

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN SCORING METAL CONTAINER COMPONENTS

(71) We, THE METAL BOX COMPANY LIMITED, a Company Incorporated under the laws of Great Britain, of 37, Baker Street, London, W.1, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to scoring metal container components.

15 The usual method of producing local weakening, usually known as scoring, in any metal, including tinplate, container components is by placing the component on an anvil and impelling against the component a scoring tool having a trapeziform shaped blade. The scoring is thus effected by local extrusion of the material and considerable pressure, depending on the physical properties, is required. In addition to the considerable energy needed, the scoring tool must be made with precision and is thus expensive to produce, the tool is found in practice to have a relatively short life when used for scoring ferrous metals such as tinplate and to be subject to breakage at the corners thereof which are subject to the shearing stresses, and due to excessive work-hardening the score produced are often such that when the components are secured to containers the scores are apt to fracture if the containers are subjected to mis-use as by dropping or knocking thereof. It is further found that the scoring process tends to cause disintegration of the protective film, usually a coating of lacquer, which is applied to the surface of the component opposite that in which the scoring is effected.

40 It is a main object of the present invention to provide a scoring tool, and a method of scoring tinplate or other metal container components, which will considerably reduce the above-mentioned disadvantages inherent in the use of scoring tools the scoring blades of which are of trapeziform shape.

According to the invention there is pro-

vided a scoring tool for scoring a metal container component, comprising a head portion connectable to the ram of a press and extending from the head a scoring blade having two faces which define the shape of the score to be formed in the component, which faces in section converge as substantially straight lines substantially to a point, and the angle between which is from 80° to 120° but is greater than 80°. Desirably the angle between the faces is at least 90° and in the preferred embodiment the angle between the faces is substantially 90°.

The invention also contemplates a method of scoring a metal container component comprising cutting into the component the desired score by locating the component relative to one of a pair of scoring tools of which one is an anvil and the other a scoring head having a scoring blade formed by two faces which define the shape of the score to be formed in the component, which faces in section converge as substantially straight lines substantially to a point, and the angle between which is from 80° to 120° but is greater than 80°, and impelling against the component the other of the tools. Desirably the angle is at least 90° and in the preferred embodiment the angle is substantially 90°. The method preferably includes the step of preforming the component by forming therein a radiused portion arranged to be directed upwards towards the scoring tool and to be engaged by the scoring blade.

When the component is a can end having a chuck wall connected with a seaming panel and through a chuck radius with a central panel, the radiused portion is formed in the central panel. The score may be conformed substantially to the shape of the perimeter of the can end and be located near to the chuck radius. In one embodiment thereof the invention includes the step of preforming the central panel with an annular portion for the attachment thereto of an opening tab arranged when the can end is secured to a can to effect initial rupturing of the score, said annular

portion sloping downwards from said radiused portion to a depression in the central panel.

In order that the invention may be clearly understood an embodiment thereof will now be described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 diagrammatically illustrates scoring when using the known form of scoring tool provided with a trapeziform shape scoring blade,

Fig. 2 illustrates the manner in which the scoring blade of Fig. 1 tends to fail,

Fig. 3 illustrates the method of scoring when using a scoring tool according to the invention,

Fig. 4 diagrammatically illustrates the mode of operation of the scoring tool of Fig. 3,

Fig. 5 illustrates the manner in which the blade of Fig. 3 avoids the tendency to failure of the blade of Fig. 1,

Fig. 6 illustrates a part of a can end seamed to a can body, and

Fig. 7 is a top plan of the can end of Fig. 6.

