METHOD AND APPARATUS FOR SIDE-SEAMING CAN BODIES

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Fig. 3

Fig. 2

Fig. 5

Fig. 4

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My present invention relates to a can body making machine and aims to provide certain improvements therein. More particularly it relates to a machine for making can bodies of the type disclosed in my co-pending application Serial No. 82,957, filed March 23, 1949, now Patent No. 2,629,942.

In the manufacture of sheet metal cans for packaging various items, and particularly in the manufacture of sheet metal cans for packaging foodstuffs and the like, wherein non-contamination of the contents is an important problem, it is the current practice to utilize what is known as a can body machine comprising a body maker and seamer. Such a body maker usually receives a supply of blanks from a stack, and successively passes such blanks through 5 to 7 stations wherein successive operations are performed on each sheet metal blank to form it into a can body. The operations customarily performed at these various stations comprise feeding, flexing, notching and edging of the blank and then forming the prepared blank into a can body. One or more idle stations are usually provided between the feeding and notching stations, and idle stations are also usually provided between the notching, edging and forming stations.

At the notching station of such a can body maker, the corners on one end of the blank are notched or cut away, and the other end of the same blank is simultaneously provided with corresponding slits or incisions. At the edging station the end portions of the blank between the incisions on one end and the notches on the other end are bent back in opposite directions so as to provide oppositely-turned hooks which may be interlocked when the blank is wrapped around the horn at the forming station. At the forming station the blank is wrapped around the conventional horn to assume the general shape of the can body, the oppositely turned edges of the blank or hooks are interlocked, and such hooks are "bumped" to form the conventional side seam of the can body. After the side seam is formed, the can body is moved to the soldering station where the conventional rotary solder roll is utilized to provide the necessary solder to sweat-solder the side seam. The can body is then transferred to a flanger where the top and bottom edges of the can body are flanged outwardly to receive the can ends and for the subsequent operation of double seaming.

In the formation of can bodies on machines of the type above-described, it has been found that due to the raw edges at the ends of the blank and

the step-down of metal thickness at said ends in forming the steam, minute unsoldered pinholes frequently are formed in the side seam. It has also been found, after the soldering operation, that minute holes have been formed between the can ends and the side seam at the inner corners of the notches, and that such small holes, in fact, expose a raw edge of the can body. The minute holes in the side seam and the minute holes which occur at the notched corners both provide air leaks which facilitate contamination of the contents of the can.

Among the objects of my invention are: To provide a body making machine in which the number of stations and operations on a can blank are reduced, thereby to simplify and reduce the cost of can making machines and of the cans made thereon; to reduce the overall dimensions of such machine and to thereby conserve space; to provide a body making machine wherein the side seam is formed in a can body within three stations or less and without cutting or notching the blank; to provide a can body making machine wherein the side seam is formed by flanging and drawing complementary portions of a blank and then lock-seaming said complementary portions; to provide a machine adapted to make can bodies of the type disclosed in my aforementioned application in a continuous and efficient manner.

The foregoing and other objects of my invention not specifically enumerated I accomplish by providing a can body making machine which will feed flat sheet metal blanks to a can body horn, and while held by clamping wings, simultaneously form the overlapped ends of the blanks, one with a groove and the other with a flange disposed within the groove, and will then fold back the interengaged walls of the metal formed by the flange and the walls of the groove against the metal of the blank to provide a locked seam, at least one end of which terminates short of the end of the resulting can body. The invention will be better understood from the detailed description which follows, when considered in connection with the accompanying drawings, wherein:

Figure 1 is a rear elevation of a can body making machine embodying my invention.

Fig. 2 is a section taken along the plane of the line 2—2 of Fig. 1.

Fig. 3 is a sectional elevation of the can body horn and of the complementary dies and the male die operating means for preforming the side seam in the can body.

Fig. 4 is a section taken along the plane of the
Fig. 6 is a plan view of a metal blank from which the can body is formed.

Fig. 7 is a side elevation of a can body formed from the blank shown in Fig. 6 and particularly showing the side seam of the can.

Fig. 8 is a section, on an enlarged scale, taken along the plane of the line 8—8 of Fig. 7.

Figs. 9, 10 and 11 diagrammatically show the progressive steps in which the side seam shown in Fig. 3 is formed by the can body making machine shown in Figs. 1 to 4.

In the drawing, the same reference characters designate the corresponding parts in the various figures.

