

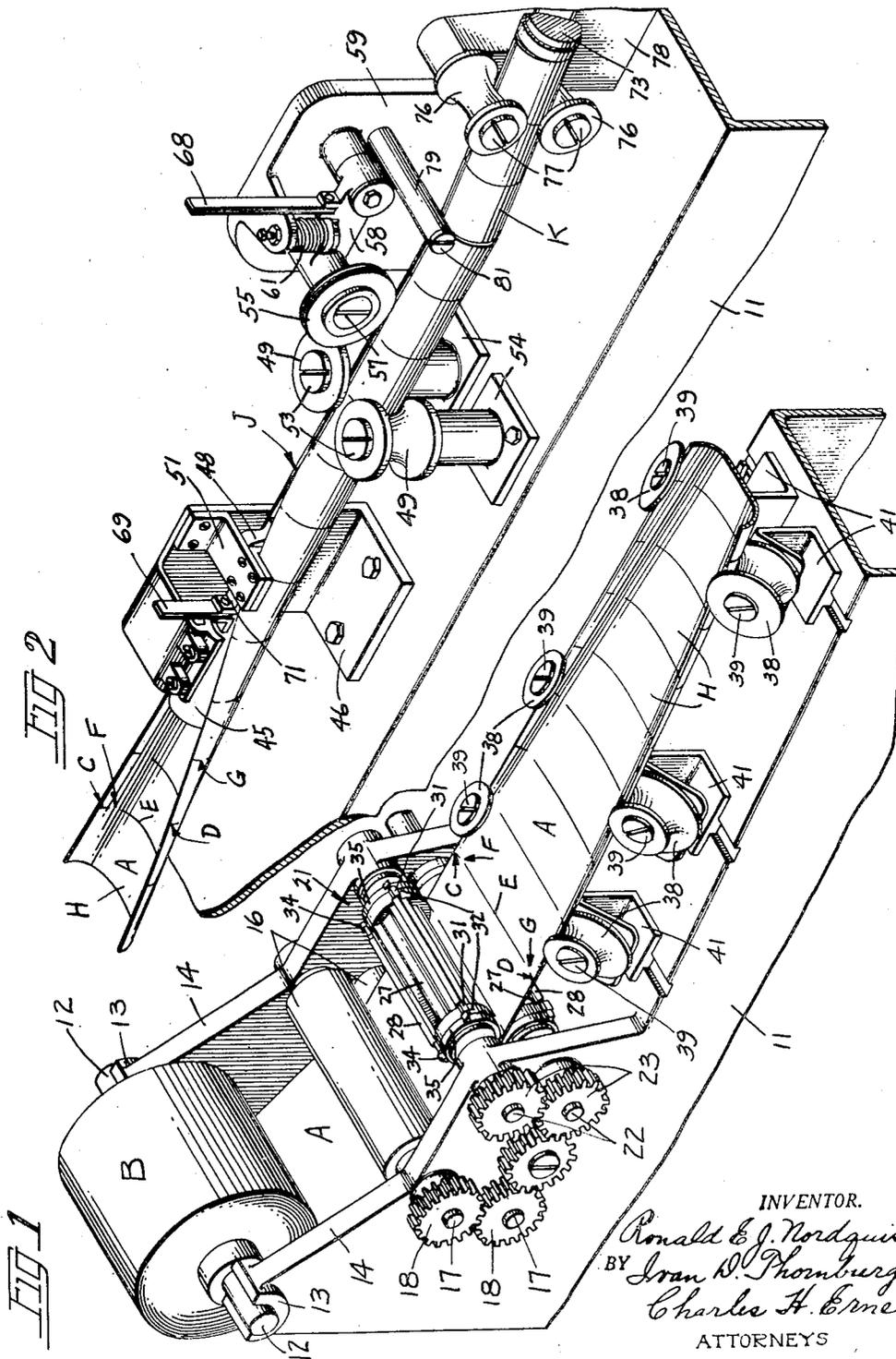
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R. E. J. NORDQUIST
METHOD OF PRODUCING CAN BODIES

