Dec. 14, 1948. W. McK. MARTIN 2,455,938

METHOD OF MAKING TUBULAR CONTAINER BODIES WITH SOLDERLESS SIX-LAYER SIDE-SEAMS

Filed Jan. 27, 1945 3 Sheets-Sheet 1

FIG 4

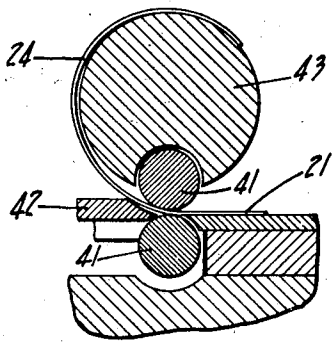


FIG 1

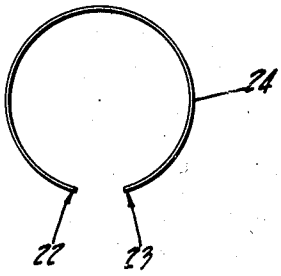


FIG 5

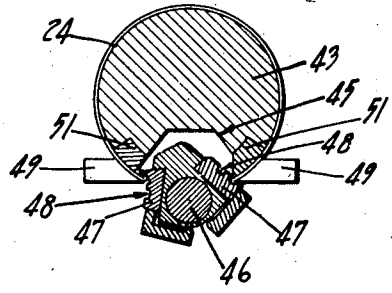


FIG 2

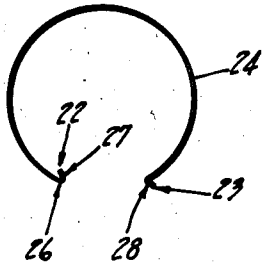


FIG 6

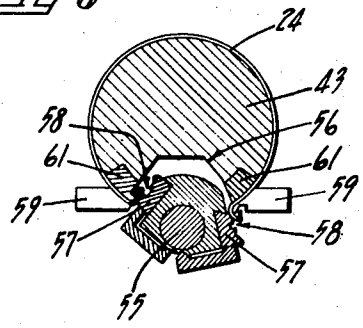
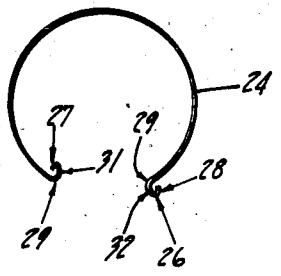


