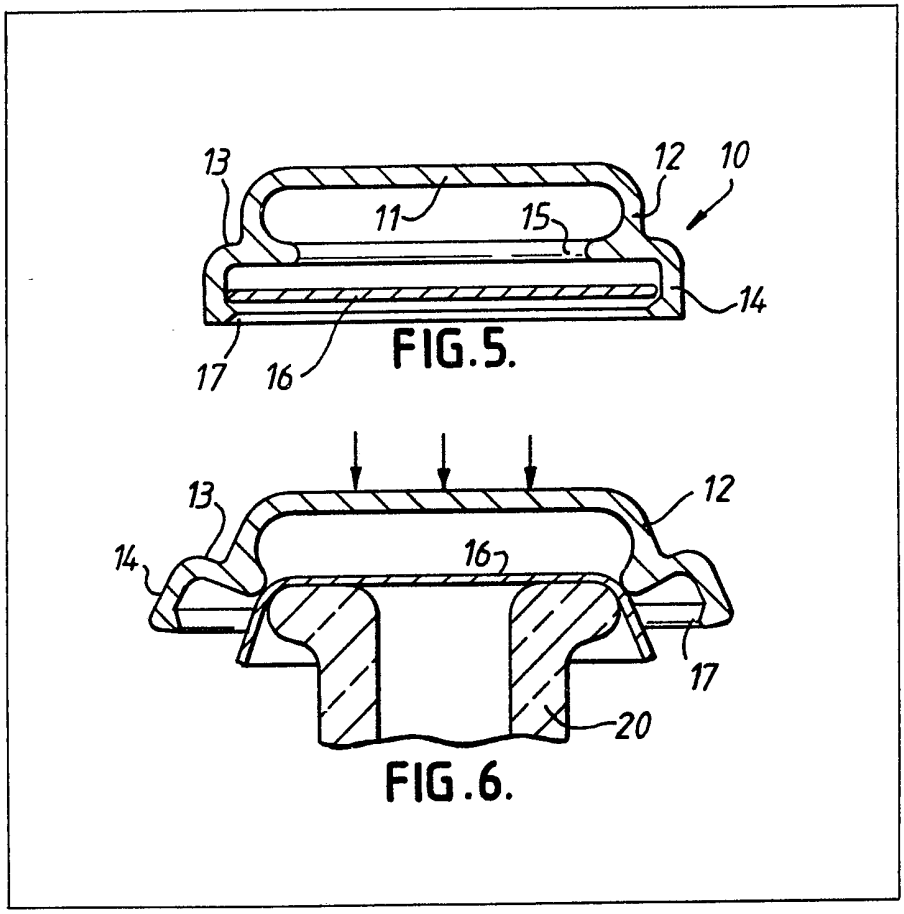
(12) UK Patent Application (19) GB (11) 2 096 980 A

(21) Application No **8207922**
(22) Date of filing **18 Mar 1982**
(30) Priority data
(31) **8108456**
**8121533**
(32) **18 Mar 1981**
**13 Jul 1981**
(33) **United Kingdom (GB)**
(43) Application published
**27 Oct 1982**
(51) **INT CL³**
**B67B 3/22**
(52) Domestic classification
**B8T** 82F AD
(56) Documents cited
**GB 1538642**
**GB 1135943**
(58) Field of search
**B8T**
(71) Applicants
**United Glass Limited,**
**Kingston Road, Staines,**
**Middlesex, TW18 1AD**
(72) Inventors
**David Vivian Eckett,**
**John Graham Smith**
(74) Agents
**Carpmaels and Ransford,**
**43 Bloomsbury Square,**
**London WC1A 2RA**

(54) **Sealing of containers**

(57) There is described a method of induction heat sealing a heat softenable plastics coated metal foil membrane onto a container, in which the membrane (16) has a diameter greater than that of the container (20) sealing surface. The membrane is initially retained in an overcap (10) and during application to the container is formed into dished shape and crimped around the mouth of the container. Preferably the cap (10) applies sufficient pressure to the membrane (16) for sealing to be accomplished without the need for extraneous top pressure. In an alternative embodiment the membrane is formed into a dished shape before application to the overcap.




GB 2 096 980 A

The drawing originally filed was informal and the print here reproduced is taken from a later filed formal copy.