2,444,463

Filed June 26, 1945

2 Sheets-Sheet 1



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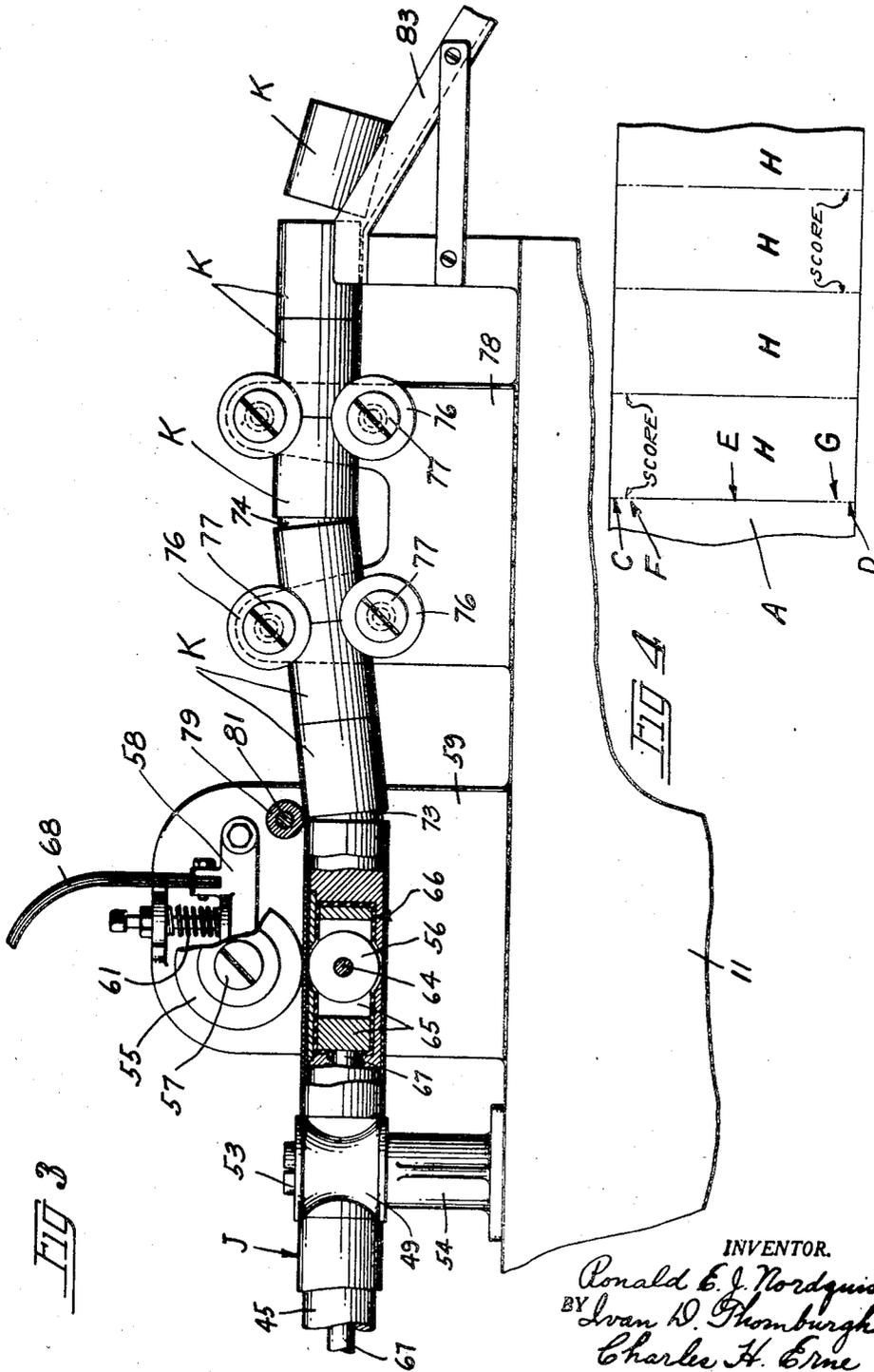
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METHOD OF PRODUCING CAN BODIES

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The present invention relates to a method of making can bodies from a strip of sheet material of a length sufficient to form a plurality of can bodies and has particular reference to precutting the strip with transverse slits and continuing and connecting score lines located at spaced intervals along the strip as an incident to the forming of the strip into a tube so that the tube may be readily divided into a plurality of individual and separated can bodies. This is an improvement over United States Patent No. 2,177,104, issued October 24, 1939, to B. W. Gonsler, on Method of manufacturing can bodies.

An object of the invention is the provision of a method of producing can bodies from a strip of sheet material adapted to be formed into a tube and subsequently divided into a plurality of can bodies, wherein the strip is first pre-cut with transverse slits and adjacent continuing score lines located at spaced intervals along the strip in accordance with the desired length of the can bodies to be produced so that the tube may be readily divided into a plurality of bodies at a high speed rate of production.

Another object is the provision of such a method of producing can bodies from strip material wherein the longitudinal edges of the strip are formed with edge slits which are located in alignment with the pre-cut body slits and score lines so that they will come into register with each other in the side seam when the strip is formed into a tube, to facilitate dividing of the tube into a plurality of can bodies.