FIG 3



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FIG 7

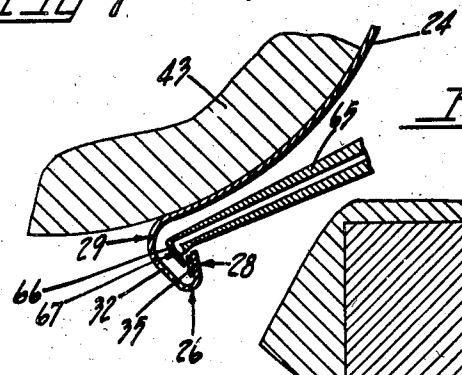


FIG 8

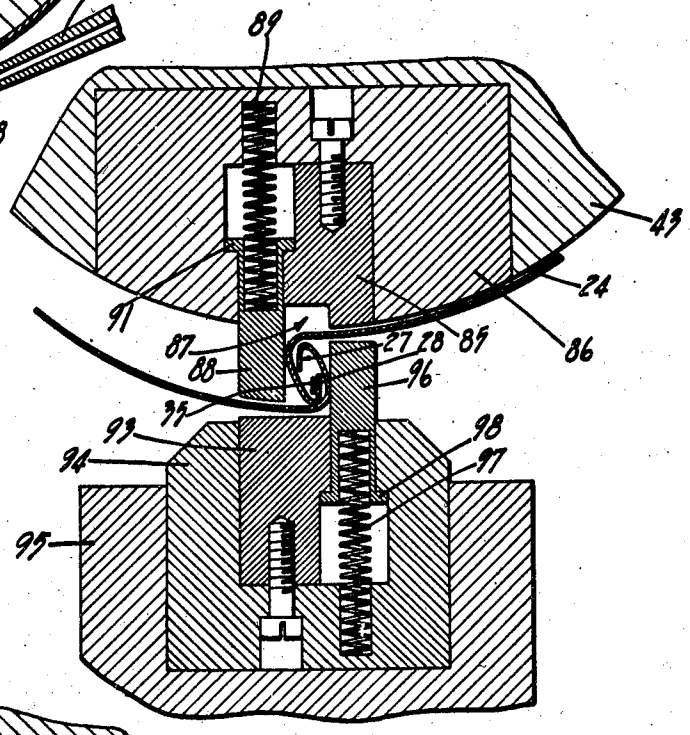


FIG 9

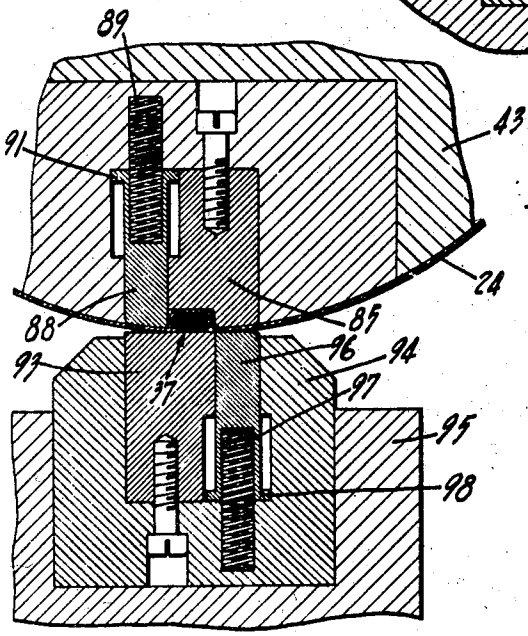
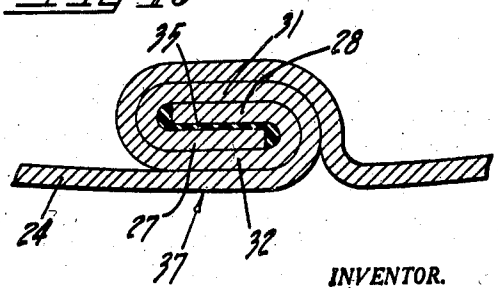


FIG 10



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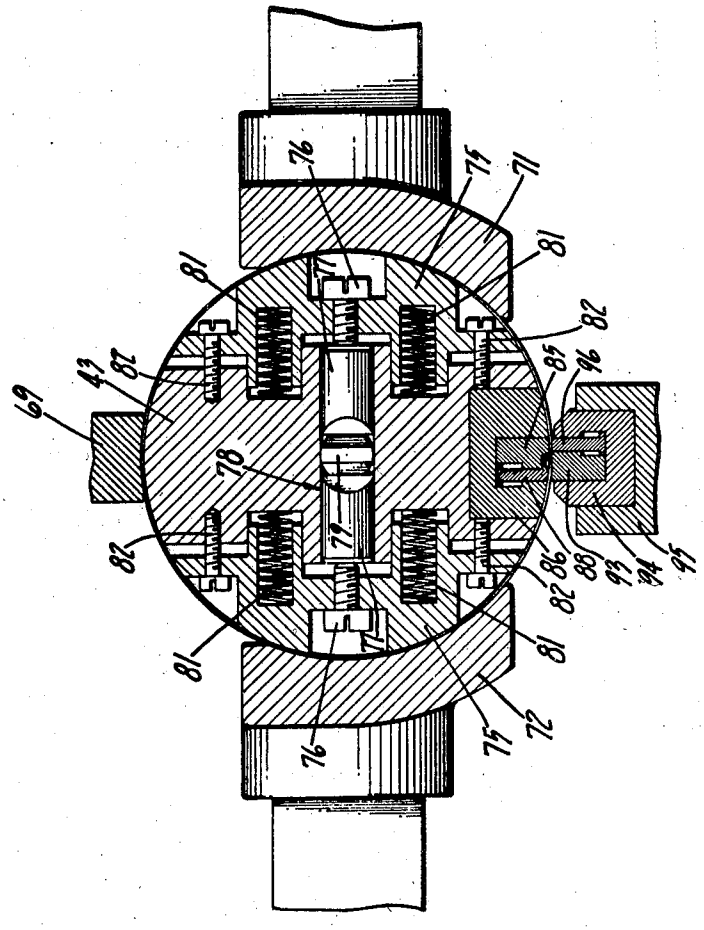


FIG 11

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UNITED STATES PATENT OFFICE

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METHOD OF MAKING TUBULAR CONTAINER BODIES WITH SOLDERLESS SIX-LAYER SIDE SEAMS

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Application January 27, 1945, Serial No. 574,840

1 Claim. (Cl. 113—120)

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The present invention relates to a method of producing container or can bodies and has particular reference to forming a solderless hermetic side seam for holding the longitudinal edges of the bodies together.