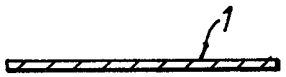



FIG.1

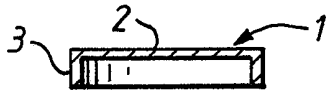



FIG.2.

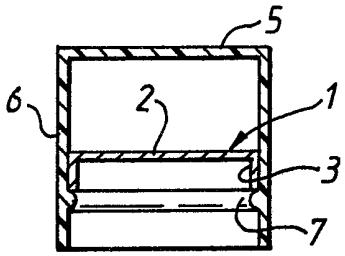



FIG.3.

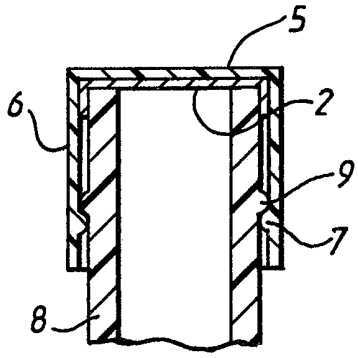



FIG.4.

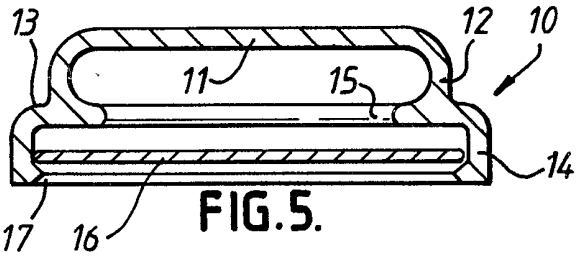



FIG.5.

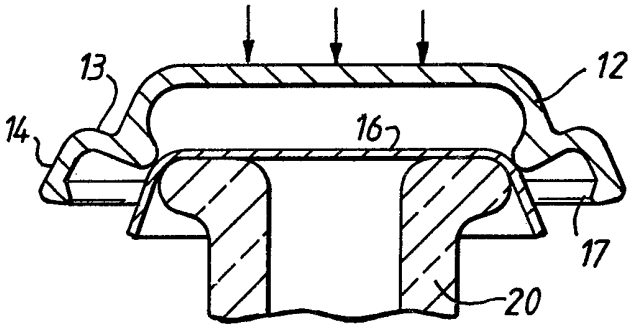



FIG.6.

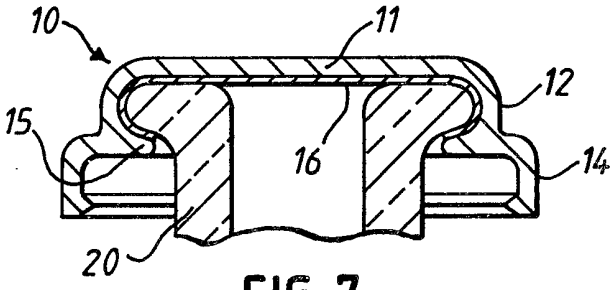



FIG.7.

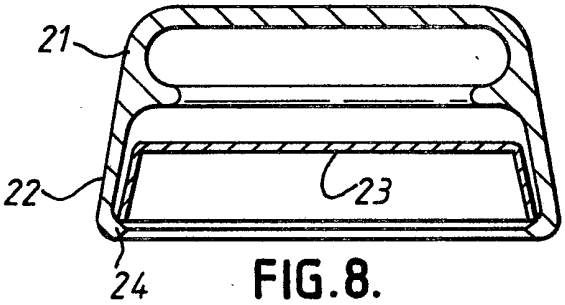



FIG.8.

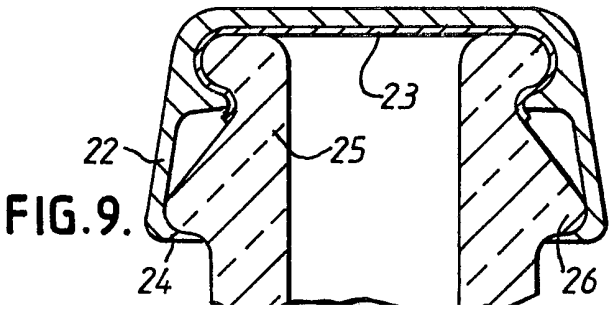



FIG.9.

SPECIFICATION

**Sealing of containers**

This invention relates to the sealing of containers, and especially to the application to the mouths thereof of metal foil membranes.

