

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



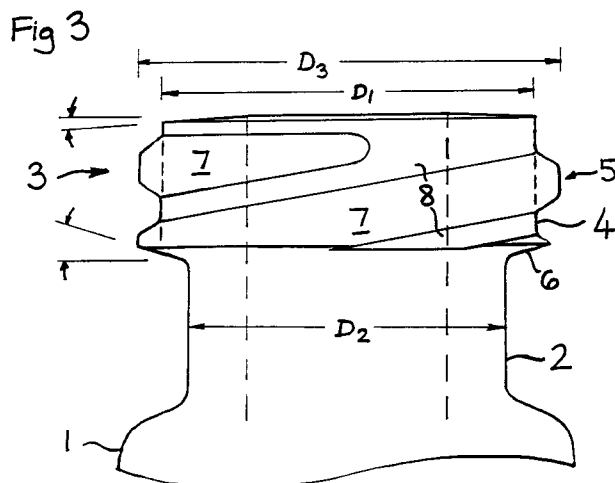
(11) Publication number:

0 654 411 A2

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **94307594.5**(51) Int. Cl.⁶: **B65D 1/02**(22) Date of filing: **17.10.94**(30) Priority: **19.11.93 GB 9323833**(43) Date of publication of application:
24.05.95 Bulletin 95/21(84) Designated Contracting States:
CH DE FR GB LI(71) Applicant: **CHROMACOL LIMITED**
Glen Ross House
3 Little Mundells
Mundells Industrial Centre
Welwyn Garden City, Herts AL7 1EW (GB)(72) Inventor: **Katz, Richard**
Epsom Glass Industries Ltd.,
Longmead
Epsom,
Surrey KT19 9AN (GB)(74) Representative: **Parry, Christopher Stephen**
Saunders & Dolleymore
9 Rickmansworth Road
Watford,
Herts WD1 7HE (GB)(54) **Vial or bottle.**

(57) A glass or plastic vial has a head 3 to which a closure (not shown) is to be attached; the head comprising a plinth portion 4 having a first diameter D_1 and on the outside of which a multi-start screw thread 5 is provided. A neck 2 is formed immediately adjacent the head and has a second diameter D_2 less than the first diameter. A shoulder 6 is formed at the junction between the head 3 and the neck 2, and the threads 7 of the multi-start screw thread terminate at the shoulder and form a part of it. The vial can be closed by either a screw cap or a crimp cap.

**EP 0 654 411 A2**

The invention relates to glass or plastic vials or bottles and has particular application to vials such as may be used in chromatography.

Chromatography vials are generally closed by a plastic screw cap or by an aluminium crimped cap and are constructed to be closed by one or other of such caps. In the first case a single-start screw thread is provided on the neck of the vial and in the second case the neck of the vial is provided with an enlarged head portion to which a crimp cap can be fitted by means of a special crimping tool. Both types of cap may employ a seal made of e.g. rubber, silicone, or PTFE and may have an aperture for the passage of a sampling needle through the seal.

The present invention sets out to provide a vial which can receive either a screw cap or a crimp cap. This is achieved by providing a screw thread on the head of a crimp-top vial.

Accordingly the present invention provides a glass or plastic vial or bottle having an upper part formed with an upper cylindrical head immediately above a lower cylindrical reduced neck and adapted to be closed by a crimp cap fitted to the head, wherein the head is formed with an external screw thread so that the vial or bottle can be alternatively closed by a screw cap.

In a preferred embodiment the upper cylindrical head comprises a plinth having a first diameter and on the outside of which the screw thread is formed and wherein the lower reduced neck is formed immediately adjacent the plinth and has a second diameter less than the first diameter; whereby a shoulder is formed at the junction between the head and the reduced neck and the thread or threads of the screw thread terminate at the shoulder and form part thereof.

Preferably, the screw thread is a multi-start thread. This means that the ends of the threads terminating at the shoulder are equally spaced around the circumference of the neck to provide a relatively regular, albeit partly interrupted, shoulder perpendicular to the axis of the vial. If only a single start screw thread is used the effect is to cause the thread to form a part of the shoulder only at one position around the circumference of the vial, thus making the shoulder somewhat uneven. As a result, a successful seal is not so readily achieved by a crimp cap. This effect can be mitigated by making the thread very fine but for a glass or plastic vial, this is difficult. Also a single start thread may be damaged by crimping a cap onto it.

