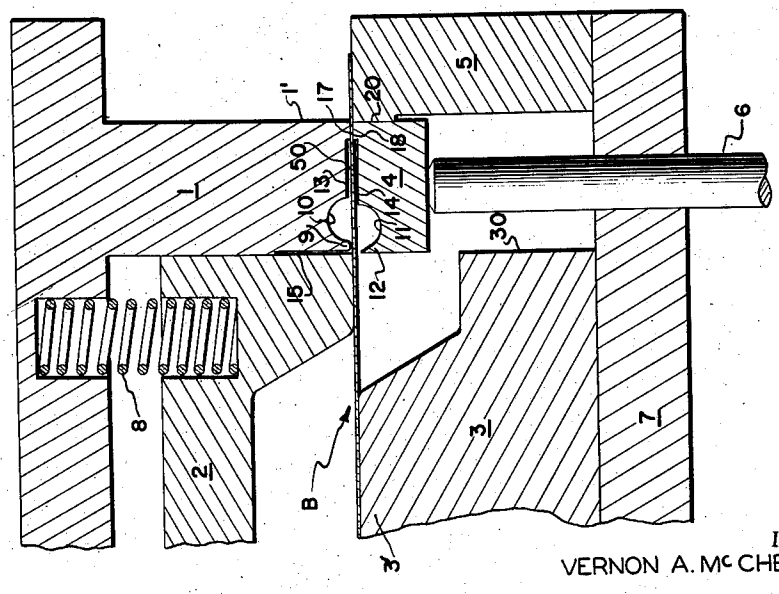


FIG. 1.



INVENTOR
VERNON A. McCHESNEY

BY James E. Toomey

ATTORNEY

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FIG. 3.

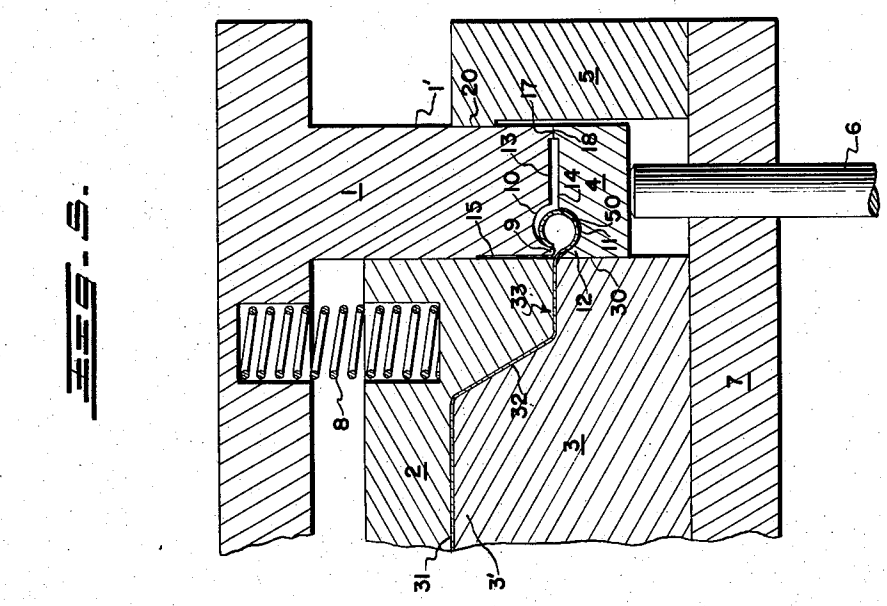


FIG. 4.