Referring to the drawings, Figs. 1 and 2 are illustrative of the known form of scoring tool provided with a trapeziform shaped scoring blade 1. When this blade is used for scoring a tinplate can end 2 the compound angle between the blade flanks 3, 4 is usually of the order of between 50° and 60° and the width of the blade face 5 depends on the nature of the tinplate. The blade 1 induces high stresses in the can end 2 and the action of scoring produces primarily compressive stress equal to the characteristics plastic stress of the can end which gradually work hardens as the deformation progresses. The material beneath the face 5 undergoes an extrusion process which is resisted by the friction forces between the scoring blade and the die face, not shown. The stresses increase proportionally to the reduction in thickness of the residual material 6. This reduction is considered to be high and the effect thereof is illustrated in Fig. 1 where the original rectangle a_0, b_0, c_0, d_0 of material has been transformed by reduction of thickness to rectangle a_1, b_1, c_1, d_1 with considerable lateral movement of material as indicated at a_1, d_1, a_2, d_2 and b_1, c_1, b_2, c_2 . The pressure exerted by the material being scored on the face 5 of the scoring blade is accentuated when work hardening material such as tinplate is used, and is influenced by the surface finish of both the scoring blade 1 and the support anvil, not shown, and by the width of the face 5. This pressure may reach a critical magnitude which is manifested by a phenomenon sometimes referred to as a "Stress Hill". The pressure in the scored material, combined with the frictional stresses on the face 5, induce shear stresses in the scoring blade. The relevant directions

of these shear stresses are inclined at 45° to the face 5, as shown in Fig. 2, and create lines 7, 8 of potential failure which often result in the breaking off of the corners 9, 10 of the blade.

To reduce these disadvantages inherent in the blade 1 the present invention provides a scoring tool which comprises a head portion 11, Fig. 3, connectable to the ram, not shown, of a press and extending from the head 11 is a scoring blade having two faces 12, 13 which define the shape of the score, for example the score 14, Fig. 7, to be formed in the component 15 which for the purposes of this description is considered to be a tinplate can end for a container 16, Fig. 6. As seen in section, the two faces 12, 13 converge as substantially straight lines, see Fig. 5, substantially to a "point" 17 and the angle between the faces 12, 13 is substantially 90° . The "point" 17 is slightly radiused; for example the radius is of the order of less than 0.0005 inch. The blade so constructed has the strength to resist the shear stresses during a scoring operation because the potential failure lines 7, 8 do not emerge from the faces 12, 13 of the blade. This also has the effect of diminishing the "Stress Hill" condition because the scored material is cut by the blade, rather than extruded as is the case with the known kind of blade 1 discussed above.

It is also found that the scoring tool of Fig. 3 is more economical to manufacture than is the blade 1 because the tool of Fig. 3 has only two faces 12, 13 to be shaped and finished to a high degree as compared with the three faces 3, 4 and 5 of the tool 1. It is further found that efficient scoring can be effected by the use of the tool of Fig. 3 with much lower pressures as compared with those necessary when using the tool of Fig. 1.

The method of scoring a tinplate container component 15 according to the invention comprises locating the component 15 on a stationary anvil 18, Fig. 3, having a radiused upper surface to engage the component; and cutting into the component the desired score 14 by impelling against the component the scoring blade having the two faces 12, 13 which define the shape of the score 14, which as described above in section converge substantially 90° . If desired, the scoring tool may be stationary and the anvil impelled against a component 15 located on the scoring tool. It is of importance that the surface 11a of the head 11 and the surface 18b of the support 18c for the anvil 18 to be accurately machined in order to obtain proper control of the thickness of the residual metal forming the score 14.

While 90° represents the optimum, the advantages obtained by the invention can be achieved with angles greater than 90° and the angle may be as high as 120° . If the

angle is slightly less than 90° there will be a theoretical tendency for slight blade fracture to occur, but in some instances in practice this tendency may be sufficiently negligible for an angle in the range 80° to 90° but greater than 80° to be acceptable.