Another object is the provision of a method of this character of producing can bodies from strip material wherein the strip is pre-cut in such a manner that subsequent to the forming of the pre-cut strip into a tube, the tube may be readily divided into a plurality of can bodies by a mere bending action to break the individual can bodies from the tube.

Another object is the provision of such a method of producing can bodies from strip material wherein the cutting of the edge slits, the body slits and the score lines is effected simultaneously and while the strip is being continuously and progressively advanced along a predetermined path of travel so that the forming of the tube and the dividing of the tube into individual and separated can bodies may proceed at a high speed rate of production and in which continuous welding of the side seam of the tube may be had when the strip is made of metal or metallic material.

Numerous other objects, and advantages of the invention will be apparent as it is better un-

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derstood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

5 Figures 1 and 2 are continuing perspective views of one form of apparatus for carrying out the method steps of the instant invention, the views showing a strip of material in place and in various stages of being converted into can bodies in accordance with the instant method inven-
10 tion, parts being broken away;

15 Fig. 3 is an enlarged side elevation of a portion of the apparatus shown in Fig. 2 with a continuing extension added and with parts broken away and parts shown in section; and

20 Fig. 4 is an enlarged plan view of a portion of the pre-cut strip of material from which the can bodies are made.

25 As a preferred embodiment of the invention the drawings illustrate method steps of making can bodies from a strip A of sheet metal, such as tin plate or the like, of a width approximately the circumference of the can body and of a length sufficient to form a plurality of can bodies there-
30 from. Such a strip preferably is handled in the form of a roll or coil B.

35 In accordance with the method steps of the invention the strip A is unrolled from the coil B and is continuously and progressively fed or advanced along a straight line path of travel for its conversion into can bodies. The moving strip is first partially divided or pre-cut along lines extending transversely of the strip and located at spaced intervals therealong in accordance with
40 the desired length of the can bodies to be produced.

45 Each transverse dividing line includes two oppositely disposed short edge slits C, D (Fig. 4) which are cut across and through the longitudinal edges of the strip and which extend back into the strip for a short distance. The strip intermediate the slits C, D is cut through along a line of severance E which is disposed in alignment with the slits, the outer ends of the cut E terminating in spaced relation to the inner ends of the slits and thus setting off a pair of uncut portions F, G adjacent the edges of the strip.

50 The uncut portions F, G of the strip A are partially cut through or scored to form a weakening line connecting the inner ends of the slits C, D with the outer ends of the cut E. These score lines are coincident continuations of the slits C, D and the cut E which taken together provide a straight dividing line extending entirely across
55 the strip and setting off in the strip potential can

body blanks H connected together as a unitary strip structure only by the two short scored portions F, G disposed adjacent the longitudinal edges of the strip.

Following the pre-cutting or partial dividing of the strip A and as it continues to move forward, the longitudinal edges of the strip are flexed or bent inwardly toward each other to form the strip into a longitudinal tubular form. During this continuous tube forming operation the outer longitudinal edges of the strip are brought together in an overlapping position and are secured together in any suitable manner, preferably by welding to unite these edges in a continuous side seam which includes the slits C, D.

There is thus produced a long tube or tubular member J containing a plurality of potential can bodies set off by the slits C, D, cuts E and scored portions F, G but still connected by the scored portions so that the tube is a unitary structure. When welding of the side seam takes place, the slits C, D may become slightly filled with molten metal but this metal becomes brittle when cooled. The tube J thus formed is still an integral part of the strip A and as such is progressively and continuously advanced as the strip advances.

As the partially divided tube J continues to move along its path of travel it is deflected or bent, first in an upward direction and then in a reverse direction to hinge the potential can bodies in the tube J at their side seams and along the line of the slits C, D. This hinging action breaks across the brittle side seam at the slits C, D and ruptures the weakened or scored portions F, G of the tube, thus separating from the tube the individual can bodies K. This completes the steps required to produce the can bodies from the continuously moving strip A.

In such a manner, the pre-cutting or partial dividing of the strip produces clean cut terminal edges for the can bodies and makes it possible to separate the bodies from the tubular member produced from the strip, at high speed rates of production and while the tubular member is advancing along its path of travel.

One form of apparatus for carrying out the above described method steps is shown in the drawings and comprises a long frame 11 on which the various parts of the apparatus are supported. The coil B of sheet material A is disposed at one end of this frame and is mounted on an axle 12 (Fig. 1), the ends of which are loosely carried in open half bearings 13 formed in upright web section 14 on the two longitudinal sides of the frame.