An object of the invention is the provision of a method of making can bodies having side seams wherein the side seam edges of the bodies are formed with primary hooks and continuing secondary hooks and wherein a liquid lining compound is applied to one of the primary hooks so that the hooks may be double interfolded into a side seam of the double seam character embodying at least six layers of body stock with the lining material interposed between the two inner layers to produce a strong solderless and hermetic side seam for the bodies.

Another object is the provision of such a method of making can bodies wherein the side seam hooks while being compressed into interfolded relation are confined laterally and the bodies are expanded to simultaneously bring the bodies and their side seams to accurate dimensions just prior to the final compression step that locks the side seam edges together permanently to produce the can bodies.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figures 1, 2 and 3 are respectively ends views of a partially formed can body showing various steps of forming hooks on the side seam edges of the body in accordance with the instant method invention;

Figs. 4, 5 and 6 are respectively sectional views of apparatus for performing the various steps on the partially formed bodies illustrated in Figs. 1, 2 and 3, respectively, the sectional views showing the bodies in place in the apparatus;

Fig. 7 is an enlarged sectional view of a completed side seam hook and the apparatus used for applying a liquid lining compound to one surface of the hook;

Figs. 8 and 9 are respectively enlarged sectional views showing the hooked side seam portion of a partially formed can body and portions of apparatus for compressing the interengaged edges into a side seam, the views showing different stages of the forming of the seam and the different positions of the movable parts of the apparatus;

Fig. 10 is an enlarged detail cross sectional view of the completed side seam of a can body made

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in accordance with the method steps of the invention; and

Fig. 11 is an enlarged cross sectional view of an expanding mandrel and its associated parts on which the can bodies are supported during certain steps of the method.

As a preferred embodiment of the invention the drawings illustrate the forming of a sheet metal tubular can body of cylindrical shape although the invention is readily adapted to many other materials and other shapes of can bodies. In the instant method invention the can bodies are produced from rectangular flat blanks 21 (Fig. 4), which have been prepared previously such as by having corners or other portions cut away or by having the blanks preformed, or by flexing, straightening or other treatments usually required before forming of the blank into tubular body shape.

As the first step in the instant method, the flat blank 21 is bent into can body shape, with its side seam edges 22, 23 (Fig. 1) unattached, that is, separated to produce a partially formed can body 24, as best shown in Fig. 1. Following the body shaping step, the marginal portion of the partially formed body adjacent its side seam edge 22 is bent inwardly along a sharp line of fold 26 (Fig. 2) into a position forming an acute angle with the body wall to produce an outer or overlock primary hook 27. In a similar manner the side seam edge 23 is bent outwardly to produce an inner or underlock primary hook 28.

In a subsequent step the marginal portion of the partially formed body 24 adjacent the overlock primary hook 27 is again bent inwardly along a sweeping curved line of bend 29 into a position slightly less than normal to the body wall. This produces an outer or overlock secondary hook 31 (Fig. 3). This secondary hook is a continuation of the primary hook 27 and is slightly more than twice as long, as will be readily seen in the enlarged views shown in Figs. 7 and 8. In a similar manner the marginal portion of the body adjacent the underlock primary hook 28 is bent outwardly. This produces an inner or underlock secondary hook 32 which forms a continuation of the primary hook.

Following the forming of the primary and secondary hooks on the partially prepared can body, a liquid or fluid lining or sealing compound 35 is applied to the inner surface of the underlock primary hook 28, as best shown in Fig. 7. No other sealing material is applied to any of the other surfaces of the hooks.

After thus being lined with the sealing com-

pound 35, the overlap primary and secondary hooks 27, 31 are interengaged with the underlock primary and secondary hooks 28, 32 as shown in Fig. 8, and the body is expanded to full cross-sectional size. The hooks at the same time are pressed together into a compact inter-folded side seam 37 (Figs. 9 and 10) which unites the side seam edges 22, 23 of the body to convert the body into a complete tubular structure.

During this compression, the interengaged hooks are confined against lateral displacement and the resulting side seam is accurately dimensioned, one set of hooks closing tightly within the other. The result is a can body having a strong, solderless side seam of doubled, double seam character and consisting of six interfolded layers hermetically sealed with lining compound interposed between the two innermost layers and their adjoining spaces, as best shown in Fig. 10. This broadly suggests the steps required to produce a can body having a solderless side seam in accordance with the instant method invention.