It is found that an advantage is obtained if, before scoring is effected, the portion 19, Fig. 3, of material to be scored is bent. To this end a radiused portion 19 is formed in the component 15 to be directed upwards towards the scoring tool to be engaged by the scoring tool as shown in Fig. 3. The radiused portion 19 is formed so that it conforms it to the profile of the radiused upper surface of the anvil 18. As mentioned above, the component 15 is a can end and the can end has a chuck wall 20 which is connected with a seaming panel 21 and through a chuck radius 22 with a central panel 23. The radiused portion 19 is formed in the central panel 23. As can be seen from Fig. 7, the score 14 is conformed substantially to the shape of the perimeter of the can end and is located near to the chuck radius 22.

With can ends scored by the known kind of tools as described with reference to Fig. 1 it was found that should the can receive a knock on the seam at about the position indicated at 24, Fig. 6, the seam would be inwardly deformed as indicated in broken lines and the score in the can end would sometimes burst open. This tendency is greatly reduced by constructing the can end as described in the preceding paragraph.

The method also includes the step of preforming the central panel 23 with an annular portion 25 for the attachment thereto, as by soldering 26, of a wire opening tab 27 having an end portion 28 located over the score 14 and arranged when the can end is seamed to the can 16 to effect initial rupturing of the score. The annular portion 25 slopes downwards, Figs. 3 and 6, from the radiused portion 19 to a depression 29 in the central panel. By this means the finger gripping portion 30, Fig. 7, of the opening tab 27 extends over the depression 29 to be capable of being easily raised by the fingers of a hand. On lifting of the portion 30 the annular portion 25 is raised, as indicated by broken lines in Fig. 6, so that the score is ruptured by the end portion 28 of the tab 27 and pulling on the tab 27 can effect removal of the can end portion bounded by score 14.

Another advantage of the use of a scoring tool as described with reference to Fig. 3 over that of Fig. 1 is that when the portion bounded by the score is removed the raw edge left by said removal is less apt to cut or damage the hand of the consumer, for example while extracting the contents from the container.

WHAT WE CLAIM IS:—

1. A scoring tool for scoring a metal container component, comprising a head portion connectable to the ram of a press and extending from the head a scoring blade having two faces which define the shape of the score to be formed in the component, which faces in section converge as substantially straight lines substantially to a point, and the angle between which is from 80° to 120° but is greater than 80° .

2. A tool according to Claim 1, wherein the angle is at least 90° .

3. A tool according to Claim 1, wherein the angle is substantially 90° .

4. A method of scoring a metal container component comprising cutting into the component the desired score by locating the component relative to one of a pair of scoring tools of which one is an anvil and the other a scoring head having a scoring blade formed by two faces which define the shape of the score to be formed in the component, which faces in section converge as substantially straight lines substantially to a point and the angle between which is from 80° to 120° but is greater than 80° , and impelling against the component the other of the tools.

5. A method according to Claim 4, wherein the angle between the faces is at least 90° .

6. The method according to Claim 4, wherein the angle between the faces is substantially 90° .

7. The method according to any one of Claims 4 to 6, including the step of preforming the component by forming therein a radiused portion arranged to be directed upwards towards the scoring tool and to be engaged by the scoring blade.

8. The method according to Claim 7 in which the component is a can end having a chuck wall connected with a seaming panel and through a chuck radius with a central panel, wherein said radiused portion is formed in the central panel.

9. The method according to Claim 8, wherein the score is conformed substantially to the shape of the perimeter of the can end and is located near to the chuck radius.

10. The method according to Claim 9 including the step of preforming the central panel with an annular portion for the attachment thereto of an opening tab arranged when the can end is secured to a can to effect initial rupturing of the score, said annular portion sloping downwards from said radiused portion to a depression in the central panel.

11. A can component scored by the method according to any one of Claims 4 to 10.

angle is slightly less than 90° there will be a theoretical tendency for slight blade fracture to occur, but in some instances in practice this tendency may be sufficiently negligible for an angle in the range 80° to 90° but greater than 80° to be acceptable.

