Dec. 16, 1947. J. COYLE 2,432,658

METHOD OF AND APPARATUS FOR FLANGING CANS

Filed April 20, 1945 2 Sheets-Sheet 1

FIG. 1

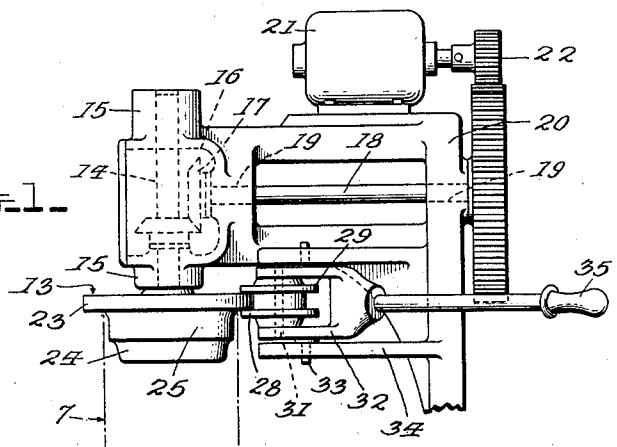


FIG. 5

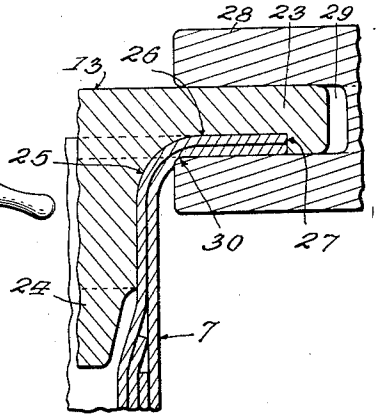
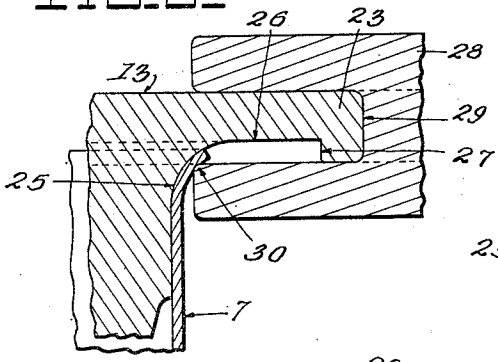


FIG. 2



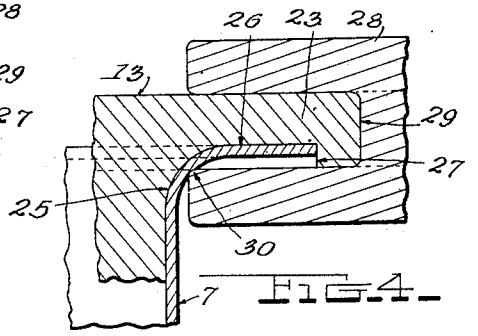
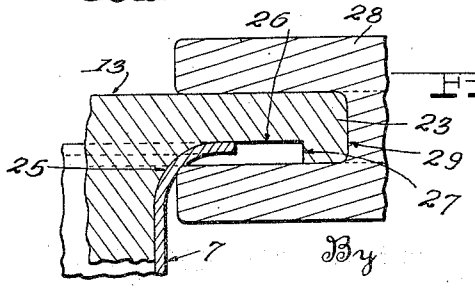


FIG. 4

FIG. 3



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FIG. 6.

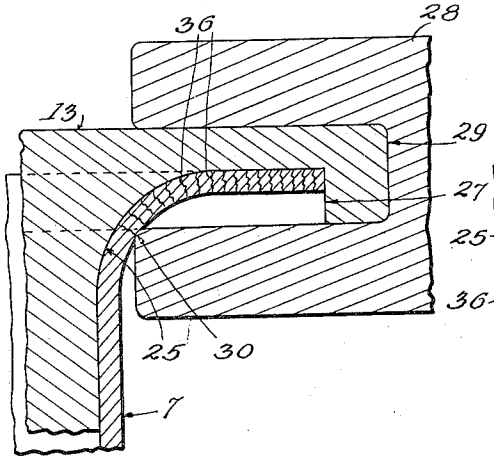


FIG. 8.

