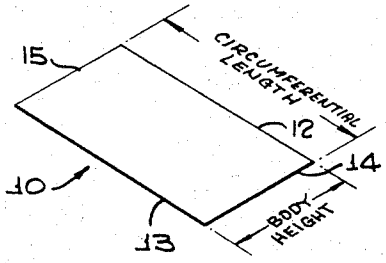
April 2, 1968 E. J. OBIDOWSKI 3,375,798

APPARATUS FOR FLANGING CAN BODIES HAVING PRE-STRETCHED CIRCUMFERENTIAL EDGES

Original Filed May 27, 1963 3 Sheets-Sheet 1

FIG. 1



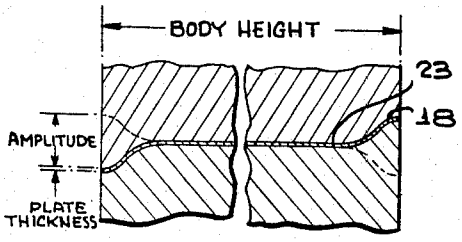


FIG. 4

FIG. 2

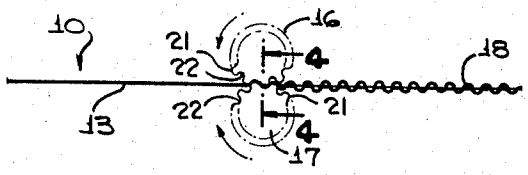


FIG. 3

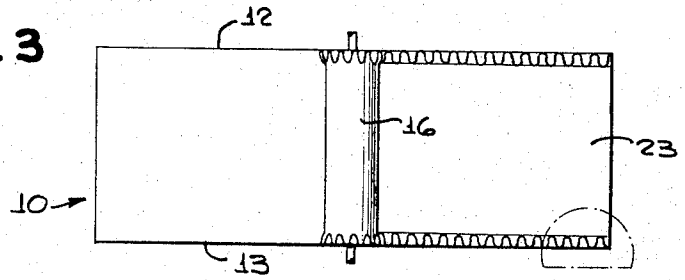


FIG. 6

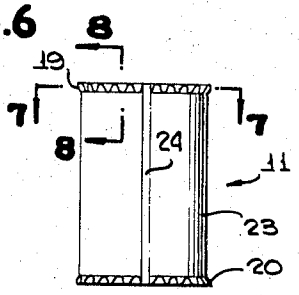
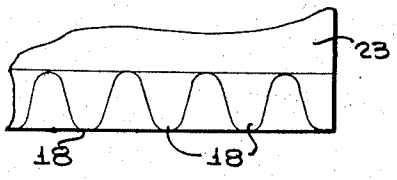


FIG. 5



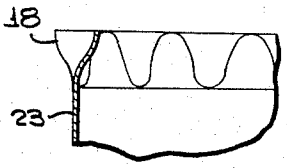
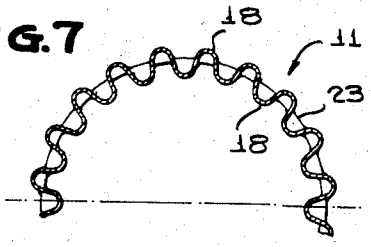


FIG. 8

FIG. 7



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APPARATUS FOR FLANGING CAN BODIES HAVING PRE-STRETCHED CIRCUMFERENTIAL EDGES

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FIG. 9

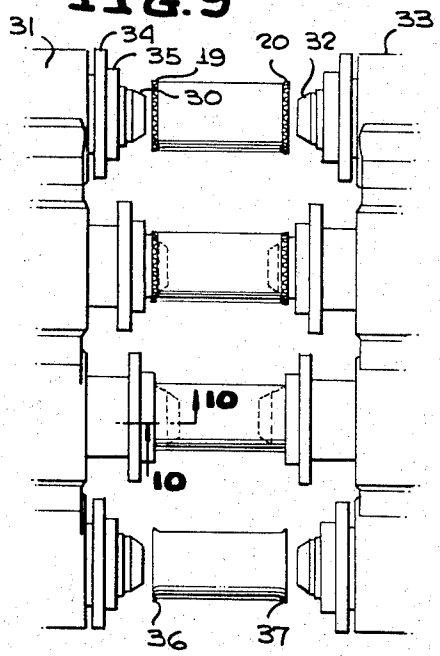
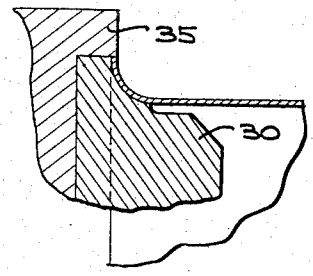