The techniques of applying a metal foil membrane to a container, to seal the mouth thereof, such as is described in our U.K. Patent Specification No:1,135,943, is now well established on a commerical scale. Broadly speaking, the technique involves applying to a container mouth a metal foil membrane, e.g. an aluminium foil membrane, coated on its side adjacent the mouth with a heat-softenable plastics material, placing the membrance under pressure on the mouth, and raising the temperature of the membrane by the application of an induction field to soften the plastics coating and adhere the membrane to the container mouth. Preferably the operation is conducted in such a manner as not to distort the container mouth, so that the membrane is removably, or strippably, adhered to the container.

Although in certain cases the foil membrane is a sufficient seal, it is usually preferred, especially when the container contents are not all immediately consumed, to use a secondary seal in conjunction with the membrane. Such a secondary seal may take the form for example of an injection-moulded snap-on or screw-on plastics overcap.

For example, currently the sealing of the metal, e.g. aluminium, foil to a glass container may be carried out by crimping the foil round the glass, heating the aluminium foil in the region of the glass contact, and subsequently applying a plastic cap which for example locks onto a bead on the external surface of the glass finish. The sealed container thus produced may be used to contain products which are senstive to environmental contaimination, e.g. by oxygen, but once the aluminium seal is broken the contents should be consumed within a short period e.g. a few days. The purpose of the plastic cap in this case is to produce a convenient reseal for the short period of time during which the contents are being consumed.

The object of the present invention is to provide a more convenient and economical method of applying a metal foil membrane and plastic overcap to a container.

According to one aspect of the invention a metal sealing membrane coated with heat-softenable material, and having a diameter greater than that of the sealing surface of a container to which it is to be applied, is formed into dish-shape and retained in a plastics cap, whereafter the cap and membrane are applied to the container and the membrane is subjected to the action of an induction field to seal the membrane to the container mouth.

In one method according to this aspect of the invention a container can be sealed and capped by punching a circular disc from a sheet of coated aluminium foil, the disc having a diameter somewhat greater than the diameter of the finish of the container itself, curling the disc around its circumference to impart to it a dish shape, inserting the disc into a plastics cap provided with a locking projection in such a manner that the curl springs over the projection and then locks between the projection and the face of the cap, applying the cap to the container by means of top pressure and subsequently sealing the coated aluminium to the container by means of an induction field.

In another method according to this aspect of the invention a container can be sealed and capped by punching a circular disc from a sheet of foil, the disc having a diameter somewhat greater than the finish of the container itself, curling the disc around its circumference to impart to it a dish shape, inserting the disc into a plastics cap having a first region, of relatively large internal diameter, and a second region, of relatively small internal diameter nearer the top of the cap than the first region, said disc being retained in said first region, applying the cap to the container by means of top pressure so that the disc is forced into the said second region and becomes wrapped round the top of the container, and sealing the disc to the top of the container by means of an induction field.

According to a second aspect of the invention a metal sealing membrane coated with heat softenable material, and having a diameter greater than that of the sealing surface of a container to which it is to be applied, is retained in a plastics cap having a first region, of relatively large internal diameter, and a second region, of relatively small internal diameter nearer the top of the cap than the first region, said membrane being retained in said first region, whereafter the cap and membrane are applied to the container, so that the membrane is forced into said second region and becomes wrapped around the mouth of the container, and the membrane is subjected to the action of an induction field to seal the membrane to the container mouth.

In a method according to the second aspect of the invention a container can be sealed and capped by punching a circular disc from a sheet of coated aluminium foil, the disc having a diameter somewhat greater than the diameter of the finish of the container itself, and locking this disc behind a projection in a plastics cap, wherein the internal diameter of the plastics cap at the point where the foil is locked in position is greater than the diameter of the cap at the point where the cap locks onto the container. By applying the cap to the container by means of top pressure the foil becomes wrapped round the top of the container which can then be sealed to the coated aluminium foil by means of an induction field.

By means of the invention it is possible to apply to a container a coated metal foil membrane which both seals on the container top surface and is crimped to seal around the side of the container mouth below the top surface, and at the same time to apply a secondary closure to the container

Although of course the aluminium heats up during the application of the induction field in order to melt the coating resin in contact with the container, we have found that common plastics materials can be used for the cap with little effect on its appearance or integrity. Such plastics materials include polyethylene and polypropylene.