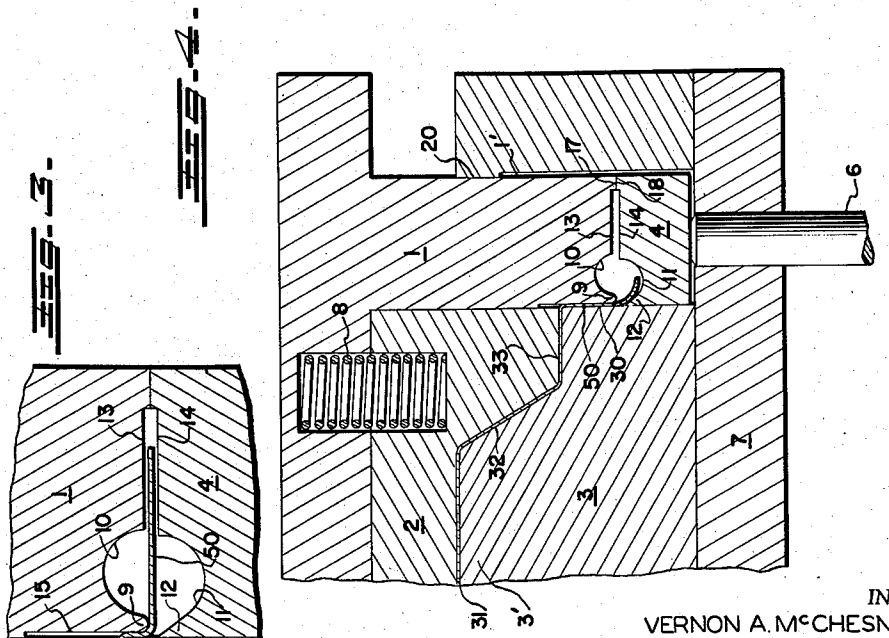


FIG. 5.

INVENTOR
VERNON A. McCHESNEY

BY James C. Cooney

ATTORNEY

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2,968,270

APPARATUS FOR FORMING RECEPTACLES

Vernon A. McChesney, Evanston, Ill., assignor to Kaiser Aluminum & Chemical Corporation, Oakland, Calif., a corporation of Delaware

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5 Claims. (Cl. 113—43)

This invention relates to the manufacture of pans from thin gauge sheet metal within or approximating the thicknesses of metal foils, such as aluminum foil. More particularly, it relates to a novel apparatus for satisfactorily making these pans with a minimum amount of cost.

Accordingly, it is an object of the invention to devise a novel inexpensive apparatus for manufacturing a receptacle, particularly of light metals, for foodstuffs and the like.

Specifically, another object of the present invention is to provide a novel apparatus for producing from metallic foil, such as aluminum foil, a receptacle whereby the receptacle will have an extremely attractive edge appearance hithertofore not obtained in the prior art and wherein the pan or receptacle may be formed during the single stroke cycle of suitable machine element members.

A still further significant object of the invention is to provide a novel apparatus for forming a flanged metal foil pan of any desired configuration wherein the flanged portion of the pan is provided with a beaded rim or rolled portion from which the undulations normally present in the beads have been ironed out.

Another significant object of the instant invention is to provide a novel apparatus for forming a beaded or rolled edge on a foil receptacle such as an aluminum foil pan, wherein the interference normally present during curling or forming of the beaded or curled rim structure on receptacles of this type due to undulations formed in the walls of the receptacle is eliminated or neutralized.

Still another object of the invention is to provide a novel apparatus for forming an aluminum foil receptacle wherein although the wall portions are normally corrugated, they are prevented from interfering with the proper formation of a beaded rim and wherein the pan forming and edge beading or rolling operations are performed in a single stroke of a suitable fast acting machine, such as a punch press or the like.

A further object of this invention is to provide a novel apparatus for forming a metal receptacle from light weight metallic foil, whereby the receptacle walls will not have any ragged edges which might be harmful to the touch.

Prior art receptacles formed of thin gauge metal, such as aluminum foil, have been generally of circular shape. They usually comprise a flat bottom portion, a conical wall surface reinforced by corrugations and an outwardly extending flange which because of its integral formation with the wall structure of necessity includes corrugations or undulations. These corrugations when compressed during the receptacle forming operation effect a very shabby appearing and ragged flange structure which detracts from the normal appealing and eye-catching appearance of pans or the like formed of relatively thin aluminum foil. Furthermore, the ragged and rough edges on the flange structure can also cause physical injury to the person handling the receptacle.

In certain instances the flange portion has been provided with a beaded rim which hithertofore has been relatively ineffective to perform the function desired, namely, the strengthening of the flange structure of the pan and the production of a pleasing, smooth appearing peripheral or marginal edge on the flange of the pan. These deficiencies in the prior art have resulted from the fact that the rolled or beaded rim is formed without regard to the fact that the flange is corrugated. Thus, the edge formed is in no way uniform and the increased resistance of the corrugated portions of the metal to proper beading has resulted in a defective rim and bead formations necessitating rejection of the finished article as unsatisfactory. In addition, such articles do not have the desired neat appearance and lack the strengthening factor ordinarily provided by such a beaded rim.

By the instant apparatus of forming pans of the general type described above, all of the difficulties in properly forming a bead on the flange have been overcome. As will be evidenced from the following description and drawings, the instant device can be used in forming rolled beads on receptacles made of thin sheet material, such as metal foil, having corrugated wall portions regardless of the shape or configuration which the receptacle may assume such as round, square, rectangular, oval, or otherwise. In addition, the instant apparatus may be used in making beads on receptacles which are not provided with flanged edges as well as beads on those that are flanged.