FIG. 10



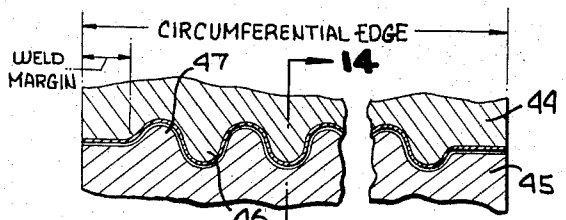


FIG. 13

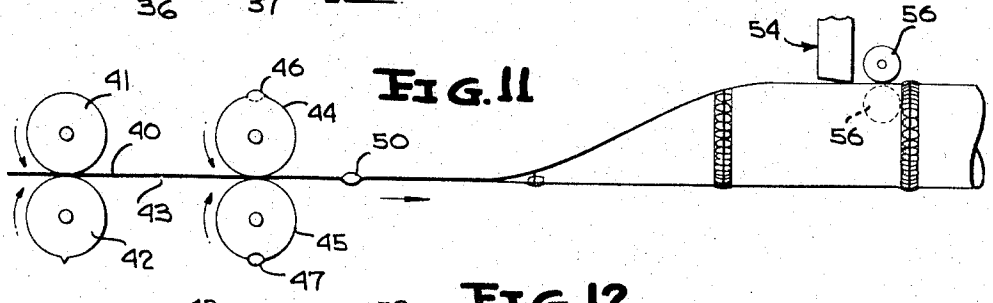


FIG. 11

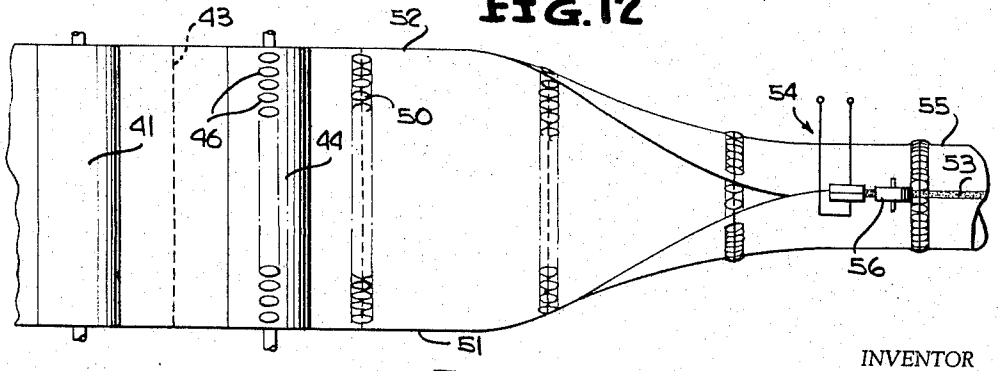


FIG. 12

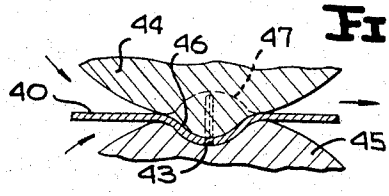


FIG. 14

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APPARATUS FOR FLANGING CAN BODIES HAVING PRE-STRETCHED CIRCUMFERENTIAL EDGES

