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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to the Closing of Cans or Like Containers

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: —

This invention relates to the closing of a can or like container by a circular lid or cap made of sheet metal such as tinplate or aluminium, said lid or cap including a plug portion for insertion into and frictional engagement with the mouth ring of the container, a centre panel, and a peripheral flange.

Where a container is closed by a lid or cap of the kind above mentioned and interference fit required to prevent leakage between the container mouth ring and the plug portion of the lid or cap is such that there is built up in the headspace of the container a positive pressure which causes the lid or cap to be less secure in its attachment or may even lead to ejection of the lid. Further, if the filled and closed container is dropped on its side the lid or cap is more easily ejected by the dropping if there is a positive pressure in the container than is the case if the internal pressure is approximately equal to or less than atmospheric pressure.

In one proposal for overcoming these objections the plug portion of a lid or cap has been provided with an indentation which extends for approximately one half the length of the plug portion from the lower, or inner, end thereof. This results in only a partial venting of the headspace because the top half of the plug portion must be a perfect fit with the sides of the mouth ring of the container in order to prevent leakage of the contents of the container.

In another proposal a very shallow indentation is arranged to extend the full length of the plug portion and to permit pressure to vent away slowly. This proposal is, however, subject to the disadvantage that products of low viscosity leak from the closed container.

It is an object of the present invention to provide a lid or cap capable of permitting rapid venting, that is at a rate compatible with normal running of high speed capping machines, of a container closed thereby while preventing leakage from the container and with this object in view there is provided a circular lid or cap made of sheet metal such as tinplate or aluminium, said lid or cap including a plug portion for insertion into and frictional engagement with the mouth ring of a can or like container, and a centre panel, wherein the plug portion is provided with at least one reformable indentation extending lengthwise thereof from the outer to the inner end of the plug portion, the indentation or indentations being so formed that, during the insertion of the plug portion into the mouth ring of a container, air in the headspace of the container is rapidly vented through the space formed between the mouth ring and the indentation or indentations and following said insertion the indentation or indentations is or are capable of re-formation to press it or them smoothly into engagement with the mouth ring to prevent leakage of the contents of the container. In one embodiment of the invention the indentation or each indentation, is directed towards the axis of the lid or cap and has a radius approximately equal to the radius of the exterior of the plug portion. The plug portion may

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include inner and outer concentric walls spaced one from the other and the indentation be formed in the outer wall. The upper end of the indentation, or of each indentation, may slope inwards and towards the inner wall to permit a plug-reforming tool introduced between the inner and outer walls gently and progressively to ease the indentation outwards into engagement with the mouth ring.

Another object of the invention is to provide a method of closing a can or like container and in accordance with this object there is provided the method of closing a can or like container provided with a mouth ring, which method consists of the steps of venting the headspace of the container by pressing the plug portion of a lid or cap as set forth in the last preceding paragraph into the mouth ring of the container until the plug portion is fully inserted therein and then applying pressure to the indentation or indentations to effect re-formation thereof until it or they is or are pressed into engagement with the mouth ring. The method may include the step of flexing the centre panel of the lid towards the bottom of the container to effect venting of more air from the headspace prior to re-formation of the indentation or indentations. The method also include the step of flexing the bottom of the container towards the top thereof to effect venting of air from the headspace prior to re-formation of the indentation or indentations.

The invention also comprehends a capping head for closing with a lid or cap according to the invention a can or like container provided with a mouth ring, said head comprising a platen adapted for connection with a reciprocable plunger, an annular indentation reforming tool concentric and movable with said platen, a ring spaced axially from the platen and supported by the reforming tool for movement therewith to effect insertion of the plug portion of the lid or ~~can~~ into the mouth ring of the container and for limited axial movement relative to said tool to permit movement of the tool to effect said reformation of the indentation or indentations and springs extending between said platen and ring. The capping head may include a pressure pad movable with and axially relative to said tool, and auxiliary springs operable to apply pressure through the pressure pad to the centre panel of the lid or cap to effect flexing thereof towards the bottom of the container before the reforming tool effects reformation of the indentation or indentations.

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

Fig. 1 is a pictorial view of a lid or cap according to the invention,

Fig. 2 is a top plan of the cap or lid,

Fig. 3 is a section on line III—III, Fig. 4,

Fig. 4 is a section of a part of a can fitted with the lid of Fig. 1 before reformation of the indentation provided in the plug portion of the lid,

Fig. 5 is a section of a part of another kind of lid according to the invention,

Fig. 6 is a section through a capping head for closing a container with a lid as shown in Fig. 1, and

Fig. 7 is a section on line VII—VII, Fig. 6,

Fig. 8 is a top plan of a modified form of the lid shown in Fig. 1,

Fig. 9 is a section on line IX—IX, Fig. 8 and

Fig. 10 is a section similar to that of Fig. 4 but showing the lid of Fig. 8.