Reference will now be made to Figs. 4, 5, 6, 7, 8, 9 and 11 which show principal parts of one form of apparatus for carrying out the above method steps of producing the solderless side seam can body illustrated in the drawings. Shaping of the blank 21 into the cylindrical, partially formed can body 24 preferably is effected by passing it endwise between a pair of rotating rollers 41 (Fig. 4) which force it against a deflecting plate 42 disposed adjacent the rollers. The deflecting plate bends or curls the blank into its open cylindrical form. A mandrel 43 located above the rollers receives the shaped blank.

The edging operation for bending the marginal portions of the partially formed body 24 adjacent the side seam edges 22, 23 into the oppositely directed primary hooks 27, 28, is effected preferably by an edging mechanism illustrated in Fig. 5. This operation is accomplished preferably while the partially formed body 24 is on the mandrel 43. The bottom of the mandrel is cut away in a recess 45 and in this recess a rocker shaft 46 is mounted parallel with the mandrel. This rocker shaft is provided with a pair of edging irons 47, one located along each side of the shaft.

The side seam edges of the partially formed body prior to edging project down beyond the wall of the recess in the mandrel and extend into grooves 48 formed in the edging irons. On the outside and adjacent the side seam edges the body is held by clamps 49 which hold the edges against edging steels 51 inserted in the mandrel.

While the body is in this clamped position, the rocker shaft 46 is oscillated first in one direction and then in the reverse direction. This movement of the rocker shaft wipes the edging irons 47 over the clamps 49 and the edging steels 51 and thus bends the body side seam edges into the overlock and the underlock primary hooks 27, 28.

Forming of the secondary hooks 31, 32 is accomplished in a manner similar to that described above and while the partially formed body is still on the mandrel 43. The body may be shifted longitudinally along the mandrel into the desired position. The secondary hooks are bent into shape by an edging mechanism illustrated in Fig. 6. This mechanism includes a rocker shaft 55 which is mounted parallel with the mandrel in a recess 56 formed in its lower portion. The shaft is fitted with edging irons 57 having grooves 58 which receive the just formed primary hooks 27, 28. These hooks project down beyond the inner walls of the recess 56. Clamps 59 hold the can body against edging steels 61 set into the mandrel. Upon oscillation of the rocker shaft 55, the edging irons 57 wipe the hooked edges of the body against the clamps 59 and the edging steels and thus produce the overlock and underlock secondary hooks 31, 32.

Depositing of the lining or sealing compound 35 onto the inner surface of the underlock primary hook 28 is shown in Fig. 7. Such a deposit preferably is effected by a liner nozzle 65 which is connected to a suitable source of supply of the compound which may be discharged under pressure. The nozzle is formed with an angularly shaped head 66 having a flat outer surface and is small enough to fit into the space between the primary hook 28 and the secondary hook 32. A discharge aperture 67 in the flat face of the head is directly opposite the inner face of the primary hook 28 when the nozzle is in operating position. Thus the nozzle deposits a film of the liquid sealing compound along the hook in a uniform thickness. This application of the sealing compound to the hook 28 is effected preferably while the can body is moving longitudinally along the mandrel 43.

After the lining compound applying operation, the hooks 27, 28, 31, 32 are interengaged as shown in Fig. 8 and are then bumped or squeezed flat to produce the multiple layer side seam 37, illustrated in detail in Fig. 10. This bumping of the side seam is done while the body is on the mandrel 43 and while it is tightly clamped against the mandrel at a suitable bumping station. For this purpose there is provided a top clamp bar 69 (Fig. 11) which holds the body in place and a pair of movable side wings 71, 72 which engage the body on each side of the clamp bar.

These wings move toward the body one after the other, the wing 71 moving first followed by the wing 72. This movement of the wings properly overlaps and interengages the body hooks and then further clamps the body against expansible side sections 75 of the mandrel 43. These side sections are secured by screws 76 to cam blocks 77 which slide in bores 78 formed in the mandrel. The inner edges of the cam blocks operate against a reciprocable wedge cam 79 mounted in the mandrel. Compression springs 81 interposed between the side sections 75 and the mandrel 43 press the side sections outwardly while screws 82 in the mandrel limit this outward travel of the sections. The expander sections 75 are shifted outwardly from the mandrel during the seam bumping operation to bring the interengaged hooks together and to expand the body to its full and proper size.