The strip A as it is unrolled from the coil B, travels longitudinally of the frame 11. The unrolling and continuous feeding of the strip is effected preferably by a pair of parallel engaging feed rollers 16 between which the strip is threaded. These feed rollers are formed with trunnions 17 which are journaled in suitable bearings formed in the frame side web sections 14. The rollers are continuously rotated in unison by a pair of meshing gears 18 mounted on the trunnions 17. The gears are rotated in any suitable manner in time with the other moving parts of the apparatus.

Pre-cutting or partially dividing the strip A is effected preferably by a cutting and scoring mechanism 21 (Fig. 1) which includes a pair of spaced and parallel rotatable cutter shafts 22 between which the strip A advances continuously. These shafts are journaled in the frame

side web sections 14 and are rotated in unison by a pair of meshing gears 23 which are mounted on the shafts and which in turn are rotated in any suitable manner in time with the other moving parts of the apparatus.

Each of the cutter shafts 22 carries a long cutter body 27 which has mounted thereon a plurality of long shear blades 28 for producing the long cuts E in the moving strip A. These blades are spaced apart around the periphery of the cutter body, a distance equal to the length of the potential can body blanks H to be set off in the strip by the long cuts E. Hence as the strip A continuously passes through the cutting mechanism the shear blades 28 in the two rotating cutter bodies 27 cooperate in cutting through the strip to produce the transverse long cut E.

The slits C, D in the edges of the strip and the score lines in the adjacent uncut portions F, G are all produced preferably simultaneously with the forming of the long cut E. The score lines are produced by scoring tools 31 which are carried in a pair of ring members 32 mounted on the cutter shafts 22 adjacent the ends of the cutter bodies 27. These scoring tools are in endwise alignment with the shear blades 28.

The slits C, D are formed by slitting tools 34 which are secured in the outer periphery of a pair of annular slitting members 35 mounted on the cutter shafts 22 adjacent the scoring rings 32. These slitting tools are in endwise alignment with the scoring tools 31 and the shear blades 28.

Hence since all of the cutting and scoring elements are mounted in continuing endwise alignment on the two cutter shafts 22 and transversely of the strip A, the slits C, D, long cut E and scored portions F, G are all produced in accurate alignment across the strip and in proper sequence as the strip advances between the two cutter shafts.

The longitudinal flexing or bending of the strip A into tubular form is performed preferably by a plurality of shaped forming rollers 38 which are disposed adjacent the path of travel of the strip and which engage against both of the longitudinal outer edges of the moving strip. These rollers are freely rotatable on short inclined studs 39 secured in brackets 41 mounted on the frame 11.

Hence as the strip advances past the forming rollers, it is gradually and progressively flexed or bent from a flat condition into a cylindrical or tubular form to produce the tube J. During the final stages of this tube forming operation, the formed strip passes onto a stationary horizontal mandrel or horn 45 (Figs. 2 and 3) which extends longitudinally of the frame 11. The horn is supported from a bracket 46 bolted to the frame. The tube J still integral with the strip A is progressively and continuously advanced by the feed rollers 16 along this horn.

During the advancement of the tube J along the horn 45, its longitudinal edges are brought into overlapping relation adjacent each other by a stationary guide finger 48 and a pair of guide rollers 49. The guide finger is secured to an angle plate 51 bolted to the horn bracket 46. One longitudinal edge of the strip passes under this finger and the other edge frictionally engages the side of the finger as the formed strip passes onto the mandrel. This positions the edges of the strip in overlapping relation.

The guide rollers 49 are located adjacent the guide finger 48 and are disposed one on each

side of the horn. These rollers are formed with curved profile to fit against and almost to surround the horn so as to bend the formed strip into a true cylindrical shape while maintaining the edges of the strip in their overlapped relation. These rollers also support the horn intermediate its length. The rollers are freely mounted on short stub shafts 53 carried in brackets 54 bolted to the frame 11.

In the instant apparatus the overlapped edge portions of the tube J are secured together by electric welding devices which include an outside rotatable disc electrode 55 and a similar inside electrode 56. The outside electrode 55 is located in a vertical position just above the horn 45. Its outer periphery engages against and rolls on the overlapped edges of the tube J. This electrode is freely mounted on a short shaft 57 carried in a lever 58 pivotally supported on an upright web section 59 of the frame 11. A compression spring 61 acting against the lever yieldably presses the electrode against the tube J.

The inside electrode 56 is freely mounted on a short shaft 64 (Fig. 3) carried in a yoke 65 located in a recess 66 formed in the horn 45. The yoke is formed on the inner end of a rod 67 which extends back through the horn and terminates adjacent the horn bracket 46. The yoke and the rod are insulated from the horn.

Electric energy from any suitable source is continuously supplied to these electrodes by way of a pair of bus bars 68, 69 (Fig. 2). Bus bar 68 connects with the lever 58 of the outer electrode 55 while bus bar 69 connects with a coupling 11 which extends through the horn adjacent the horn bracket 46 and connects with the yoke rod 67. The coupling is insulated from the horn.

Thus as the overlapped edges of the moving tube J pass between and in contact with the electrodes 55, 56, the electrodes are rotated frictionally and thus form a continuous weld between the edges of the tube. This produces the side seam for the potential can bodies still connected together in the unitary tube structure. Such a connection, it will be recalled, is made by the side seam and the scored portions F, G of the tube.

After the tube is welded it is subjected to a bending action as it advances along an upwardly inclined section 73 of the horn 45 and thence along an elevated horizontal section 74. These sections of the horn are integral with the main horn and are supported on curved rollers 76. Rollers 76 are freely mounted on short shafts 77 secured in a bracket 78 bolted to the frame.

As a potential can body in the tube J advances along the inclined section 73 of the horn, it is moved upwardly and is bent or hinged on its side seam adjacent the slits C, D. This breaks the brittle, welded seam at the slits and ruptures the scored portions F, G along the weakening score lines therein. A stationary roller 79 mounted on a long stud 81 secured in the web section 59 of the frame backs up the straight or unbent part of the tube J during this breaking operation.

Thus the partially divided potential can body is broken at its connecting end and is separated from the tube J and thereupon becomes an individual can body K. The separated can body K is deflected downwardly as it passes from the inclined section 73 of the horn to the elevated horizontal section 74. This separates adjacent bodies K at their side seams and pulls the broken side seam section of the body apart adjacent the slits

C, D. This positively insures that complete separation of the bodies takes place one from another.

This completes the steps required to form the can bodies K from a strip A of continuously moving sheet material. The separated can bodies are discharged to any suitable place of deposit by way of an inclined chute 83. Such a chute is conveniently disposed adjacent the outer end of the elevated horn 45.

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 method 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:

1. The method of making tubular can bodies from a strip of sheet metal continuously moving in the direction of its longitudinal axis, the strip being of a width substantially that of the circumferential dimension of the can body and of a length sufficient to form a plurality of can bodies, which comprises simultaneously cutting through and scoring the continuously moving strip to produce a series of three spaced aligned slits joined by intermediate scored portions lying on a line transverse to the longitudinal axis of the strip, the slits including a central long slit and two adjoining short slits respectively extending through the opposed longitudinal margins of the strip, successively similarly cutting and scoring the continuously moving strip on other transverse lines spaced longitudinally of the strip at intervals equal to the length of a single can body, progressively forming the continuously moving strip into an elongated tube with the longitudinal strip margins in engaged relation with the short slits of each transverse line in registry, continuously metallically bonding the engaged margins of the continuously moving tube to form a side seam, and finally bending the continuously moving bonded tube at successive forward slitted circumferential lines to break the unsevered portions thereof to produce unitary separate can bodies therefrom.

2. The method of making tubular can bodies from a strip of sheet metal continuously moving in the direction of its longitudinal axis, the strip being of a width substantially that of the circumferential dimension of the can body and of a length sufficient to form a plurality of can bodies, which comprises simultaneously cutting through and scoring the continuously moving strip to produce a series of three spaced aligned slits joined by intermediate scored portions lying on a line transverse to the longitudinal axis of the strip, the slits including a central long slit and two adjoining short slits respectively extending through the opposed longitudinal margins of the strip, successively similarly cutting and scoring the continuously moving strip on other transverse lines spaced longitudinally of the strip at intervals equal to the length of a single can body, progressively forming the continuously moving strip into an elongated tube with the longitudinal strip margins in overlapped relation and with the short slits of each transverse line in registry, continuously welding together the overlapped margins of the continuously moving tube to form a side

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seam, and finally bending the continuously moving welded tube at successive forward slitted circumferential lines to break the unsevered portions thereof to produce unitary separate can bodies therefrom.

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REFERENCES CITED

The following references are of record in the file of this patent:

8

UNITED STATES PATENTS

Number	Name	Date
517,223	Lee -----	Mar. 27, 1894
517,580	Livingston -----	Apr. 3, 1894
565,186	Taylor -----	Aug. 4, 1896
1,952,172	Knowlton -----	Mar. 27, 1934
2,052,380	Chapman -----	Aug. 25, 1936
2,177,104	Gonser -----	Oct. 24, 1939
2,222,842	Humphrey -----	Nov. 26, 1940
2,345,411	Moeller -----	Mar. 28, 1944