In the drawings like reference numerals refer to like or similar parts.

Referring to Figs. 1 to 4 of the drawings, a circular lid or cap is made of sheet metal, such as tinplate or aluminium, and includes a plug portion for insertion into and frictional engagement with the mouth ring 1 of a can or like container 2. As shown in Fig. 4 the mouth ring 1 is as described in British Specification No. 832383 but it may, if desired, be of other known form. The plug portion as shown in Fig. 4 includes inner and outer concentric walls 3, 4 spaced one from the other, a centre panel 5 formed in continuation of the inner wall 3, and a peripheral lever flange 6 which extends laterally from and is integral with the outer wall 4. From the upper end a reformable indentation 8 slopes towards the axis of the lid, as at 7, Fig. 4, to permit a plug-reforming tool, described below, to be introduced between the inner and outer walls 3, 4 and gently and progressively to ease the indentation 8 formed in the outer wall 4 outwards into engagement with the mouth ring 1.

If desired more than one reformable indentation 8 may be provided and spaced apart around the plug portion.

The indentation, or each indentation, 8 is curved inwards towards the axis of and extends lengthwise of the outer wall 4 to a position adjacent to the outer end of the plug portion where the latter joins the lever flange 6. As can be seen from Fig. 3, the depth *d* of the indentation is shallow as compared with its width W and in a preferred embodiment of the invention the inwardly directed curve of the indentation has a radius 9, Fig. 3, which is approximately the same as the radius of the exterior of the outer wall 4. The longitudinal sides of the indentation are curved, as at 10, Fig. 3, and are blended into the plug portion. This avoids the formation of sharply defined creases as the metal of the inwardly curved portion is eased outwards as described

below and also any tendency for kinking of the metal.

When a container 2 is to be closed by the lid or cap the plug portion of the lid is entered into the mouth ring 1 and the container is positioned on the bed of a closing press which includes a capping head as described below. The capping head engages the peripheral lever flange 6 and presses the plug portion of the lid into the mouth ring until the plug portion is fully inserted as shown in Fig. 4. As the plug portion passes into the mouth ring the air in the headspace of the container is rapidly vented through the space formed between the mouth ring 1 and the indentation 8. When the plug portion is pressed fully into the mouth ring an indentation reforming tool is arranged to press and reform the indentation gently and progressively outwards into engagement with the mouth ring 1 thus forming a smooth leak-proof joint therewith.

In order to obtain further venting of the container, when the plug portion of the lid is fully inserted into the mouth ring the centre panel 5 may be flexed inwards towards the bottom of the container before reforming of the indentation. Alternatively, or additionally, the bottom, not shown, of the container may be flexed upwards towards the top of the container. This may be effected by doming the press bed on which the container rests during closing thereof so that the closing pressure exerted by the capping head presses the bottom against the dome to effect the flexing of the bottom.

A capping head suitable for closing a container with a lid as shown in Figs. 1 to 4 is illustrated in Figs. 6 and 7 and comprises a platen 11 provided with a spigot 12 by which it can be connected with a reciprocable plunger or the like, not shown, forming a part of the closing press. An annular indentation reforming tool 13 is concentric and movable with the platen 11, being secured thereto as with screws 14. A ring 15 is spaced axially from the platen 11 and is supported by a lip 16 on the reforming tool 13 so as to be movable with the tool during the insertion of the plug portion of a lid into the mouth ring of a container. As may be seen from Fig. 6, this allows limited axial movement of the tool 13 relative the ring 15, to effect the reformation of the indentation 8 of the lid or cap. Springs 17 extend between the platen 11 and ring 15 and are compressible when the tool 13 is moved relative to ring 15 to reform the indentation. A pressure pad 18 is also supported by the tool 13 to be movable therewith and to permit limited axial movement of the tool relative to the pad, the pad being supported by a lip 19 on the tool 13. Auxiliary springs 20 extend between the pad 18 and the platen 11 and are arranged, when the plug portion has been fully inserted into the mouth ring, to press against and flex the centre panel 5 towards the bottom of the container. The auxiliary springs are so selected that they cause flexing of the centre panel 5 without permanent creasing thereof.