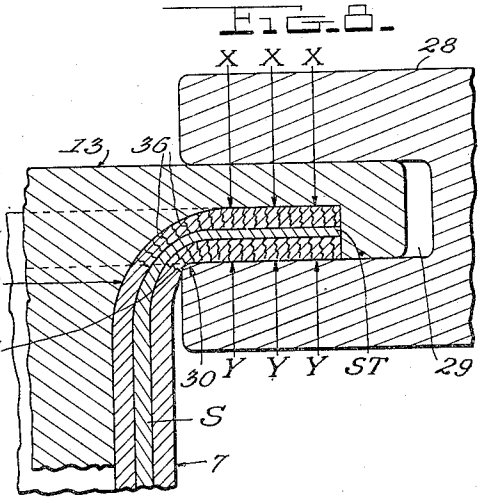


FIG. 7.

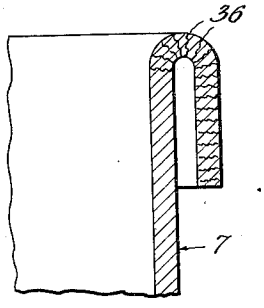
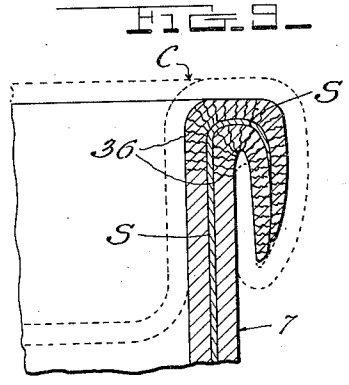


FIG. 9.



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Patented Dec. 16, 1947 2,432,658

UNITED STATES PATENT OFFICE

2,432,658

METHOD OF AND APPARATUS FOR FLANGING CANS

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Application April 20, 1945, Serial No. 589,368

15 Claims. (Cl. 153—29)

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The invention relates generally to the art of manufacturing cans, and it primarily seeks to provide a novel method of and apparatus for forming the flanges which are provided at the ends of the can bodies and adapted for being rolled into the seam structures by which attachment of the container end closures is effected.

According to prevailing practices of flanging cans bodies, no practical method or means is available for definitely determining the length of the body hooks formed by the downward bending of the can body end flanges during the seam securing of end closures thereon, or in other words no means or method for definitely determining the line about the can body end flange whereat the flange will turn downwardly in the formation of the body hook. Thus, there has been a lack of uniformity in the formation of cans and some have been of slightly different lengths than others.

In the usually practiced method of forming can bodies, the flanges are formed by bringing about relative endwise movement between each can body and a forming die to cause the latter to engage in the end of the body and turn a flange outwardly at the end thereof. During the process of bending said flange, the end of the body flares outwardly until it strikes the end wall of the forming surface on the die and then flares outward against said wall, the flare gradually widening until it strikes the circumferential abutment ring or flange of the die which limits outward turning of the body flange. Continued endwise movement of the body then collapses the flare against the die wall, the latter being curved to determine the curvature of the juncture between the body wall of the container, and the outwardly extended portion of the flange flattened against the end wall of the die. The metal of the body flange is stiff and springy and it is practically impossible to determine accurately where the hook will bend in the subsequent formation of the closure attaching seam, or in other words to definitely determine the length of the body hook. This problem is particularly troublesome at the cross-over area, that is at the position of the side seam where the flange is turned in overlapped thicknesses of metal. This practice results in provision of flanges which are irregular in shape because of differences in the stiffness of the metal and the lack of means for positively causing the turning flange to conform to the shape of the die, and by reason of the fact that the flanges are unopposed outwardly of the forming surface of the die, outward bending strains

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set up incident to the outward flanging of the body edge portion often result in bursting of the solder bond and opening of the lap seam portions of the customarily formed lock and lap seams.