Original Filed May 27, 1963 3 Sheets-Sheet 3

FIG. 15

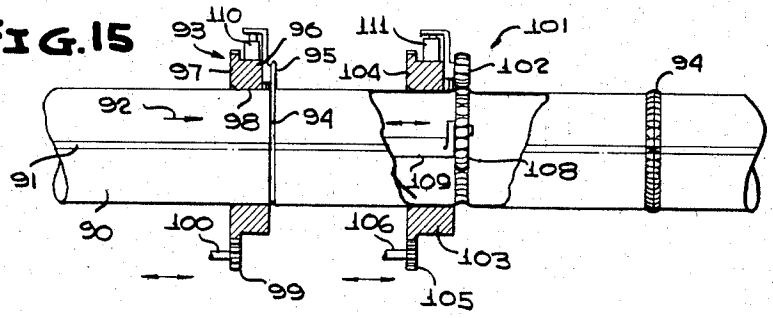


FIG. 16

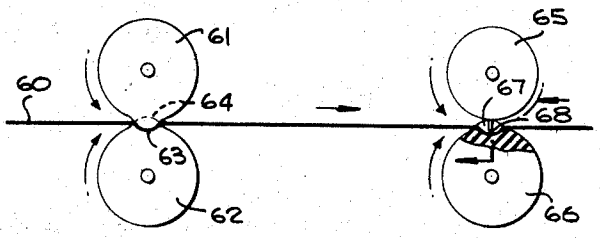


FIG. 17

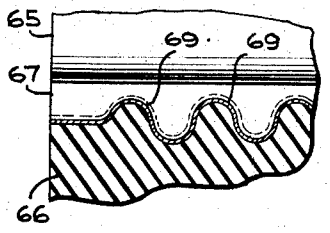


FIG. 18

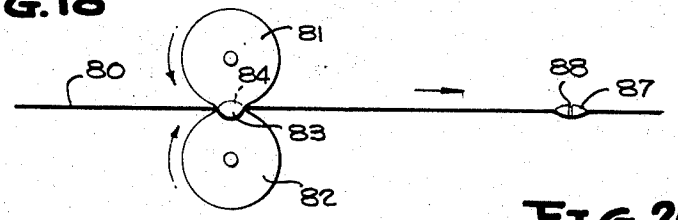


FIG. 19

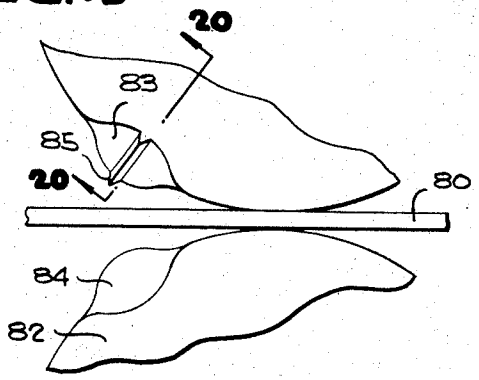
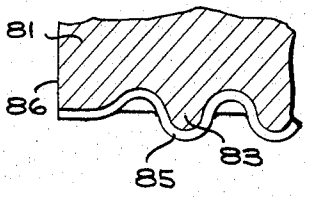


FIG. 20



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United States Patent Office 3,375,798 Patented Apr. 2, 1968

3,375,798

APPARATUS FOR FLANGING CAN BODIES HAVING PRE-STRETCHED CIRCUMFERENTIAL EDGES

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Original application May 27, 1963, Ser. No. 283,332, now Patent No. 3,285,212, dated Nov. 15, 1966. Divided and this application Sept. 30, 1966, Ser. No. 583,390

7 Claims. (Cl. 113—1)

ABSTRACT OF THE DISCLOSURE

Apparatus for treating can body material in the area thereof which is used for forming the conventional flange for attaching a can and to the can body. A pair of coining rolls stretch the can body material along the flange forming portion thereof and forms said portion into an undulating wave which reduces the probability of ruptures or shear lines occurring during flanging of the can body. Apparatus for scoring can body material is used in conjunction with the coining rolls for forming a plurality of can body blanks or can bodies from the can body material.

This is a division of my previous application Ser. No. 283,332, filed May 27, 1963, now Patent No. 3,285,212.

This invention relates generally to the art of making metal can bodies and primarily seeks to provide novel apparatus for forming a flange on a can body such that the flange does not crack or shear along an edge of the flange.

In the manufacture of can bodies, it is common practice to form the can body either from a pre-cut blank or from a coil strip of thin highly tempered aluminum material or thin highly tempered tin-plated steel. It is also known in this art to tin-plate the steel prior to a final rolling operation to produce a very thin blank or strip. As a result of the rolling operation, the blank or strip becomes work hardened and less ductile. Thereafter, when a conventional flanging operation is performed to provide a can body with the usual flange for connecting a can end to the can body, small ruptures or shear lines are likely to occur in the flange.