The lower portion of the mandrel 43 carries an anvil or spline 85 (Figs. 8 and 9) which is secured in an anvil block 86 inserted in the mandrel. The lower face of the anvil is formed with a rectangular shaped seam groove 87 which in dimensions is the same size as the finished side seam 37. A seam confining bar 88 is disposed in the anvil 85 adjacent the seam groove 87 and extends down beyond the mandrel and adjacent the interengaged hooks of the can body. This confining bar is backed up by a compression spring 89. Ledges 91 on the upper end of the bar retain it against displacement from the anvil.

Bumping of the interengaged hooks 27, 28, 31, 32 of the can body is effected by a bumping hammer 93 (Figs. 8 and 9) which is supported in a hammer block 94 carried in a vertically reciprocable hammer slide 95. The slide with the parts carried thereby is actuated in any suitable man-

ner. The bumping hammer is located below and in vertical alignment with the anvil 85. The hammer carries an upwardly projecting seam confining bar 96 which extends above the hammer and which is backed up by an expansion spring 97. Ledges 98 on the lower end of the bar retain it against displacement from the hammer. The inner face of the bar is in vertical alignment with the inner face of the seam groove 87 in the anvil 85.

When the hammer slide 95 moves upwardly toward the anvil 85, the seam confining bar 96 carried in the hammer 93 moves up adjacent the interengaged hooks of the can body on the mandrel and thus confines the hooks between it and the cooperating seam confining bar 88 in the anvil. In this position of the confining bars, as best shown in Fig. 8, the distance between them is the same as the width of the seam groove 87 in the mandrel anvil.

As the hammer 93 continues to move toward the anvil 85, the confining bar 96 in the hammer engages the can body wall and presses it against the mandrel and then remains at rest as the hammer continues to move upwardly around it. In a similar manner, the hammer presses the adjacent side of the can body against the confining bar 88 in the anvil and forces this bar back into the anvil. During this operation the hooks remain confined between the confining bars 88, 96 and are progressively compressed into the seam groove 87 of the anvil.

By thus confining the seam during the bumping operation, the edges of the primary hooks 27, 28 are forced along the curved surfaces of the secondary hooks 31, 32 until the locking operation is completed. At the same time the excess stock of the secondary hooks is forced outwardly by the confining action of the confining bars 88, 96 as they slide into the anvil and the hammer respectively.

The shape of the hooked edges of the partially formed can body is such that when they are interengaged on the mandrel, the primary hooks are off-center with respect to the direction of movement of the hammer 93. By this means the hooks as they are being compressed are caused to rotate in a counter-clockwise direction as viewed in Fig. 8 and this results in wrapping the secondary hooks 31, 32 around the primary hooks 27, 28 just before the resulting seam is squeezed into the seam groove 87 of the anvil and bumped flat by the hammer. This double-locking operation is thus dependent not only on the shape or form of the hooked edges of the partially formed body but also on the off-center position of the primary hooks with respect to the direction of movement of the hammer in bumping the seam.

Although the expansible side sections 75 of the mandrel assist in drawing excess stock from the primary hooks during the bumping of the seam, a satisfactory seam can be made without their use. The main function of these expansible sections is to maintain a uniform diameter in the can body.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the steps of the process described and their order of accomplishment without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the process hereinbefore described being merely a preferred embodiment thereof.

I claim:

The method of producing a tubular container body having a solderless lined hermetic side seam, comprising feeding a flat blank between a pair of rollers and against a deflector member to form a tubular body about a mandrel, advancing the tubular body along the mandrel to successive stations and at the respective stations performing the following operations on said body: first bending the opposed marginal side seam portions of the body into cooperating interengageable inner and outer primary hooks, then further bending said tubular body adjacent said hooks into inner and outer secondary hooks respectively constituting inner continuations of said primary hooks, then applying a lining material to the inner surface of one of said primary hooks, then bringing the side seam edges of the tubular body together to interengage the hooks of one edge with those of the other edge, and finally compressing said interengaged hooks while confining the hooks against lateral displacement to set up a rotating action to first wrap the secondary hooks around the primary hooks and to thereafter flatten the wrapped hooks into an interfolded locked side seam including six layers of body material with the lining material interposed between the two innermost layers constituting said primary hooks, whereby to produce a hermetic solderless side seam for the container body.

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