It is found that an advantage is obtained if, before scoring is effected, the portion 19, Fig. 3, of material to be scored is bent. To this end a radiused portion 19 is formed in the component 15 to be directed upwards towards the scoring tool to be engaged by the scoring tool as shown in Fig. 3. The radiused portion 19 is formed so that it conforms it to the profile of the radiused upper surface of the anvil 18. As mentioned above, the component 15 is a can end and the can end has a chuck wall 20 which is connected with a seaming panel 21 and through a chuck radius 22 with a central panel 23. The radiused portion 19 is formed in the central panel 23. As can be seen from Fig. 7, the score 14 is conformed substantially to the shape of the perimeter of the can end and is located near to the chuck radius 22.

With can ends scored by the known kind of tools as described with reference to Fig. 1 it was found that should the can receive a knock on the seam at about the position indicated at 24, Fig. 6, the seam would be inwardly deformed as indicated in broken lines and the score in the can end would sometimes burst open. This tendency is greatly reduced by constructing the can end as described in the preceding paragraph.

The method also includes the step of preforming the central panel 23 with an annular portion 25 for the attachment thereto, as by soldering 26, of a wire opening tab 27 having an end portion 28 located over the score 14 and arranged when the can end is seamed to the can 16 to effect initial rupturing of the score. The annular portion 25 slopes downwards, Figs. 3 and 6, from the radiused portion 19 to a depression 29 in the central panel. By this means the finger gripping portion 30, Fig. 7, of the opening tab 27 extends over the depression 29 to be capable of being easily raised by the fingers of a hand. On lifting of the portion 30 the annular portion 25 is raised, as indicated by broken lines in Fig. 6, so that the score is ruptured by the end portion 28 of the tab 27 and pulling on the tab 27 can effect removal of the can end portion bounded by score 14.

Another advantage of the use of a scoring tool as described with reference to Fig. 3 over that of Fig. 1 is that when the portion bounded by the score is removed the raw edge left by said removal is less apt to cut or damage the hand of the consumer, for example while extracting the contents from the container.

WHAT WE CLAIM IS:—

1. A scoring tool for scoring a metal container component, comprising a head portion connectable to the ram of a press and extending from the head a scoring blade having two faces which define the shape of the score to be formed in the component, which faces in section converge as substantially straight lines substantially to a point, and the angle between which is from 80° to 120° but is greater than 80°.
2. A tool according to Claim 1, wherein the angle is at least 90°.
3. A tool according to Claim 1, wherein the angle is substantially 90°.
4. A method of scoring a metal container component comprising cutting into the component the desired score by locating the component relative to one of a pair of scoring tools of which one is an anvil and the other a scoring head having a scoring blade formed by two faces which define the shape of the score to be formed in the component, which faces in section converge as substantially straight lines substantially to a point and the angle between which is from 80° to 120° but is greater than 80°, and impelling against the component the other of the tools.
5. A method according to Claim 4, wherein the angle between the faces is at least 90°.
6. The method according to Claim 4, wherein the angle between the faces is substantially 90°.
7. The method according to any one of Claims 4 to 6, including the step of preforming the component by forming therein a radiused portion arranged to be directed upwards towards the scoring tool and to be engaged by the scoring blade.
8. The method according to Claim 7 in which the component is a can end having a chuck wall connected with a seaming panel and through a chuck radius with a central panel, wherein said radiused portion is formed in the central panel.
9. The method according to Claim 8, wherein the score is conformed substantially to the shape of the perimeter of the can end and is located near to the chuck radius.
10. The method according to Claim 9 including the step of preforming the central panel with an annular portion for the attachment thereto of an opening tab arranged when the can end is secured to a can to effect initial rupturing of the score, said annular portion sloping downwards from said radiused portion to a depression in the central panel.
11. A can component scored by the method according to any one of Claims 4 to 10.



12. A scoring tool for scoring a metal container component, constructed and arranged substantially as herein described with reference to and as illustrated in Figs. 3 to 5
- 5 of the accompanying drawings.

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