The ruptures or shear lines occur incidental to the outward bending of the ends of the can body because the perimeter of the end of the can is considerably enlarged and the metal at the bend is stretched on one side and compressed on the other side thus producing shearing stresses which cannot be resisted by the work hardened blank or strip.

It is the purpose of the present invention to provide novel apparatus for forming flanged can bodies in such a manner as to solve the problem referred to above.

An object of this invention is to provide a pair of coining members for stretching can body material in an area which lies within an area from which a circumferential flange is to be formed.

Another object of this invention is to provide a pair of coining members for forming a flange forming portion of a can body into the shape of an undulating wave having peaks and valleys which lie on opposite sides of a plane defined by the can body material.

Another object of this invention is to provide a combined scoring and coining roll which includes a plurality of undulating cogs and a scoring blade corresponding to

the general configuration of said cogs for simultaneously scoring and coining can body material.

Another object of this invention is to provide separate scoring rolls and coining members which are spaced from each other and cooperate for scoring and coining a strip of can body material at intervals spaced apart a distance equal to a can body height.

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

In the drawings:

FIGURE 1 is a perspective view of a blank for forming a can body, the blank having a pair of edges which are to be joined together to form a tubular can body and a pair of end portions for forming opposite end portions of the can body.

FIGURE 2 is a schematic elevational view and shows the blank being disposed between an upper and a lower pair of cooperating coining rolls with part of the blank already having been coined.

FIGURE 3 is a plan view of FIGURE 2 and illustrates that the coining of the blank is limited to a small area along each of the opposite can body end forming portions of the blank.

FIGURE 4 is an enlarged cross-sectional fragmentary view taken on the line **4—4** of FIGURE 2 and shows the relative exemplary dimensions of the plate thickness and the amplitude of a wave or wrinkle produced by the coining operation.

FIGURE 5 is a greatly enlarged fragmentary view of the lower right-hand corner of the coined portion of the blank shown in FIGURE 3.

FIGURE 6 is an elevation view of a can body which is formed from the blank shown in FIGURE 1, after the blank has been coined as shown in FIGURE 3, and shows that the periphery of the end portion of the can has been enlarged with respect to the circumference of the can.

FIGURE 7 is a fragmentary cross-sectional view taken on the line **7—7** of FIGURE 2, and shows that the undulating curl formed by the coining operation curves alternately outwardly and inwardly of the wall of the can body.

FIGURE 8 is an enlarged fragmentary cross-sectional view taken on the line **8—8** of FIGURE 6 and shows the undulating inwardly and outwardly configuration of the coined portion at the top of the can body.

FIGURE 9 is a fragmentary view of a known type of machine for simultaneously flanging two end portions of a can body and graphically illustrates how the undulating curl formed by the coining operation is smoothened during the flanging operation.

FIGURE 10 is a fragmentary enlarged cross-sectional view taken on the line **10—10** of FIGURE 9 and shows a portion of an end portion of a can body cooperating with a flanging die and flanging ring.

FIGURE 11 is a diagrammatic side elevational view of a welding line for forming a continuous tube from a metal strip and which tube is separated into can bodies, the welding line being provided with a pair of cooperating scoring rolls for transversely scoring the strip at can body height intervals and a pair of cooperating coining rolls for transversely coining the scored strip in alignment with score lines formed thereon by the scoring rolls.

FIGURE 12 is a plan view of the welding line of FIGURE 11 and shows the score line extending completely across the strip and the coining terminating at points slightly inwardly from the edges of the strip.

FIGURE 13 is a fragmentary cross-sectional view of the coining rolls in cooperative engagement to impress the undulating curl into the can forming strip.

FIGURE 14 is an enlarged cross-sectional view on the line **14—14** of FIGURE 13 and shows the strip being coined directly over the previously formed score line.

FIGURE 15 is a fragmentary diagrammatic view of a tube for making can bodies with portions broken away, and shows apparatus for making a circumferential score line in the tube and apparatus for circumferentially coining the tube directly over a previously formed score line.

FIGURE 16 is a diagrammatic elevation view illustrating one form of the invention wherein the coining operation is performed prior to the scoring operation.