Referring now in particular to the attached drawings, Figure 1 is a vertical section of a portion of a lower and upper die assembly with the blank from which a receptacle is made being shown as positioned therebetween prior to initial operation of the die assembly.

Figure 2 is an elevational section through a portion of the upper and lower die members showing the blank stamped to form the bottom and side wall of the container or receptacle.

Figure 3 is a vertical elevational section showing a portion of the upper and lower die members with the blank drawn to its proper shape and showing the initial step effected to produce a rolled edge.

Figure 4 is a vertical elevational sectional view of a portion of the upper and lower die members with the blank finally formed to include the bead on the peripheral edge of the receptacle flange.

Figure 5 is an enlarged partial sectional view of the action of the instant invention and illustrating the position of the metal blank material as the punch holder moves downwardly from the position shown in Fig. 2 to that shown in Fig. 3.

With reference to all of the figures above, it is to be noted that the operation of the apparatus is a continuous one wherein the drawings are illustrative of the series of steps which occur during the cyclic movement of the upper or movable die member from its position of rest to its position of maximum action and back again substantially to its position of rest.

As is apparent from the sequence of operation, the pan or receptacle is formed by a stamping process wherein the article is stamped into proper shape and wherein the rolled edge or rim on the container is accomplished first by stamping the pleated or corrugated flange section at its marginal edge to flatten and smooth the pleated surfaces followed by the action of a suitable curling means to curl the edge back upon itself.

As will be seen from an inspection of Fig. 1, there is provided a lower stationary die member 3 and a vertically movable cooperating die member 2, these die members being of such a shape as to form a receptacle including a flat, annular bottom 31, a conical pleated or corrugated wall portion 32 having a horizontally extending flange 33 as is conventional in the art. The

corrugations on the wall portion 32 result from the forming operation when the horizontal portion of the blank is drawn down over the raised portion 3' of the lower die member 3 by the cooperative mating surface of the vertical moving die member 2, the edges of the blank being frictionally engaged by suitable surfaces 17 and 18 of a punch 1 and draw ring 4 as will be more fully described hereinafter. The lower die member 3 is encircled by the annular draw ring 4 arranged in a suitable annular space provided between the lower die member 3 and an outer annular shearing member 5.

As seen in Fig. 1 the draw ring 4 is vertically movable and is supported at its uppermost position by a series of pneumatic plungers 6 or the like forming a suitable air cushion such that upon increased pressure by an upper punch member 1 in a manner to be hereinafter described, the ring 4 may be moved downward against the action of plungers 6 and upon removal of the downward pressure will be caused to move upwardly to its initial starting position.

The uppermost movable die member 2 is held within the vertically movable punch holder 1 by means of springs 8 interposed between the punch holder 1 and the vertically movable die member 2, the purpose of which will be hereinafter described. It is to be noted that the die member 2 is vertically movable within specific limits in the punch holder 1 which in turn is vertically movable by suitable cams or similar acting means (not shown) with respect to the base 7 and the lower stationary die member 3 as well as the outer annular shearing member 5. The punch holder 1 includes a downwardly extending outer annular wall portion 1' which is of such a size as to be in slidable, frictional engagement with the inner annular wall 20 of the shear member 5. The downwardly projecting portion 1' of the punch holder has a horizontal lower surface 17 which extends outwardly at a transverse angle to the wall 1'. A similar horizontal surface 18 at the top of draw ring 4 cooperates with surface 17 of the punch holder to retain a portion of the blank therebetween.

Upon downward movement, surfaces 17 and 18 act in concert with wall 20 of shear member 5 to produce a shearing action on a suitable blank member B held between the lower flattened annular ring portion 17 and the planar surface 18 on draw ring 4. The inner surface of the horizontal portion 17 of the punch holder is also provided with a substantially arcuate recess 10 to be hereinafter described which is in suitably arranged registry with a second substantially arcuate recess 11, also to be hereinafter more fully described, provided in the draw ring 4.

Thus, it may be seen that when a suitable blank B of aluminum foil is laid across the planar surfaces of the highest portion of lower die member 3 and the annular shearing member 5 as is clearly shown in Fig. 1, the draw ring 4 under the influence of air cushions 6 is in such a position that its uppermost surface 18 will be in coplanar relation with an extension of the plane of the uppermost portion of the lower die member 3 and the uppermost portion of the outer shearing member 5.