When the capping head is in operation it is moved downwards as a unit until the lip 21 on the ring 15 engages the peripheral lever flange 6 of the lid and has effected full insertion of the plug portion of the lid into the mouth ring of the container when the ring 15 is arrested and continued downward movement of the platen 11 compresses the spring 17, 20 thereby causing the pad 18 to flex the centre panel 5 and causing the reforming tool 13 to move between the inner and outer walls 3, 4 of the lid and gently and progressively to ease the inwardly curved indentation 8 outwards smoothly into engagement with the mouth ring. A venting channel 22 provided in the reforming tool 13 permits venting of air entrapped between the lid and the capping head. On the return movement of the platen 11, the reforming tool is withdrawn and the springs 17 cause the closed container to be released from the capping head.

Fig. 5 illustrates an alternative known form of lid or cap to which the indentation 8 can be applied. In this form of cap or lid the plug portion consists of a single wall 23.

Figs. 8 to 10 illustrate a modification which can be embodied in the lid or cap shown in Figs. 1 to 4 or 5. The modification consists of the provision of "pips" or indents 24 the purpose of which is to prevent sealing of the cap or lid against the mouth ring 1 before air has had an opportunity of venting through the indentation 8. As shown in Fig. 7 a pair of pips 24 are disposed one on each side of the indentation 8 and two further pairs of pips are provided to maintain the correct geometric relationship between the lid and the container.

WHAT WE CLAIM IS:—

1. A circular lid or cap made of sheet metal, such as tinplate or aluminium, said lid or cap including a plug portion for insertion into and frictional engagement with the mouth ring of a can or like container, and a centre panel, wherein the plug portion is provided with at least one reformable indentation extending lengthwise thereof from the outer to the inner end of the plug portion, the indentation or indentations being so formed that, during the insertion of the plug portion into the mouth ring of a container, air in the headspace of the container is rapidly vented through the space formed between the mouth ring and the indentation or indentations and following said insertion the indentation or indentations is or are capable of reformation to press it or them smoothly into

below and also any tendency for kinking of the metal.

When a container 2 is to be closed by the lid or cap the plug portion of the lid is entered into the mouth ring 1 and the container is positioned on the bed of a closing press which includes a capping head as described below. The capping head engages the peripheral lever flange 6 and presses the plug portion of the lid into the mouth ring until the plug portion is fully inserted as shown in Fig. 4. As the plug portion passes into the mouth ring the air in the headspace of the container is rapidly vented through the space formed between the mouth ring 1 and the indentation 8. When the plug portion is pressed fully into the mouth ring an indentation reforming tool is arranged to press and reform the indentation gently and progressively outwards into engagement with the mouth ring 1 thus forming a smooth leak-proof joint therewith.

In order to obtain further venting of the container, when the plug portion of the lid is fully inserted into the mouth ring the centre panel 5 may be flexed inwards towards the bottom of the container before reforming of the indentation. Alternatively, or additionally, the bottom, not shown, of the container may be flexed upwards towards the top of the container. This may be effected by doming the press bed on which the container rests during closing thereof so that the closing pressure exerted by the capping head presses the bottom against the dome to effect the flexing of the bottom.

A capping head suitable for closing a container with a lid as shown in Figs. 1 to 4 is illustrated in Figs. 6 and 7 and comprises a platen 11 provided with a spigot 12 by which it can be connected with a reciprocable plunger or the like, not shown, forming a part of the closing press. An annular indentation reforming tool 13 is concentric and movable with the platen 11, being secured thereto as with screws 14. A ring 15 is spaced axially from the platen 11 and is supported by a lip 16 on the reforming tool 13 so as to be movable with the tool during the insertion of the plug portion of a lid into the mouth ring of a container. As may be seen from Fig. 6, this allows limited axial movement of the tool 13 relative the ring 15, to effect the reformation of the indentation 8 of the lid or cap. Springs 17 extend between the platen 11 and ring 15 and are compressible when the tool 13 is moved relative to ring 15 to reform the indentation. A pressure pad 18 is also supported by the tool 13 to be movable therewith and to permit limited axial movement of the tool relative to the pad, the pad being supported by a lip 19 on the tool 13. Auxiliary springs 20 extend between the pad 18 and the platen 11 and are arranged, when the plug portion has been fully inserted into the mouth ring, to press against and flex the centre panel 5 towards the bottom of the container. The auxiliary springs are so selected that they cause flexing of the centre panel 5 without permanent creasing thereof.