FIGURE 17 is a fragmentary view partly in section, taken on line **17—17** of FIGURE 16, and shows the scoring rolls inscribing a score line on the previously formed coined area.

FIGURE 18 is a diagrammatic elevation view and illustrates that form of the invention wherein the coining and scoring operations are performed simultaneously.

FIGURE 19 is an enlarged fragmentary portion of the coining-and-scoring rolls shown in FIGURE 18.

FIGURE 20 is a fragmentary cross-sectional view taken on line **20—20** of FIGURE 19 and shows the strip engaging portion of one of the coining-and-scoring rolls.

Referring to the drawings in detail, and initially to FIGURES 1 to 10, there is shown a rectangular blank **10** for forming a can body, generally indicated by the numeral **11**. The blank **10** includes a top edge **12**, a bottom edge **13** parallel to the top edge **12**, a first side edge **14**, and a second side edge **15** which is parallel to the first side edge **14**. The edges **12** and **13** of the blank **10** are pre-cut to a measured length in accordance with the circumferential length of the finished can body **11**, and the edges **14** and **15** are pre-cut to a measured length in accordance with the height of the can body **11**.

The blank **10** is fed between an upper coining roll **16** and a lower coining roll **17** and is embossed with a plurality of undulating protuberances along the top edge **12** and the bottom edge **13** to prestretch the blank **10** along an area from which is formed a top flange **19** and a bottom flange **20** for the can body **11**. Each of the coining rolls **16** and **17** is provided with a plurality of cogs **21** separated circumferentially by spaces **22**. The cogs **21** on the coining roll **16** are designed for mating engagement with the spaces **22** of the coining roll **17** and the cogs **21** on the coining roll **17** are designed for mating engagement with the spaces **22** in the coining roll **16** to emboss the blank **10** with the protuberances **18**. Each of the cogs **21** and spaces **22** diminish in cross-sectional area inwardly of the length of each roll **16** and **17** such that the amplitude of each of the protuberances **18** gradually diminishes into the planar body wall forming portion **23** of the can body **11**.

The area of the blank **10** in which the protuberances **18** have been formed is prestretched such that the edges have been elongated and stresses in this area of the blank **10** have been relieved. After the can body **11** has been formed by joining the first side edge **14** and the second side edge **15** by any known method to form a seam **24**, the peripheral length of the edges **12** and **13** is greater than the normal circumference of the side wall **23**. This prestretching of the flange forming portions of the blank **10** eliminates the ruptures and shear lines which normally are likely to be caused during the flanging operation to be hereinafter described.

Attention is directed to FIGURE 9 which shows can bodies **11** having prestretched top flange forming portions **19** and bottom flange forming portions **20** disposed for

engagement with first flanging dies **30** on a left flanging turret **31** and second flanging dies **32** on a right flanging turret **33**. Each flanging die **30** is provided with a flanging die slide **34** and a flanging ring **35**. Corresponding parts are also provided for the flanging dies **32**, all of which are known in the can making art.

Prior to the present invention it was the standard practice in the can making industry to form the required flanges on the can body by stretching the metal at the ends thereof. When the flanging dies moved into the ends of the can body, shearing stresses were imposed thereon which caused rupturing or shear lines to occur at the edges as the metal of the end portions of the can body was stretched.

In accordance with the present invention, the bottom edge **13** and the top edge **12** of the can body **11** have been prestretched by the coining operation previously described such that when the dies **30** and **32** form the flanges **36** and **37**, as shown in FIGURE 9, it is only necessary that the flange forming portions **19** and **20** be forced to conform to the shape of the dies **30** and **32**. This allows the flanges **36** and **37** to form with very little stretching which is required only to eliminate or iron out the protuberances caused during the prestretching operation and thereby produce a can body **11** having the desired flanges which are required for the double seaming operation which is performed in connecting a can end to the can body.