The foil membrane suitably comprises plain 20 to 50$\mu$m aluminium, coated on one side with heat seal coating, e.g. "Surlyn". Where print or decoration is required, the aluminium can be printed with a heat resistant ink to prevent print transfer to the cap during induction heating. If necessary, the ink can be over-lacquered for further protection. Alternatively, aluminium foil of thickness 9—50 $\mu$m coated on one side with heat seal resin and backed with paper, or a thermoplastic or thermosetting coating can be used.

One considerable advantage of the present invention is that the cap and sealing membrane can be supplied to the user, i.e. the bottler/capper, as a single unit, the membrane being retained in the cap. It is thus no longer necessary for the user to purchase separately supplies of cap and sealing membrane, and to apply these separately to the container to be sealed. The cap is suitably one whcih may be readily removed from the container. For example, each of the cap and container may have a series of interengaging angled or inclined lugs which engage upon twisting the cap in the normal unscrewing direction and assist the lifting off of the cap. The cap may thus be of the "press-on twist-off" type.

A further considerable advantage can be achieved if the connection means between the cap and its container is such as to squeeze the sealing membrane tightly between the cap and the container mouth. In this way the connection between the cap and the container provides all the pressure necessary for sealing to occur, and extraneous top pressure, involving ancillary equipment, is unnecessary. In this case the seal is formed at the point, or series of points, where the membrane is held against the finish of the container with maximum pressure. It has been found that the seal produced under these conditions is of surprisingly durable quality, and that this may be attributed to the fact that the adhesion between coated foil and container is strongest at the point where maximum pressure is exerted by the cap on the container. Since this pressure will be maintained during storage of the sealed container, maintenance of the seal area under compression is ensured.

It is preferred, in the operation of the present invention, to use magnetic flux intensifiers to concentrate or focus the induction field onto the actual area of sealing. A benefit to be obtained from this is that any unwanted liquid which may be present on the container sealing surface can be evaporated off immediately prior to sealing. Intensifiers are also of advantage when the sealing membrane has a tear tab, as the heating field can be directed away from the tear tab. The use of magnetic flux intensifiers is described in our U.K. Patent Specification No:1,319,679.

The various steps involved in a method according to the invention are illustrated in the accompanying diagrammatic drawings, which are for the purpose of illustration alone.

In the drawings,

Figures 1 is a cross-section of a metal foil disc coated with heat-softenable plastics material and punched from a sheet thereof;

Figure 2 is a section showing the disc formed into dish-shape;

Figure 3 is a section of the disc inserted into a plastics snap-on cap;

Figure 4 is a section showing the cap and disc applied to a container;

Figure 5 is a section showing a coated metal foil disc inserted into a specially-shaped cap;

Figures 6 and 7 show the intermediate and final stages respectively of the application of the assembly of Figure 5 to a glass container;

Figure 8 is a section showing a dish-shaped coated foil membrane retained in a specially-shaped cap; and

Figure 9 shows the final stage of the application of the Figure 8 assembly to a glass container.

Referring to Figures 1 to 4, the membrane disc 1 is suitably circular in shape, and is formed by punching from a sheet of plastics-coated metal, e.g. "Surlyn"-coated aluminium of thickness 20 to 50 $\mu$m. It is then deformed into a dish shape by curling its periphery to form an annular flange 3 depending from a flat top 2.

The dish-shaped disc is then inserted into a plastics (e.g. polypropylene or polyethylene) snap-on cap comprising a flat top 5, a depending skirt 6 and an internal bead or shoulder 7. As seen in Figure 3, the foil disc is retained in the cap with its flange or curl 3 resting on the bead 7.

The cap and retained membrane are applied to the neck of a container 8 by simply pressing them thereon, the bead 7 snapping over and being retained behind a corresponding bead 9 on the container neck, and passing the assembly into the influence of an induction field. This heats the metal foil, softens the plastics coating, and both seals the periphery of the top 2 of the membrane to the top sealing surface of the membrane to the cylindrical surface of the container neck just below its top.