When the capping head is in operation it is moved downwards as a unit until the lip 21 on the ring 15 engages the peripheral lever flange 6 of the lid and has effected full insertion of the plug portion of the lid into the mouth ring of the container when the ring 15 is arrested and continued downward movement of the platen 11 compresses the spring 17, 20 thereby causing the pad 18 to flex the centre panel 5 and causing the reforming tool 13 to move between the inner and outer walls 3, 4 of the lid and gently and progressively to ease the inwardly curved indentation 8 outwards smoothly into engagement with the mouth ring. A venting channel 22 provided in the reforming tool 13 permits venting of air entrapped between the lid and the capping head. On the return movement of the platen 11, the reforming tool is withdrawn and the springs 17 cause the closed container to be released from the capping head.

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Figs. 8 to 10 illustrate a modification which can be embodied in the lid or cap shown in Figs. 1 to 4 or 5. The modification consists of the provision of "pips" or indents 24 the purpose of which is to prevent sealing of the cap or lid against the mouth ring 1 before air has had an opportunity of venting through the indentation 8. As shown in Fig. 7 a pair of pips 24 are disposed one on each side of the indentation 8 and two further pairs of pips are provided to maintain the correct geometric relationship between the lid and the container.

WHAT WE CLAIM IS:—

1. A circular lid or cap made of sheet metal, such as tinplate or aluminium, said lid or cap including a plug portion for insertion into and frictional engagement with the mouth ring of a can or like container, and a centre panel, wherein the plug portion is provided with at least one reformable indentation extending lengthwise thereof from the outer to the inner end of the plug portion, the indentation or indentations being so formed that, during the insertion of the plug portion into the mouth ring of a container, air in the headspace of the container is rapidly vented through the space formed between the mouth ring and the indentation or indentations and following said insertion the indentation or indentations is or are capable of reformation to press it or them smoothly into

engagement with the mouth ring to prevent leakage of the contents of the container.

2. A lid or cap according to Claim 1, wherein the indentation, or each indentation, is directed towards the axis of the lid or cap and has a radius approximately equal to the radius of the exterior of the plug portion.

3. A lid or cap according to Claim 1 to Claim 2, wherein the plug portion includes inner and outer concentric walls spaced one from the other and the indentation is formed in the outer wall.

4. A lid or cap according to Claim 3, wherein the upper end of the indentation, or of each indentation, slopes inwards and towards the inner wall to permit a plug-reforming tool introduced between the inner and outer walls gently and progressively to ease the indentation outwards into engagement with the mouth ring.

5. A lid or cap according to any one of Claims 1 to 4 provided with a laterally extending peripheral lever flange, wherein the lever flange is provided with pips to prevent sealing engagement of the lid or cap with a container before venting of the container through said space.

6. A lid or cap according to Claim 5, wherein the pips are arranged in pairs, the pips of one pair being arranged one on each side of said indentation and those of the other pairs being spaced around the flange to maintain the correct geometric relationship between the lid or cap and the container.

7. The method of closing a can or like container provided with a mouth ring, which method consists of the steps of venting the headspace of the container by pressing the plug portion of a lid or cap according to any one of Claims 1 to 6 into the mouth ring of the container until the plug portion is fully inserted therein and then applying pressure to the indentation or indentations to effect reformation thereof until it or they is or are pressed into engagement with the mouth ring.

8. The method according to Claim 7, including the step of flexing the centre panel of the lid towards the bottom of the container to effect venting of more air from the headspace prior to reformation of the indentation or indentations.

9. The method according to Claim 7 or Claim 8, including the step of flexing the bottom of the container towards the top thereof to effect venting of more air from the headspace prior to reformation of the indentation or indentations.

10. A can or like container closed by the method according to any one of Claims 7 to 9.

11. A capping head for closing with a lid or cap according to any one of Claims 1 to 6 a can or like container provided with a mouth ring, said head comprising a platen adapted for connection with a reciprocable plunger, an annular indentation reforming tool concentric and movable with said platen, a ring spaced axially from the platen and supported by the reforming tool for movement therewith to effect insertion of the plug portion of the lid or cap into the mouth ring of the container and for limited axial movement relative to said tool to permit movement of the tool to effect said reformation of the indentation or indentations and springs extending between said platen and ring.

12. A capping head according to Claim 11, including a pressure pad movable with and axially relative to said tool, and auxiliary springs operable to apply pressure through the pressure pad to the centre panel of the lid or cap to effect flexing thereof towards the bottom of the container before the reforming tool effects reformation of the indentation or indentations.

13. A circular lid or cap made of sheet metal, such as tinplate or aluminium, substantially as herein described with reference to and as illustrated in Figs. 1 to 4, or Fig. 5, or Figs. 8 to 10 of the accompanying drawings.

14. A capping head according to Claim 11 substantially as herein described with reference to and as illustrated in Figs. 6 and 7 of the accompanying drawings.

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