A modified form of the invention is illustrated in FIGURES 11 through 14 from which it will become apparent that the present invention is readily adaptable for use in making cans from an elongated strip can body forming material. FIGURES 11 and 12 show a strip **40** being fed from a coil between cooperating scoring rolls **41** and **42** for forming score lines **43** completely across the strip **40**. As the strip **40** continues to the right, as shown in FIGURES 11 and 12, each score line **43** becomes disposed between an upper coining roll **44** and a lower coining roll **45** and is engaged by cogs **46** of the roll **44** and cogs **47** of the roll **45** such that the strip **40** is embossed with a series of protuberances **50** which extend transversely of the strip **40**. As shown in FIGURES 12 and 13, the portion of the strip **40** which is embossed with the protuberances **40** ends slightly short of the marginal edges **51** and **52** so that the embossed protuberances **50** will not interfere with the forming of a welded seam **53**, which joins the edges **51** and **52**, at a welding station, generally indicated by the numeral **54**, for forming the strip **40** into an elongated tubular member **55**. Forge rolls **56** are provided at the welding station **54** to insure a proper seam **53**.

A modified form of the invention is illustrated in FIGURES 16 and 17 from which it will be apparent that the coining operation is performed prior to the scoring operation. A can body forming strip **60** is fed (from a source not shown) between an upper coining roll **61** and a lower coining roll **62**. The coining rolls **61** and **62** are similar to the previously described coining rolls **44** and **45** and are provided with mating cogs **63** and **64** respectively. The embossed portion of the strip **60** is then fed between cooperating scoring rollers **65** and **66**. As can be seen in FIGURES 16 and 17, the scoring roll **65** is provided with a scoring blade **67** for producing a score line **68** transversely of the strip **60** along the previously coined portion thereof.

The scoring blade **67**, as is shown in FIGURE 17, is designed for mating engagement with the protuberances **69** formed in the strip **60** by the coining drums **61** and **62**. The score line **68** extends completely across the strip **60** but the protuberances **69** of the embossed portion of the strip terminate short of the marginal edge of the strip **60** so is not to interfere with the welding operation which is to be performed in the manner described with reference to FIGURES 11 and 12.

In FIGURES 18 through 20, there is illustrated another form of the invention wherein the coining opera-

tion and scoring operation are performed simultaneously. A can body forming strip **80** is fed from a source not shown between cooperating combined scoring and coining rolls **81** and **82** which are provided with mating cogs **83** and **84**, respectively. In addition to the cogs **83**, the roll **81** is also provided with a scoring blade **85**. The scoring blade **85** corresponds to the general configuration of the cogs **83**. As shown in FIGURE 20, the scoring blade **85** terminates at a marginal edge **86** of the roll **81** such that the strip **80** will be scored completely transversely of its length, while the roll **81** has cogs **83** which do not extend to the marginal edge **86** but terminate inwardly therefrom. Thus, the strip **80** is provided with a coined portion **87** and has a score line **88** therein.

After the strip **60** and the strip **80** have been coined and scored, as above described, the strips are shaped into tubular form, such as the tubular member **55** as shown in FIGURE 12, and a welding operation is performed to provide the resultant tubular members with a welded seam, such as the seam **53**. The tubular members are then broken along their respective score lines so as to provide a plurality of can bodies. Each of the can bodies formed in this manner is provided with flange forming portions at the opposite edges thereof, which portions have been prestretched by the coining operation such that flanges formed by the apparatus shown in FIGURE 9, and described above, will not have ruptures or shear lines therein.

Another modified form of the invention is illustrated in FIGURE 15 from which it will be apparent that the scoring and coining operation may be performed after the tubular can body forming member has been welded. As shown, a tubular can body forming member **90** having a welded seam **91** is moving to the right as indicated by the arrow **92**. A scoring device **93** is reciprocated along the path of travel of the tubular member **90**, by means not shown, to produce longitudinally spaced circumferential score lines **94** in the tubular member **90**. The scoring device **93** includes a scoring blade **95** which is mounted on an annular block **96** which is integral with an annular gear **97**. The block **96** and the gear **97** have a passageway **98** centrally therethrough to permit passage of the tubular member **90**. The scoring blade **95**, block **96** and gear **97** are rotated about the longitudinal axis of the tubular member **90** by a drive pinion **99** which is connected to a drive shaft **100** which is driven by a source of power, not shown.