Before describing the machine shown in Figs. 1 to 4, I will describe the type of seam and can body which the machine of the present invention is adapted to make. Such can body 18 (Figs. 7 and 8) has a longitudinal side seam 16, the said can body being preferably formed from a rectangular sheet metal blank 17 by forming at one of the ends thereof an outwardly directed flange 15 and at the other end portion 22 of the blank an outwardly directed groove 19, the flange 15 and the walls 20 and 21 of the groove being coextensive, interengaged, lock-seamed and folded back against the end portion 22 of the blank end formed with the groove 19, and against the body portion 24 of the blank adjacent to the end formed with the flange 15. The flange 15 and the groove 19 terminate at their opposite ends short of the edges 23 and 24 of the blank and the metal at the ends of the blank between said edges and the ends of the flange and the ends of the groove respectively is uncut, unflanged, unbroached and integral with the flanged and the grooved portions, respectively, and in single thickness overlying relation. The seam 16 between the approximate points 20 and 25a on Fig. 7 is constituted by at least four thicknesses of metal, the innermost of which bears against the can body longitudinally beyond said points 23 and 25c by lapped single thicknesses of metal, and said seam, when formed on the machine of the present invention in the manner hereinafter described, may be soldered or not, as desired, and the die, respectively.

The operation of the machine in simultaneously forming the flange 15 and in drawing the groove 19 in the blank while positioned around the horn 26c will be presently described. However, it may be here explained that in the drawing operation the grooved end portion of the blank has its top and bottom edges 36 (Fig. 7) drawn inwardly toward each other and out of true alignment with the edges 29 and 34, and the end portion 22 of the blank beyond the groove has its edge drawn inwardly between the extreme end of the top and bottom edges 39, as best shown at 31 in Fig. 7.

In view of the inward drawing of the top and bottom edges as shown at 31 the equivalent of chamfers at said lapped edges of the blank are provided, thus preparing the outer edges 31 so they will not project beyond the edges 23 and 24 during the flanging of the ends of the can body. The drawn edges 35 and 31 also provide a means for accommodating solder where the seams are to be soldered.

Referring now to Figs. 1 to 5 of the drawings, the machine comprises a frame 32 having mounted therein an operating shaft 33 adapted to be driven by a pulley 34 or equivalent means. Suitably mounted in the frame is the can body forming machine 35, the left hand portion 26b of which may be considered the blank-receiving or feed-in station which is substantially encircled by horn blank guides 35 and 35a, an axially spaced right hand portion 26c which may be considered the forming station which is substantially encircled by horn wings 36, a conventional support 37 for a stack of sheet metal can body blanks 17, and means for feeding said blanks to the horn comprising suction cups 33, a pusher rod 36, feed rolls 40 and means for forming the seam presently to be described.

At the feed-in station the horn portion 26b is formed with a shoulder 42a on a part 42 (Fig. 4) which may be formed as a permanent magnet for engaging and stopping the leading end 17a of a blank when fed to said horn portion, said part 42 being provided with an outer shield 42b preferably made of brass, which prevents the blank from being hindered in its path around the horn. For moving a blank along the horn from the blank-receiving station 26b to the forming station 26c there is provided a pair of fingers 43 pivotally carried by feed bars 44 movable in longitudinally-extending recesses 45 in the periphery of the horn.

At the forming station the horn is provided with the male die or punch 27 which is movable radially outwardly by a reciprocable horn wedge cam 46 extending through the horn, said horn wedge cam being operable by a vertically movable wedge rod 47 through suitable linkages 48 and 49, by a cam 50 mounted on the operating shaft 33. The horn wedge cam 46 has cam surfaces 51 which cooperate with complementary cam surfaces 52 on the punch for operating the latter, and the cam 46 is returnable to its inoperative position by spring means 53 after the punch has performed its drawing and forming operations. For permitting movement of the male punch 27 relatively to the horn, 5 the latter is appropriately recessed and formed with filler segments 54 having outer curved surfaces providing continuations of the horn outer surface, the said filler segments being held within the horn by screws 55. The male punch 27 has transverse pins 56 extending therethrough, against which operate cam action springs 57 for returning the punch to its inoperative position after or substantially simultaneously with the movement of the horn wedge cam to its inoperative position. The horn wings
are operated to hold the can body blank firmly against the horn at the forming station with the ends of the blank in predetermined overlapped relation underlying the male punch 27, the horn wings being movable into clamping relation by toggle arms 58 which, in turn, are operable by the lever 55, rod 60 and cam 61. Supplemental means for holding the blank in position on the horn at the forming station while permitting axial movement of the blank along the horn is provided by a pressure bar 62 urged toward the horn by a plurality of springs 63 acting against a bracket 64 carried by the machine frame. The lapped ends of the blank are firmly held against the horn during the sheet-forming operation by the outer pressure foot 26 which is adapted to be moved into contact with said lapped ends and held thereagainst by a cam 66. The lapped ends of the blank may be supplementally held during the drawing operation by the lips 28a and 28b of the female die 28 which is operable by a cam 67.

After the male die or punch 27 is operated to form the flange 18 at one end of the blank and the groove 19 at the lapped other end of the blank, as shown in Fig. 9, both the male and the female dies recede and the interengaged flange and side walls of the groove in between the ends of the blank are folded over by the side slide 29 which is reciprocable in any preferred manner, herein shown as being mounted on a slide 69 and movable by a connection 70 which is eccentrically mounted on a stub shaft 71 rotatable from the driving shaft through a pair of sinter gears 72 and 73. After the interengaged sheet has been folded over and the side slide 29 has receded, the female die 28 is moved upwardly by its cam 67 so that the arm 28a of the die bumps the seam against the body of the horn, thus completing the seam. The various means which operate to hold the blank firmly onto the horn or groove 19 are as hereinafore mentioned, the length of the interengaged portion of the side seam is less than the height of the can blank, therefore the upper ends of the pressure foot engage the lapped portions of the blank adjacent the side edges thereof in addition to engaging the blank adjacent the line of seam. In view of the fact that the side slide 29 must move into engagement with the can blank while the pressure foot is in holding engagement with the blank, the side of the pressure foot facing the slide 29 is recessed to accommodate said slide.

The operation of the machine in forming side seams of the character described is as follows: Successive blanks are drawn from the bottom of the stack by the suction cups 39 which reciprocate in a vertical direction and bring the individual blanks from the stack level to the feed level. At the feed level a blank is pushed horizontally toward the feed rolls 41 by the reciprocating blank pusher 40, which operates in a conventional manner. The feed rolls which are driven, feed the blank to the blank-receiving or feed-in station 26b of the horn whereby the blank is wrapped around the horn and is given a predetermined cylindrical form by means of the spaced blank guides 35 and 35a, the leading edge of the blank being stopped at a predetermined position by the shoulder 42 on the punch 27. The blank is then moved along the horn between the guides 35 and 35a by the fingers 43 on the feed bars 44 to the forming station 26c whereby the drawing, bending and bumping operations are all performed. If desired, a third station may be provided on the horn for bumping the seam inwardly to provide an outwardly smooth surface, to which station the formed can body may be moved by an additional pair of fingers on the same feed bars 44. Where it is desired to solder the side seam, the formed can body may be again moved to a solder horn for the conventional soldering operation. At least two sets of fingers 43 are provided on the feed bars 44 to advance the blank successively to each station, and if a third station is required, a third set of fingers would be provided on the feed bars.

In the operation of forming the flanges and the groove in the lapped ends of the blank on the horn in forming the side seam, the punch 27 and the die 28 only require very short strokes, which may be less than one-quarter the length of the strokes conventionally required for the edging, notching and bumping of blanks on conventional machines. Also, in view of the fact that with the machines of the present invention fewer operating stations are required, it will be apparent that the machine of the present invention is capable of greater productive capacity that prior machines.

From the foregoing detailed description it will be appreciated that while I have shown and described a can body making machine capable of accomplishing the various objects of my invention as set forth in the opening statement of this specification, it is to be understood that changes in the details of construction thereof may be resorted to within the range of engineering skill without departing from the spirit of my invention as defined in the appended claims.

What I claim is:

1. A method of making a seam for sheet metal cans or the like, which comprises bringing the ends of a blank into lapped surface contacting relation and while holding said ends in clamped said relation simultaneously forming an outwardly directed flange of less length than the distance between the edges of the blank at one lap end and forming by a drawing operation an outwardly directed groove of substantially the same length as the formed flange and coextensive therewith in the other lap end with the flange disposed in the groove, and lock-seaming the engaging flange and end.

2. The method according to claim 1 wherein the groove is formed without cutting the blank.

3. The method according to claim 1 wherein the lock-seaming of the interengaged flange and the walls of the groove is performed while the unflanged and ungrooved parts of the lapped ends are held clamped in their lapped relation.

4. A can body making machine comprising a can body horn having a side seam forming station, means for positioning and holding a sheet metal blank around said horn at said station with the ends of the blank in overlapped surface contacting relation, a part of said holding means engaging the longitudinal extremities of the overlapped ends, a reciprocable punch and a cooperating die at said station between the extremities holding means and of less length than the lapped ends of the blank for acting on said lapped ends to simultaneously form therein by a drawing operation an outwardly directed flange at one of the lapped ends of the blank and a co-extensive outwardly directed groove in the other end portion of the blank with the flange disposed within the groove, and means for lock-
5. A can body making machine according to claim 4, wherein said reciprocable punch is mounted within the horn for movement outwardly through the surface of the horn, and means extend into the horn and are operative from the exterior of the horn to operate said punch.

6. A can body making machine according to claim 5 wherein said punch and the means for operating such punch have cooperating cam surfaces.

References Cited in the file of this patent

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<tr>
<th>Number</th>
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<tr>
<td>219,494</td>
<td>Milligan</td>
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