Figure 5 illustrates a specially-designed plastics cap 10 comprising a top 11 and a skirt consisting of an upper part 12, a radially-outwardly directed shoulder 13 and a lower part 14. The lower part 14 is of greater internal diameter than the upper part 12 and is connected to the upper part 12 via an inwardly directed annular bead 15. A coated foil disc 16 rests on an annular internal bead 17 formed in the lower part of the skirt.

Application of the assembly of Figure 5 to a container 20 (see Figures 6 and 7) deforms the membrane 16 into dish shape and wraps it around the container mouth, as seen in Figure 7, whereafter the assembly is subjected to an

induction field to seal the membrane to the container.

The cap of Figure 8 is similar to that of Figure 5, having an upper skirt portion 21 of smaller internal diameter than that of lower skirt portion 22. A dish-shaped coated metal foil disc membrane 23 is retained in the lower skirt portion 22, behind an annular bead 24 which, when the assembly is applied to the mouth 25 of a container (see Figure 9), snap-fittingly engages an annular shoulder 26 on the container.

CLAIMS

1. A method of closing a container wherein a metal sealing membrane coated with heat-softenable material, and having a diameter greater than that of the sealing surface of the container to which it is to be applied, is formed into dish-shape and retained in a plastics cap, whereafter the cap and membrane are applied to the container and the membrane is subjected to the action of an induction field to seal the membrane to the container mouth.

2. A method according to claim 1 comprising punching a circular disc from a sheet of coated aluminum foil, the disc having a diameter greater than the diameter of the finish of the container, curling the disc around its circumference to impart to it a dish shape, inserting the disc in to a plastics cap provided with a locking projection in such a manner that the curl springs over the projection and then locks between the projection and the face of the cap, applying the cap to the container by means of top pressure and subsequently sealing the coated aluminum foil to the container by means of an induction field.

3. A method according to claim 1 comprising punching a circular disc from a sheet of foil, the disc having a diameter greater than the finish of the container, curling the disc around its circumference to impart to it a dish shape, inserting the disc into a plastics cap having a first region, of relatively large internal diameter, and a second region of relatively small internal diameter nearer the top of the cap than the first region, said disc being retained in said first region, applying the cap to the container by means of top pressure so that the disc is forced into said second region and becomes wrapped around the top of the container, and sealing the disc to the top of the container by means of an induction field.

4. A method of closing a container wherein a metal sealing membrane coated with heat softenable material, and having a diameter greater than that of the sealing surface of the container to which it is to be applied, is retained in a plastics cap having a first region, of relatively large internal diameter, and a second region, of relatively small internal diameter nearer the top of the cap than the first region, said membrane being retained in said first region, whereafter the cap and membrane are applied to the container, so that the membrane is forced into said second region and becomes wrapped around the mouth of the container, and the membrane is subjected to the action of an induction field to seal the membrane to the container mouth.

5. A method according to claim 4 comprising punching a circular disc from a sheet of coated aluminium foil, the disc having a diameter greater than the diameter of the finish of the container, and locking this disc behind a projection in a plastics cap, wherein the internal diameter of the plastics cap at the point where the foil is locked in position is greater than the diameter of the cap at the point where the cap locks onto the container, applying the cap to the container by means of top pressure whereby the foil becomes wrapped around the top of the container, and sealing the coated aluminium foil to the container by means of an induction field.

6. A method according to claims 1 or 4 wherein the plastics cap and the container are provided with connection means whereby application of the cap to the container causes the sealing membrane to be pressed tightly against the mouth of the container.

7. A method according to the claim 6 wherein each of the cap and the container is provided with a series of cooperating angled lugs.

8. A method according to any of claims 1 to 7 wherein the plastics cap is formed of polyethylene or polypropylene.

9. A method according to any of claims 1 to 8 wherein the metal foil membrane is aluminium of thickness 20 to 50 $\mu$m.

10. A method according to any of claims 1 to 8 wherein the metal foil membrane is aluminium of thickness 9 to 50 $\mu$m which is backed on the face not coated with heat softenable material, with paper or a thermosetting or thermoplastics resin.

11. A method according to any of claims 1 to 10 wherein the metal sealing membrane is provided with a tear tab.

12. A method according to any of claims 1 to 11 wherein intensifiers are used to concentrate the induction field at the interface between the sealing membrane and the container mouth.

13. A method of closing a container, substantially as described with reference to the drawings.

14. Closed containers produced by a method as claimed in any preceding claim.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1982. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained