

SPECIFICATION

Methods of making sealing glass vessels

5 This invention relates to methods of sealing glass vessels holding water-containing contents and having an opening surrounded by a rim, in which a metal foil is applied over the opening and the rim, a heat activatable adhesive being applied to the rim and the foil being stuck to the rim by pressing the foil against the rim with the adhesive in between under the application of heat.

In order to seal glass vessels, metal foils, for example of aluminium, coated with a thermoplastic adhesive may be used. The adhesive-coated foil is pressed on to the rim of the vessel under the application of heat until the thermoplastic coating adheres to the rim of the vessel and then the heat is removed. Such seals protect the contents of the vessel from the ingress of moisture, dust and gases from outside and are used predominantly for dry, pulverulent contents such as coffee power and dried milk products.

Other methods of sealing glass vessels include the fitting of screw closure caps with waxed paper inserts so that the rim of the glass vessel mouth is sealed to the waxed paper by the application of pressure. When the closure cap is removed, the undamaged paper insert remains in position and shows that the contents of the vessel have not been tampered with. Instead of heat and pressure, the application of electro-magnetic high-frequency induction fields may be used for joining together glass and adhesive-coated metal foil. Here again, the seal serves only for protecting dry contents.

Vessels made of thermoplastics materials may have sealing membranes welded to them so that there is a hermetic seal between the vessel material and the closure membrane. Vessels closed in this manner are suitable also for water-containing liquid contents. With glass vessels, such welding is, of course, not possible.

Silicon organic compounds may also be used as bond promoters between glass and plastics materials. Silicon organic compounds are also used in the production of glass fibre reinforced plastics materials and when bonding two pieces of glass together. A firm bond between the surfaces results and the bond is also moisture resistant.

When sealing glass vessels with a metal foil using an adhesive, water molecules from water-containing contents tend to permeate beneath the adhesive layer between the glass and the metal foil so that for vessels containing liquid or pastry materials only closure caps of metal or plastics material with or without injected compound have so far been used.

The object of the present invention is to provide a method of sealing glass vessels as

initially described, by which a reliable bond between the glass and the metal foil is achieved, the bond resisting deterioration and diffusion when the vessel holds water-containing materials.

To this end, according to this invention, in a method of sealing a glass container as initially described, a silane which forms a bond promoter with a high affinity for glass and with free bonds for firm cross-linking to the adhesive is applied on to the rim of the vessel.

Silanes have been found to be ideal bond promoters for the purpose of the present invention, since on account of their silicon content they are related to the glass and they form owing to their organic nature a bridge to the adhesive.

In this manner, a seal between glass and a metal foil, especially an aluminium foil, is obtained which is not permeated by water molecules from water-containing liquid or water-containing pasty contents in the vessel and is not adversely influenced by such contents in a way which could lead to premature deterioration of the contents.

The bond promoter may be applied in a mono-molecular layer to the rim of the glass vessel. It is also possible to incorporate the bond promoter in a very small proportion into the adhesive which is used. The adhesive itself can be applied to the metal foil or to the rim of the vessel.

Furthermore, the rim of the vessel may, immediately after manufacture and cooling of the vessel, be treated with the bond promoter and subsequently be heated with the adhesive. It is alternatively possible to apply an adhesive incorporating a bond promoter to the rim of the vessel immediately after manufacture and cooling of the glass vessel. The metal foil is applied to the rim of the vessel under the application of heat after the vessel has been filled.

CLAIMS

1. A method of sealing a glass vessel holding water-containing contents and having an opening surrounded by a rim, in which a metal foil is applied over the opening and the rim, a heat activatable adhesive being applied to the rim and the foil being stuck to the rim by pressing the foil against the rim with the adhesive in between under the application of heat, wherein a silane which forms a bond promoter with a high affinity for glass and with free bonds for firm cross-linking to the adhesive is applied on to the rim of the vessel.

2. A method according to Claim 1, in which the silane bond promoter is applied as a mono-molecular layer to the rim of the vessel.

3. A method according to Claim 1, in which the silane bond promoter is incorpo-



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- In order to seal glass vessels, metal foils, for example of aluminium, coated with a thermoplastic adhesive may be used. The adhesive-coated foil is pressed on to the rim of the vessel under the application of heat until the thermoplastic coating adheres to the rim of the vessel and then the heat is removed. Such seals protect the contents of the vessel from the ingress of moisture, dust and gases from outside and are used predominantly for dry, pulverulent contents such as coffee power and dried milk products.