After the flange is formed on a can body, the length of the hook which will be formed in the process of attaching the closure depends upon the pressure applied between the chuck and the base plate at the time of seaming. If the pressure is excessive, it will cause the cover to break down the flange and produce a long body hook and a correspondingly short cover hook. If too little pressure is applied, the body hook will be short and the cover hook will be relatively long. As before stated, according to the prevailing practice, there is nothing to determine where the bend in the flange will take place in the formation of the hook, except experience on the part of an operator as to the correct base plate pressure to apply by adjustment of the closing machine and the seaming rolls to give the desired length of hook. It often happens that unsatisfactory containers are produced because of the formation of body hooks which are too short and which result in faulty sealing of the containers. In order to avoid this difficulty many operators have adopted the practice of providing body hooks which are longer than necessary so that in obtaining the usual percentage of hooks which are shorter than the average length of hook being made, said shorter hooks will still be of satisfactory length.

Therefore it is an outstanding purpose of the present invention to provide a novel method of and means for forming can body flanges in a manner permitting definite determination of the line about which the flange will bend in forming the base of the body hook or the juncture of the hook with the body so that all containers can be made with hooks of uniform length, thereby assuring that the completed containers will be of correct length.

An object of the invention is to provide a novel method of flanging can bodies which comprises, gradually bringing about endwise contact between the can body and an outwardly curved flanging surface formed on a flanging die while simultaneously revolving a grain breaking roll externally against the metal itself to constitute the finished flange, breaking the grain of the metal as it passes between the grain breaking roll and the flanging surface and shaping it to the outwardly curved flanging surface to the predetermined limit of a circumferential retaining wall.

Another object of the invention is to provide

a novel flanging method of the character stated in which the grain breaking contact of the grain breaking roll with the can body flange being formed is terminated at a line about the turned flange at which the flange is subsequently to be turned to form the body hook, thereby to reduce the resistance to bending of the flange over the portions thereof contacted by the roll and definitely determine the length the hook will have when subsequently formed during the seam securing of a closure on the can body.

Another object of the invention is to provide a novel method of flanging can bodies which comprises the steps of forcing the can body endwise against a die having an outwardly curved flanging surface thereby gradually to force the die into the can body end, engaging a grain breaking edge in rolling contact externally against the body end edge portion being turned into the flange, said grain breaking contact being effected opposite the outwardly curved die surface while continuing to bring about relative endwise movement of the die and can body, thereby to cause the turned flange to conform to the outwardly curved flanging die surface, and terminating the grain breaking edge contact at a definite point opposite the die surface to predetermine the line about which the body hook will turn during subsequent seam securing of a closure on the can body.

Another object of the invention is to provide a novel apparatus for flanging can bodies, said apparatus comprising a flanging die having a portion insertible in the end of a can body to be flanged and including an outwardly curved flanging surface, means for supporting a can body, means for bringing about relative endwise movement between the die and the support to force the can body end edge portion endwise over the curved flanging surface, a roller having a grain breaking edge, means for presenting the grain breaking roller edge against the external surface of the can body end edge portion as it is being forced endwise over the curved flanging surface, and means for bringing about relative rotation between the grain breaking edge and the die and can body being flanged thereagainst.

Another object of the invention is to provide an apparatus of the character stated in which the flanging die has an outwardly directed flange and the outwardly curved flanging surface terminates in an undercut under said flange disposed to provide an abutment shoulder for definitely determining the extent of outward turning of the can body flange.

Another object of the invention is to provide an apparatus of the character stated in which the outwardly directed die flange snugly engages in an annular groove formed in the periphery of the grain breaking roller, and the grain breaking edge of the roller constitutes the outer terminus of the floor of said groove, said groove floor being spaced below the abutment terminus of the curved flanging surface of the die the distance of a predetermined normal lap seam thickness.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by reference to the following detailed description, the appended claims, and the several views illustrated in the accompanying drawings.

In the drawings:

Figure 1 is a side elevation illustrating the improved can body flanging apparatus.