After the initial pan forming step has been instituted by the application of suitable downward pressure to the punch member 1 as indicated in Fig. 1 wherein the cylindrical lower downwardly projecting portion 1' is engaged by the sharply defined wall 20 of shearing member 5 and the blank B cut into the proper circular configuration. The next step is initiated by continuing the downward movement of the blank under the influence of the punch holder 1. This causes the blank to be clamped even more firmly between the complementary mating surfaces 17 and 18 of the lower projecting portion 1' of the punch member 1 and the upper planar portion of the draw ring 4. As a result, the draw ring 4 is caused to move downwardly in unison with punch holder 1 while the uppermost and lowermost die members 2 and 3 are at the same time caused by such downward movement of punch holder 1 to stamp the material into the configuration illustrated clearly in Fig. 2. The resistance of spring 8 to compression forces is great enough such that the uppermost vertically movable die member 2 will be carried downwardly with the punch holder 1 until such time as die members 2 and 3 are in complete registry with the blank properly formed.

Referring now to Fig. 3, it is to be noted that the downward movement of punch member 1 compresses the springs 8 to such an extent that the lowermost projecting portion 1' of the punch holder 1 will pass below the surface formed by the horizontally mating portions of the die members 2 and 3. The material formerly clamped between the uppermost surface 17 of the draw ring 4 and the lowermost portion 18 of the punch holder 1 will thus move inwardly laterally of the path of movement of the punch holder 1 and the draw ring 4. This movement, in effect, causes the material to wipe over or stretch over the rounded projection or lip element 9 as will be more fully explained hereinafter. This ironing or wiping action is noteworthy in that it produces an ironing or smoothing out of the wrinkles or corrugations in the portion 50 of flange 33 of the receptacle which, as viewed in Fig. 3, is disposed in a vertical plane between the complementary surfaces of punch holder 1 and lower die member 3. It will be noticed also that at this time the punch holder 1 has reached its lowermost position of travel and that the springs 8 have been completely compressed. Also, it is to be noted that draw ring 4 has moved downwardly under the influence of the punch holder against the action of air cushion 6 to its maximum lowermost position.

As also may be seen from inspection of this figure, the distance of travel of the draw ring 4 and the punch holder 1 is selected in such a manner that the very edgemost portion of the blank member is not influenced directly by the ironing action described. This slight peripheral portion of the blank projects outwardly and slightly inwardly into the suitably provided recess 11 provided in the upper surface of the draw ring 4 which is closest to the drawing dies 2 and 3.

Upon release of the pressure exerted on punch holder 1 urging the same in a downward direction the inherently stored reactions will affect punches or air cushions 6 to urge the entire assembly upward. As this occurs, force will in turn be exerted on the relatively small edge portion 50 of the blank flange 33 projecting into the recess 11 by the upwardly moving draw ring 4. By this action, the edge 50 of the flange 33 will be tightly rolled back upon itself within the overall opening formed by recesses 10 and 11 by the vertical movement of the draw ring 4 until the draw ring reaches the position from whence it was initially displaced as shown clearly in Fig. 4. The upward motion of the punch holder 1 continues until such time as the compression springs 8 have fully expanded and the uppermost die member 2 has been carried free of lower die member 3. It is to be noted that during this upward movement of die holder 1, the plungers 6 and draw ring 4 may be so coordinated in their return action such that the upper members 1 and 2 are completely clear of lower members 3, 5, etc. after the rim curling step, before the draw ring 4 returns to the initial position. By providing the slight lag in relative movements between the parts, the finished receptacle will not be deformed in any manner as continued upward movement of draw ring 4 ejects it from its position on die member 3. Since the wrinkles or corrugations in the edge portion 50 have been substantially ironed out by the pressing action referred to above, the edge portion 50 will roll back upon itself smoothly and easily during the curling operation.

The finished article having been removed, a new blank is inserted between the members as has been heretofore described and the operation is repeated.

Referring now specifically to the complementary groove members carried in the mating faces **17, 18** of the punch holder **1** and the draw ring **4**, attention is first directed to the grooved portion **10** which is contained within the punch holder **1**. This grooved portion **10** comprises a substantially semi-circular groove closely adjacent to the inner cylindrical wall portion of the punch member **1**. The semi-circular configuration is dispensed with at that portion of the groove closely adjacent the innermost cylindrical wall and the outer wall portion **9** is rounded off as clearly indicated, such that any material contacted thereby will be drawn or wiped across the sharp radial curve as is clearly evident from an inspection of Fig. 5. This wiping action is due to the fact that the blank material is actually moving laterally across the portion **9** of die holder **1** as it is displaced from its initial position between the surfaces **13** and **14** as shown in Fig. 2, to its cylindrical position as seen in Fig. 3.

Further action is effected to smooth the edge of the blank by reason of the close tolerances existing between wall **15** of die holder **1** and wall **30** of stationary die member **3**. However, the principal smoothing action occurs by reason of the wiping or ironing action of the material as has been described above. The effect of the described operation on the blank is to cause the corrugations of necessity formed in the flanged portion of the container during the initial stamping operation to be flattened out as the blank edge is moved into a cylindrical perpendicular relation with respect to the flange as clearly shown in Fig. 3.

The lightness of the material from which the container is formed allows the material to be highly compressed and ironed such that the corrugations substantially disappear from view and the resulting surface may be said to be substantially cylindrical and coextensive with the innermost and outermost sides of members **15** and **30** which form in effect concentric cylinders having a difference in radius of approximately the thickness of the initial blank material B. The semi-circular portion **10** is interrupted again at the edge thereof away from the vertically extending wall portion of the die member **2**. This portion of the lower face of the punch holder **1** is provided with a recess **13** as shown above in regard to surface **17** of the punch holder **1** which clamps the blank material to the draw ring **4**. Thus surface **17** forms an outer shoulder portion adjacent recess **13** similar to the manner in which surface **18** forms an outer shoulder portion adjacent recess **14**. The purpose of this annular recessed portion **13** will be apparent when consideration is given to the complementary shape of the grooved portion **11** and draw ring **4**.

Referring now to the latter groove, it is to be noted that this groove is similarly located with respect to draw ring **4** as was the groove **10** with respect to punch holder **1**. Two apparently insignificant yet critical differences exist with respect to these grooves. The groove **11** in draw ring **4** comprises a semi-circular portion of smaller radius than that carried by draw ring **1** and the point of meeting at **12** between the vertical wall portion of the draw ring **4** and the semi-circular surface is distinctly sharper and more generally disposed toward a line intersection than is the mating portion **9** of the groove **10** with the cylindrical surface **15** of punch holder **1**. The effect of this line contact between the two surfaces in draw ring **4** is such that as draw ring **4** moves upwardly, that portion of the blank material which lies at a slight angle to the cylindrical surface **30** of the lowermost die member **3**, as shown in Fig. 3, and projects inwardly of the edge, will be engaged by this lowermost edge **12** and directed into the semi-circular portion **11**. By reason of its being clamped between the uppermost die member **2** and the lowermost die member **3** the blank is caused to curl upwardly as it is peeled away from the vertical portion **30** of die member **3** by the action of the knife-like circular edge **12** described above. It is to be noted that another very critical feature is incorporated in the complementary shaped grooves. The center of generation of the semi-circular surface **11** is offset inwardly toward the die members **2** and **3** with respect to the point of generation of the semi-circular portion **10** of the upper punch member **1**. The effect of this is to dispose the outermost edge of the semi-circular surface **11** inwardly, that is, closer to the die members **2** and **3**, than the edge portion formed by the semi-circular groove **10**. This assures that the edge of the blank when engaged by the semi-circular surface **11** will be caused to pass upwardly around the lowermost semi-circular portion **11**, past the channel shaped formation between recessed portions **13, 14** and in engagement with the upper semi-circular portion of punch member **1**. Thus, the material is prevented from engaging by accident the edge formed by the semi-circular groove **10** and the recessed portion **13** of upper punch member **1** closely adjacent the semi-circular groove. It is to be noted also that the draw member **4** is also provided with a similar recessed portion **14** extending from the outermost edge of the semi-circular surface **11** in the draw ring **4**, the edge portion thereof being contiguous with the edge portion of the recess **10** provided in the punch member **1**. The purpose of this key hole, slot-like arrangement formed as shown in Fig. 3 by the recessed portions **13, 14** is to allow that portion **50** of the blank B to slip from between the complementary mating planar surfaces of the punch member **1** and the draw ring **4** such that as the material is ironed down over the cylindrical surface of the lower die member **3** by the action of the curved surface **9**, the material will not be placed under any great strain which might cause tearing thereof either at the point of contact between the die member **3** and the surface **9** on punch member **1** or at its point of confinement between the planar mating surfaces of draw ring **4** and punch member **1**.

Thus, it may be seen that by the instant apparatus and method only a single operation is needed to form a foil pan or container having a flat bottom portion, a conical corrugated generally vertically extending wall portion, and a flange extending horizontally outward from the conical wall portion. The flange is also provided with a beaded or rolled rim wherein the rim is extremely smooth in appearance. The rim is also tightly curled so as to effectively support the flange structure of the container. The beaded rim is also substantially free of any ragged edges which might be injurious to those handling the same. The effect of the operation is to produce a container of the type described which is much more acceptable to the purposes for which intended, and which may be formed economically with little or no additional expense over those containers now in evidence and use in commercial operations.

The above description is by way of illustration only in that the apparatus herein described is not necessarily limited to the formation of containers of circular configuration. The operation described may be applied with advantageous results to a rectangular, square, oval shaped container, or to any type of container. The disclosed apparatus is also applicable in making a container, the walls of which are perfectly smooth since the smoothing action produced at the very edge of the flange prior to the curling operation will in all cases produce a beaded rim which is tightly curled, unusually smooth and which is of a greater reinforcing value as well as considerably more pleasing appearance than any beaded rim formed by other apparatus now in existence. It is obvious therefore that various changes may be made in the invention without departing from the spirit and scope thereof as defined by the appended claims, wherein what is claimed is:

1. An apparatus for making thin metallic foil receptacles comprising the combination of a base member and a punch member movable toward and away from said base member, a stationary die disposed on said base mem-

ber and a die movably mounted on said movable punch member, said dies having cooperating surfaces for forming and drawing a receptacle having a closed bottom, side wall and an integrally formed peripheral flange, a draw ring slidably mounted about said stationary die in opposed relationship to said punch member, said draw ring including a planar face provided with recessed and outer shoulder portions and a semi-circular groove disposed intermediate the recessed portion and the innermost edge of said draw ring so as to be located closely adjacent said stationary die, the portion of said punch member opposed to said draw ring having a cooperating planar face engageable with the planar face on the draw ring, the planar face on the punch member also having recessed and shoulder portions and a groove, the groove of which is adapted to register in part with the groove on said draw ring, the innermost wall of the groove on the planar face of the punch member having a downwardly projecting curved peripheral lip which acts to wipe the peripheral flange of the receptacle being formed so as to remove the wrinkles produced thereon by the normal action of said dies and means for moving said draw ring and punch member relative to said dies so as to effect a curling and beading of the outer portion of said peripheral flange normally disposed in the opening formed by the cooperating grooves of said punch member and draw ring after the wiping of said flange.

2. A device as set forth in claim 1 wherein the said draw ring comprises a vertically movable member having spaced parallel side walls disposed to either side of the planar face thereof, the one side wall thereof which is in sliding engagement with the stationary die having a sharply defined edge, said edge being formed by the intersection of said one side wall and the groove on the draw ring, said edge also being slightly offset inwardly from the lip on the punch member.

3. An apparatus as defined in claim 1 wherein the recessed and shoulder portions on the punch member and draw ring are in registry with one another when the cooperating planar faces of the draw ring and punch member are in frictional contact with a blank and wherein the grooves thereof are slightly offset with respect to one another.

4. Apparatus for forming a thin metallic receptacle having a closed bottom, integral sidewall and a marginal flange including a peripheral bead formed integrally with the said sidewall, comprising means operable on the downward stroke of the apparatus for drawing a thin metal blank to form the bottom sidewall and the integral marginal flange, said means including a punch holder means provided with a projecting rounded lip element and an arcuate groove, with the rounded lip element forming a part of the wall of the said groove for bending and simultaneously effecting a wiping and ironing of the marginal portion of the flange that is to be formed into the peripheral bead of the flange, said first-mentioned means further including a draw ring means disposed in opposed relationship to said punch holder means and provided with an arcuate groove disposed in opposed relationship to said lip element and said first-mentioned groove for receiving the peripheral edge of said flange during the wiping and ironing of the marginal portion thereof, the wall of the groove of the draw ring means acting upon the upward stroke of the apparatus to direct the peripheral edge and ironed portion of the flange within the groove and against the said rounded lip element of the punch holder means whereby said peripheral edge and ironed portion of the flange will be coiled into a tightly rolled bead.

5. Apparatus as set forth in claim 4 wherein the said grooves are offset with respect to one another.

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CERTIFICATE OF CORRECTION

Patent No. 2,968,270 January 17, 1961

Vernon A. McChesney

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 8, line 8, for "lip" read -- tip --.

Signed and sealed this 12th day of September 1961.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents

USCOMM-DC