A plurality of circumferential score lines **94** are formed at measured intervals along the length of the tubular member **90** such that the tubular member **90** may be subsequently broken along the score lines to provide a plurality of can bodies. Prior to the breaking operation, the tubular member **90** is coined circumferentially along the score lines **94** by a coining apparatus, generally indicated by the numeral **101**. The coining apparatus **101** includes a coining roll **102** mounted on an annular block **103** which is integral with an annular gear **104**. The coining apparatus **101** is reciprocated along the path of travel of the tubular member **90** by a form of reciprocating means not shown and the coining roll **102**, block **103** and gear **104** are rotated by a pinion **105** which is connected to a shaft **106** which is driven by a source of power not shown.

The coining apparatus **101** is further provided with a back-up coining roll **108** which is eccentrically mounted on a shaft **109** which is positioned interiorly of the tubular member **90**. The shaft **109** may be supported in cantilever fashion by supporting means, not shown, which are disposed above the strip which forms the tubular member **90** just prior to the welding station (such as the welding station **54** in FIGURE 12) which provides the seam **91** for the tubular member **90**.

The scoring apparatus **93** and the coining apparatus **101** may be operationally mounted independent of each other or it may be preferable to interconnect these mechanisms by a connecting rod which is adjustable to space the scoring blade **95** and the coining rolls **102** and **108** at various distances which correspond to the height of the desired can body. A retracting mechanism **110** is provided for retracting the scoring blade **95** out of engagement with the tubular member **90** prior to leftward movement of the scoring apparauts **93** upon completion of the cutting of score line **94**. The coining apparatus **101** is also provided with a retracting mechanism **111** for retracting the coining roll **102** out of contact with the tubular member **90** prior to the leftward movement of the embossing apparatus **101** after the coining roll **102** has circumferentially embossed the tubular member **90**.

The tubular member **90** is subsequently broken along the plurality of score lines **94** to provide a plurality of can bodies which have been prestretched at their edges along areas which are flange forming portions. The can bodies are subsequently operated upon by the mechanism shown in FIGURE 9 such that can end receiving flanges are formed on the can bodies without any ruptures or shear lines being formed therein.

While preferred forms and arrangements of parts have been shown in illustrating the invention, it is to be understood that variations in the forms and arrangement of parts may be provided without departing from the scope of the invention as defined in the appended claimed subjet matter.

What is claimed is:

1. Apparatus for shaping can bodies of can body material, said apparatus comprising a pair of opposed coining members between which can body material can be passed along a plane of movement, each member of said pair having surface portions in the shape of an undulating wave; the wave crest portions of one member being receivable in the wave trough portions of the other member and vice-versa, said members comprising means for pressing and thus coining and stretching the can body material while simultaneously positively forming the stretched areas of material alternately on opposite sides of said plane of movement.

2. Apparatus as defined in claim **1** wherein said coining members comprise means for stretching the can body material in an area which lies within an area from which a circumferential flange is to be formed.

3. Apparatus as defined in claim **1** wherein scoring means are provided for scoring can body material at intervals therealong along the same areas thereof which are acted upon by said coining members.

4. Apparatus as defined in claim **3** wherein said scoring means and said coining members are located for scoring and coining a strip of can body material at intervals spaced apart a distance equal to a can body height.

5. Apparatus as defined in claim **3** wherein said scoring means and coining member comprise a combined scoring and coining roll including a plurality of undulating cogs and a scoring blade corresponding to the general configuration of said cogs for simultaneously scoring and coining said can body material.

6. Apparatus for shaping can bodies of can body material, said apparatus comprising a pair of opposed coining members between which can body material can be passed, each member of said pair having surface portions in the shape of an undulating wave; the wave crest portions of one member being receivable in the wave trough portions of the other member, said members comprising means for pressing and thus coining and stretching the can body material while simultaneously positively forming the stretched areas of material, said can body material comprising a tubular member, means for mounting one of said coining members within the outline of the tubular member, means for mounting the other of said coining members exteriorly of the outline of the tubular member, means for moving said coining members toward and away from each other and into and out of engagement with the tubular member, and means for

causing relative movement of said coining members with respect to the tubular member.

7. Apparatus as defined in claim 3 wherein said scoring means comprises a pair of scoring rolls, one of said rolls including a scoring blade for forming a score line in the can body material, said rolls being spaced from each other a distance substantially equal to the thickness of said can body material.

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