Figure 2 is an enlarged fragmentary sectional view illustrating the cooperation of the flanging die and the grain breaking roller in flanging a can body, the commencement of the cooperation being shown.

Figures 3 and 4 are views similar to Figure 2 and illustrate successive stages in the formation of the can body flange, the completion of the flange turning function being illustrated in Figure 4.

Figure 5 is a view similar to Figure 4 illustrating engagement of the grain breaking roller with the side seam of a can.

Figure 6 is an enlarged fragmentary sectional view illustrating somewhat diagrammatically how the grain breaking roller edge breaks the grain of the flange and reduces the resistance to bending thereof over a predetermined area and in a manner for definitely determining the length of the body hook to be turned in the seam sealing of the container.

Figure 7 is a somewhat diagrammatic enlarged sectional view illustrating the flange of Figure 6 turned into a hook.

Figure 8 is a view similar to Figure 6, the section being taken at the position of the can body side seam.

Figure 9 is a view similar to Figure 7 illustrating the lapped flange portion of Figure 8 turned into a hook as it would appear in the can after the closure is seam secured thereon, the closure being shown in dotted line phantom.

In the apparatus herein disclosed, and which constitutes an example of embodiment of the invention adaptable for practicing the method forming a part of the invention, there is included a can body support or base plate **5** having a can body centering plug extension **6** thereon for entering an end of a can body **7** which is to be flanged. The base plate **5** is rotatably mounted on the upper end of a plunger **8** which is vertically reciprocable in a bearing **9** to which a lever **10** is pivoted intermediately of its end as at **11**, the short end of the lever being pin-connected as at **12** to the plunger **8**. It will be obvious by reference to Figure 1 that by lifting or lowering the long end of the lever **10**, the base plate **5** can be lowered or lifted.

A flanging die generally designated **13** is mounted above and in cooperative relation to the base plate **5**, said die being mounted on the lower end of a shaft **14** which is rotatable in bearings **15** formed in a frame housing **16**. Within the housing, the shaft **14** is bevel-coupled as at **17** with a driver shaft **18** rotatably mounted in bearings **19** provided in the frame housing **16** and in the frame extension **20** whereon is mounted an electric motor **21** which is gear coupled as at **22** with the driving shaft **18**. It will be obvious that when the motor **21** operates it will impart rotation to the shaft **18** through the gear couple **22**, and to the shaft **14** and flanging die **13** through the gear couple **17**. Whenever a can body **7** is placed upon the base plate **5** and the lever **10** is depressed so as to lift the can body and tightly engage the same with the flanging die **13**, said can body will be caused to be rotated with the flanging die.

The flanging die generally designated **13** is provided with an outwardly directed flange **23**, and a can body centering plug or extension **24** depends below the flange **23** in position for entering the upper end of the can body which is to be flanged in the manner clearly illustrated in Figures 1 to 4. The die **13** also is equipped with an upwardly and

outwardly curved flanging surface 25 terminating outwardly in an undercut 26 in the lower face of the flange 23, the terminus of said undercut serving to provide an abutment shoulder 27 which is effective to definitely determine the extent of outward turning of the can body flange. It will be apparent by reference to Figures 2, 3, 4 and 5 of the drawing that the depth of the undercut, or in other words the depth of the abutment shoulder 27, is substantially the proper thickness of the lap portion of a side seam, or in other words the double lap thickness of the stock from which the can body is formed plus the thickness of a proper solder bond.

As an outstanding feature of the invention, there is provided a grain breaking roller 28 having an annular groove 29 in the periphery dimensioned to snugly receive the outwardly directed flange 23 of the flanging die 13 so as to constantly maintain the proper cooperative relation of the flanging die and grain breaking roller illustrated in Figures 1 to 4. The floor of the groove 29 terminates outwardly in a grain breaking edge 30 which is adapted to be held against the can body flange as it is being turned in the manner clearly illustrated in Figures 2, 3, 4 and 5.