- Other methods of sealing glass vessels include the fitting of screw closure caps with waxed paper inserts so that the rim of the glass vessel mouth is sealed to the waxed paper by the application of pressure. When the closure cap is removed, the undamaged paper insert remains in position and shows that the contents of the vessel have not been tampered with. Instead of heat and pressure, the application of electro-magnetic high-frequency induction fields may be used for joining together glass and adhesive-coated metal foil. Here again, the seal serves only for protecting dry contents.

- Vessels made of thermoplastics materials may have sealing membranes welded to them so that there is a hermetic seal between the vessel material and the closure membrane. Vessels closed in this manner are suitable also for water-containing liquid contents. With glass vessels, such welding is, of course, not possible.

- Silicon organic compounds may also be used as bond promoters between glass and plastics materials. Silicon organic compounds are also used in the production of glass fibre reinforced plastics materials and when bonding two pieces of glass together. A firm bond between the surfaces results and the bond is also moisture resistant.

- When sealing glass vessels with a metal foil using an adhesive, water molecules from water-containing contents tend to permeate beneath the adhesive layer between the glass and the metal foil so that for vessels containing liquid or pastry materials only closure caps of metal or plastics material with or without injected compound have so far been used. The object of the present invention is to provide a method of sealing glass vessels as

initially described, by which a reliable bond between the glass and the metal foil is achieved, the bond resisting deterioration and diffusion when the vessel holds water-containing materials.

- To this end, according to this invention, in a method of sealing a glass container as initially described, a silane which forms a bond promoter with a high affinity for glass and with free bonds for firm cross-linking to the adhesive is applied on to the rim of the vessel.

- Silanes have been found to be ideal bond promoters for the purpose of the present invention, since on account of their silicon content they are related to the glass and they form owing to their organic nature a bridge to the adhesive.

- In this manner, a seal between glass and a metal foil, especially an aluminium foil, is obtained which is not permeated by water molecules from water-containing liquid or water-containing pasty contents in the vessel and is not adversely influenced by such contents in a way which could lead to premature deterioration of the contents.

- The bond promoter may be applied in a mono-molecular layer to the rim of the glass vessel. It is also possible to incorporate the bond promoter in a very small proportion into the adhesive which is used. The adhesive itself can be applied to the metal foil or to the rim of the vessel.

- Furthermore, the rim of the vessel may, immediately after manufacture and cooling of the vessel, be treated with the bond promoter and subsequently be heated with the adhesive. It is alternatively possible to apply an adhesive incorporating a bond promoter to the rim of the vessel immediately after manufacture and cooling of the glass vessel. The metal foil is applied to the rim of the vessel under the application of heat after the vessel has been filled.

CLAIMS

1. A method of sealing a glass vessel holding water-containing contents and having an opening surrounded by a rim, in which a metal foil is applied over the opening and the rim, a heat activatable adhesive being applied to the rim and the foil being stuck to the rim by pressing the foil against the rim with the adhesive in between under the application of heat, wherein a silane which forms a bond promoter with a high affinity for glass and with free bonds for firm cross-linking to the adhesive is applied on to the rim of the vessel.
2. A method according to Claim 1, in which the silane bond promoter is applied as a mono-molecular layer to the rim of the vessel.
3. A method according to Claim 1, in which the silane bond promoter is incorpo-

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rated in the adhesive.

4. A method according to any one of Claims 1 to 3, in which the adhesive is first applied as a layer to the metal foil which is
- 5 then applied to the rim.
5. A method according to any one of Claims 1 to 3, in which the adhesive is first applied to the rim of the vessel.
6. A method according to Claim 1 or
- 10 Claim 2, or Claim 5 when dependent on Claim 1 or Claim 2, in which the rim of the vessel is treated with the silane bond promoter immediately after manufacture and cooling of the vessel and is subsequently
- 15 treated with the adhesive.
7. A method according to Claim 3, or Claim 4 or Claim 5 when dependent on Claim 3, in which the rim of the vessel has the adhesive applied to it immediately after manu-
- 20 facture and cooling of the vessel.
8. A method according to Claim 1, substantially as described herein.

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