The grain breaking roller 28 is mounted on a shaft 31 in a bifurcated head 32 which is rockably mounted on off center trunnion bearings 33 in a frame extension 34. The bifurcated head 32 is equipped with an actuator handle 35 which may be manipulated to control the position of the grain breaking roller 28 for moving the same into operative position and holding the same in said operative position against the can body flange as it is being formed in the manner illustrated in Figures 3, 4 and 5, or for moving said roller out of contact.

In practicing the invention, a can body 7 is placed upon the base plate 5 in the manner indicated in dot and dash lines in Figure 1, and the handle 10 is depressed to elevate the can body into contact with the flanging surface 25 of the flanging die 13 and for holding the same tightly thereagainst. As before stated, the rotation of the flanging die 13 will be imparted to the can body 7 and the base plate 5, it being understood that the base plate is free to rotate relative to the supporting plunger 8. By depressing the lever 10 and forcing the can body 7 upwardly, the upper end of the can body will be caused to move endwise over the upwardly and outwardly curved flanging surface 25 in the manner clearly illustrated in Figures 2 and 3, and while this flange turning is progressing, the grain breaking edge 30 of the roller is held tightly against the flange as it is being turned, thereby breaking the grain at the outside of the turning flange and tightly pressing said flange against the flanging surface 25 and causing said flange to conform in curvature to said surface. Contact of the edge extremity of the outwardly turned can body flange with the abutment shoulder 27 will serve to definitely determine the extent of outward turning of the said flange in the manner clearly illustrated in Figure 4.

Figure 6 is an enlarged fragmentary sectional view clearly illustrating the manner in which the the grain breaking edge 30 of the roller 28 breaks the grain in the outwardly turned flange so as to reduce the resistance to bending of the flange over the portions thereof contacted by the roll edge and definitely determine the length the body hook will have when subsequently formed in the seam securing of a closure on the can body. In this figure, the breaking of the grain by progressive contact of the roller edge 30 therewith in the manner illustrated in Figures 2, 3 and 4 is illustrated by the wavy lines 36. By terminating the grain breaking contact of the roller edge 30 at the point or line indicated in Figure 6, said point or line bearing definite spaced relation to the circumferential retaining wall or abutment shoulder 27, the grain breaking is accomplished over a predetermined definite circumferential area of the outwardly turned flange so as to definitely determine the length of the body hook of the form illustrated in Figure 7. Figure 7 is a somewhat diagrammatic sectional view illustrating the flange of Figure 6 turned into a body hook, the wavy lines 36 indicating the manner in which the broken grain determines the place at which the hook is bent and consequently the length of the hook. It is well known that in the turning of the body hook incidental to the seam securing of a closure on the can body, a portion of the flange turned in the manner illustrated in Figure 6 is displaced inwardly back in line with the main body wall portion, as will be apparent by a comparison of Figures 6 and 7. It will be apparent that when the grain breaking roller edge 30 is held against the can body flange in the manner above described, the roller 28 revolves by frictional contact with the can body stock, and simultaneously with the breaking of the grain as aforesaid, the body stock being turned into the flange is caused to conform to the curvature of the flanging surface 25 while the outwardly turning extremity of the flange is being directed toward and against the abutment shoulder 27.

While the shaping of the flange and the breaking of the grain therein provides very beneficial results in the turning of the single thickness portion of the flange, the advantageous features of the invention are to be appreciated to an even greater extent at the cross-over area or the position of the lap portion of the lock and lap seams usually provided in can bodies, for it is at this point that the greatest problem with respect to rupturing of the solder bond in the lapped seam portion and the formation of uniform hooks is experienced. In Figures 5, 8 and 9 of the drawings, the advantages of the invention are illustrated in connection with the practicing of the method and the functioning of the apparatus at the cross-over area or lap seam portion. Figure 8 is a view similar to Figure 6 illustrating the engagement of the grain breaking edge 30 of the roller 28 at the lap seam portion. In this illustration the wavy lines 36 indicate the portion of the lap flange in which the grain has been broken so as to reduce the resistance to bending and definitely determine the point or line at which the lapped flange portion will turn downwardly in the formation of the body hook when a closure has been seam secured on the body in the manner indicated in dotted line phantom in Figure 9. Figure 8 clearly illustrates how the provision of the definite spacing between the die flanging wall 26 and the floor of the roller groove 29 which terminates at the grain breaking edge 30 serves to determine the desired definite thickness of the lapped portion of the side seam. As has been stated hereinabove, the depth of the undercut producing the abutment shoulder 27 is substantially that of two thicknesses of the can body stock, or in other words the thickness of the usual lap provided at the end of the lock and lap seam, including, of course, the solder

bond. In can bodies which might carry an excess of seam bonding solder S, the malleable solder would be caused to flow and become somewhat thinned in the manner clearly illustrated ST in Figure 8.

It will be apparent by reference to Figure 8 than in the flanged can body the thickness of the solder in the unflanged part of the lap seam portion is greater than in the flanged portion thereof, and the illustration in Figure 8 will serve to show how by practicing the herein described method of seam lap portion which has an unnecessarily thick solder bond will be suitably reduced in thickness. When the lapped thickness portion of a side seam passes between the grain breaking edge **30** and the flanging surface **25** as the flange is first being formed, the roll edge sizes this thickness, if thicker than standard, by first causing the solder to be thinned in the region of roll edge contact. If the tin plate also is thicker than normal, the roll edge acts on the tin plate at the same time, tending to flow the metal to a thinner gauge. As the edge of the can flange passes beyond the roll edge **30**, Figure 8, there is a fixed space X—Y in which the flange metal (tin plate and solder) can be housed. If the lap seam portion thickness is greater than the depth of this space, the rolling action and squeezing of the groove floor as the lap passes through, will size said thickness to the desired dimension.

It has been found that the spreading of excess bonding solder has no effect in diminishing the efficiency of the bond, and in this manner the desired uniformity of flange thickness is assured. Obviously this feature augments the feature of determining the diameter or outward extension of the flange by provision of the circumferential abutment wall **27**, and the feature of breaking the grain of the flange over a definite predetermined circumferential area, in the provision of body hooks of predetermined definite length.

It should be understood that as the grain breaking edge **30** of the roller **28** is forced against the single flange thickness as illustrated in Figure 6 and the double flange thickness at the lap seam as illustrated in Figure 8, said edge tends to embed itself slightly in the body metal and turn the same as the grain breaking function is being performed.

It will be apparent from the foregoing that by practicing the herein disclosed method, the turning of the body hook both at the single thickness and the double thickness or lap seam portion is greatly facilitated during the seam securing of an end closure on the can body, in addition to the provision of the formation of body hooks of uniform length. The action of the grain breaking roll breaks the grain of the metal and the solder, taking the stiffness out of each so that the action of the cover pressure and the seaming roll will result in the provision of uniform seams and cans of uniform length.

Another advantage is that of providing uniform thicknesses of the lap seam portions at the flange in the manner hereinbefore described, thereby facilitating the turning of the body hook and the seam securing of end closures on the can bodies.

Another advantage is that of providing the definitely positioned flange abutment or circumferential stop shoulder **27** which definitely determines the amount of metal turned outwardly in the formation of the body flange, in combination with the feature of definitely determining the portion of said flange which is to be formed into the body hook when a closure is affixed to the can,

these features making it possible to limit the diameter of the body flange to a predetermined standard effective to provide just the right length of body hook as aforesaid.

While one form of apparatus is herein disclosed as a practical example of the invention and a means for practicing the method forming a part of the invention, it is to be understood that various changes in the details of construction and arrangement of parts may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. The herein described method of flanging can bodies which comprises, gradually and progressively bringing about endwise contact between the can body and a rotating outwardly curved flanging surface formed on a flanging die extending within the body while simultaneously pressing a grain breaking roll externally against the metal that is to constitute the finished flange, thereby breaking the grain of the metal as it passes between the grain breaking roll and said curved flanging surface and shaping it to and against said outwardly curved flanging surface to the predetermined limit of a circumferential retaining wall of greater diameter than the can body.

2. The herein described method of flanging can bodies which comprises, gradually and progressively bringing about endwise contact between the can body and a rotating outwardly curved flanging surface formed on a flanging die extending within the body while simultaneously pressing a grain breaking roll externally against the metal that is to constitute the finished flange, thereby breaking the grain of the metal as it passes between the grain breaking roll and said curved flanging surface, and terminating the grain breaking roll contact at a line about the turned flange at which the flange is subsequently to be turned to form the body hook, thereby to reduce the resistance to bending of the flange over the portions thereof contacted by the roll and definitely determining the length the hook will have when subsequently formed.

3. The herein described method of flanging can bodies which comprises, holding a can body against a flanging die having an outwardly curved flanging surface extending into the can body, rotating the contacting die and can body, forcing the die and can body together to cause the end edge portion to move endwise over the outwardly curved flanging surface so as to turn said edge portion outwardly, and pressing a rotating grain breaking edge against the longitudinally moving outwardly turning and rotating flange so as to press it against the curved flanging surface as the flange is being turned and cause said flange to conform to said curved flanging surface.

4. The herein described method of flanging can bodies which comprises, holding a can body against a flanging die having an outwardly curved flanging surface extending into the can body, rotating the contacting die and can body, forcing the die and can body together to cause the end edge portion to move endwise over the outwardly curved flanging surface so as to turn said edge portion outwardly, and pressing a rotating grain breaking edge against the longitudinally moving outwardly turning and rotating flange so as to press it against the curved flanging surface as the flange is being turned and cause said flange to conform to said curved flanging surface and also break the grain and reduce the

resistance to bending in a predetermined definite circumferential portion of said flange inwardly of the edge extremity thereof thereby to definitely predetermine the amount of flange that will subsequently be bent into a body hook incidental to the seam securing of a closure on the can body.

5. The herein described method of flanging can bodies which comprises, forcing the can body end portion to be flanged endwise against a rotating outwardly curved surface extending into the can body thereby to turn said end edge portion into an outwardly directed flange, and while turning said flange tightly pressing a grain breaking roller edge against the outwardly turning and rotating flange in opposition to said curved surface to cause the outwardly turning flange to conform in curvature to the curvature of said curved surface and to reduce the resistance to bending of a definite circumferential area of the flange so as to predetermine the length of body hook which will subsequently be formed during the seam securing of a closure on said can body.

6. The herein described method of flanging can bodies having side seams including solder bonded lapped thickness portions which comprises, gradually and progressively bringing about endwise contact between the can body and a rotating outwardly curved flanging surface extending within the body while simultaneously pressing a grain breaking roll externally against the metal that is to constitute the flange and including the lapped thickness portion and its solder bond, thereby breaking the grain of the metal as it passes between the grain breaking roll and the flanging surface and shaping it to the outwardly curved flanging surface to the predetermined limit of a circumferential retaining wall and also thinning the lapped and solder bonded flange thickness to a predetermined standard.

7. The herein described method of flanging can bodies having side seams including solder bonded lapped thickness portion which comprises, gradually and progressively bringing about endwise contact between the can body and a rotating outwardly curved flanging surface extending within the body while simultaneously pressing a grain breaking roll externally against the metal that is to constitute the flange and including the lapped thickness portion and its solder bond, thereby breaking the grain of the metal as it passes between the grain breaking roll and the flanging surface and shaping it to the outwardly curved flanging surface to the predetermined limit of a circumferential retaining wall and also thinning the lapped and solder bonded flange thickness to a predetermined standard, and terminating the grain breaking roll contact at a line about the turned flange at which the flange is subsequently to be turned to form the body hook, thereby to reduce the resistance to bending of the flange over the portions thereof contacted by the roll and definitely determining the length the hook will have when subsequently formed, both in the single body thickness and the lapped thickness solder bonded seam portion.

8. The herein described method of flanging can bodies having side seams including solder bonded lapped thickness portions which comprises, forcing the can body end portion to be flanged endwise against a rotating outwardly curved surface extending into the can body thereby to turn said edge portion into an outwardly directed flange, and while turning said flange tightly pressing a grain breaking roller edge against the outwardly turning and rotating flange in opposition to said curved surface to cause the flange including the lapped thickness portion and its solder bond to conform to the curvature of said curved surface and have its resistance to bending reduced over a definite circumferential area so as to predetermine the length of body hook which will subsequently be formed during the seam securing of a closure on the can body, both in the single body thickness and the lapped thickness solder bonded seam portion, and directing said flange as it is being rolled and turned into a receiving space of predetermined thickness effective to reduce any overthickness lapped thickness solder bonded seam portion to the predetermined standard determined by said space.

9. In a can body flanging apparatus, a flanging die having a portion receivable in the end of a can body to be flanged and including an outwardly curved flanging surface, means for supporting a can body, means for bringing about relative endwise movement between the die and the support to force the can body end edge portion endwise over the curved flanging surface, a grain breaking edge engageable against the external surface of the can body end edge portion as it is being forced endwise over the curved flanging surface, and means for bringing about relative rotation between the grain breaking edge and the die and can body being flanged thereagainst.

10. Apparatus as defined in claim 9 in which the grain breaking edge is provided on a roll engageable in rolling contact with the can body end edge portion being flanged.

11. Apparatus as defined in claim 9 in which the flanging die includes an outwardly directed flange and the outwardly curved flanging surface merges into a wall constituting an undercut in the under surface of said die flange, said undercut being defined outwardly by an upright abutment shoulder disposed to definitely limit the extent of outward turning of the can body flange.

12. Apparatus as defined in claim 9 in which the grain breaking edge is provided on a roll engageable in rolling contact with the can body end edge portion being flanged, and in which the flanging die includes an outwardly directed flange, said roll having an annular groove in its periphery dimensioned to snugly but movably receive the flanging die flange and prevent relative movement of said die and roll in the direction of their axes thereby to maintain the grain breaking edge and the outwardly curved flanging surface in proper cooperative relation.

13. Apparatus as defined in claim 9 in which the grain breaking edge is provided on a roll engageable in rolling contact with the can body end edge portion being flanged, and in which the flanging die includes an outwardly directed flange, said roll having an annular groove in its periphery dimensioned to snugly but movably receive the flanging die flange and prevent relative movement of said die and roll in the direction of their axes thereby to maintain the grain breaking edge and the outwardly curved flanging surface in proper cooperative relation, said flanging die outwardly curved surface merging into a wall constituting an undercut in the under surface of said flanging die flange, said undercut being defined outwardly by an upright abutment shoulder disposed to definitely limit the extent of outward turning of the can body flange.

14. Apparatus as defined in claim 9 in which the grain breaking edge is provided on a roll en-

gageable in rolling contact with the can body end edge portion being flanged, and in which the flanging die includes an outwardly directed flange, said roll having an annular groove in its periphery dimensioned to snugly but movably receive the flanging die flange and prevent relative movement of said die and roll in the direction of their axes thereby to maintain the grain breaking edge and the outwardly curved flanging surface in proper cooperative relation, said flanging die outwardly curved surface merging into a wall constituting an undercut in the under surface of said flanging die flange, said undercut being defined outwardly by an upright abutment shoulder disposed to definitely limit the extent of outward turning of the can body flange, said grain breaking edge being disposed at the outer terminus of the roll undercut wall, and said groove floor being spaced above the roll groove floor the distance of a predetermined normal lap seam thickness.

15. Apparatus as defined in claim 9 in which the grain breaking edge is provided on a roll engageable in rolling contact with the can body end edge portion being flanged, and in which the

flanging die includes an outwardly directed flange, said roll having an annular groove in its periphery dimensioned to snugly but movably receive the flanging die flange and prevent relative movement of said die and roll in the direction of their axes thereby to maintain the grain breaking edge and the outwardly curved flanging surface in proper cooperative relation, and said roll groove floor being spaced below the outermost portion of the curved flanging surface of the die the distance of a predetermined normal lap seam thickness.

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