As a result of the screw threads terminating at the shoulder and forming a part thereof, the valleys of the screw threads are completely open at their lower ends. Thus there is no obstruction to the downward movement of a screw cap which can therefore be screwed downwardly until a seal is made against the top surface of the head of the container whatever the length of the skirt of the screw cap and the thickness of any seal therein may be. The gaps which the valleys of the threads form in the shoulder also make removal of crimped caps by a de-crimping tool easier since they make it easier for the caps to be deformed by the tool.

Embodiments of the invention are described below with reference to the accompanying drawings in which:

Figure 1 is a side view of a known type of vial which can be closed by a screw cap.

Figure 2 is a side view of a known type of vial which can be closed by a crimp cap; and

Figure 3 is a partial side view, on a greatly enlarged scale, of a vial in accordance with the present invention which can be closed either by a screw cap or by a crimp cap.

Figure 1 shows a known type of glass vial having a body 1 and a neck 2. A single start screw thread is formed on the neck such that the vial can be closed by a screw cap, typically made of polypropylene.

Figure 2 shows a further known type of vial having a head 3 formed immediately above a neck 2 such that a crimp cap, typically made of aluminium or other suitably malleable metal, can be fitted thereto.

The vial of Figure 3 also has a body 1, a neck 2 and a head 3. The head consists of a plinth portion 4 having an external diameter D1 and provided on the outside with a multi-start screw thread 5, the peaks of which extend to a diameter D3 which naturally is greater than the diameter D1. The diameter D3 is actually equivalent to the diameter of the head 3 of the prior art vial shown in Figure 2. The neck 2 is formed immediately below the head 3 and has a diameter D2 which is less than diameter D1. A shoulder 6 is formed at the junction between the head 3 and the neck 2. Typically, the shoulder is inclined to the horizontal by an angle of up to 15° as shown but the shoulder may alternatively be horizontal or inclined at an even greater angle of, say 30°. This inclination of the shoulder assists in the fitting of a crimp cap. The threads 7 of the multi-start screw thread terminate at the shoulder and form a part thereof. As a result, the valleys 8 of the screw thread are completely open at their lower ends so that no obstruction to the downward movement of a screw cap will be created. It will be appreciated that the radially inner part of the shoulder 6 is provided by the plinth and the radially outer part by the ends of the screw threads 7. As a result the shoulder will not extend fully to the diameter D3 over its whole circumference but will be partly interrupted by the valleys of the screw thread. Nevertheless the shoulder will provide a satisfactory surface for the crimping of a crimp cap.

In the embodiment shown the screw thread has three starts and has an axial extent such that each thread has a circumferential extent of about 180°; The preferred range being 150 - 220° and the more preferred range being 170 - 200°. In large vials or bottles, it may be preferable to use multi-start threads having four, five or more starts.

5 It is important that the extent of the screw thread is sufficient for satisfactory fitting of a screw cap. Since the vial is also to be closed by a crimp cap of a diameter similar to D3 - advantageously one of a standard size - the axial length of the plinth 4 should not be too long. In the embodiment shown, the axial length of the plinth 4 is about the same as that of the neck 2. This is facilitated by the use of a multi-start thread.

10 In the embodiment shown, the top surface of the head is inclined to the horizontal to improve the seal between cap and neck.

It will be appreciated that a screw cap having an appropriate internal screw thread can be fitted to the vial of Figure 3 to close it. Further, however, a crimp cap of appropriate diameter can also be fitted to the vial in known manner being crimped over the shoulder 6. It will also be appreciated that the length of the reduced neck 2 must be sufficient to permit the crimping of a crimp cap. However, it is highly advantageous that the overall height of the neck and head is substantially the same as in prior art vials of corresponding size so that the vials can be interchangeably used.

An example of a 2ml vial in accordance with the present invention has the following approximate dimensions:

20

D1	= 9.6mm
D2	= 8.0mm
D3	= 10.8mm
Height of plinth 3	= 3.6mm
Height of reduced portion 4	= 3.7mm

25

Whilst the invention has been described in relation to fairly small vials such as may be used in autosamplers, the invention has application to vials or bottles of any size where the option of closing the vial or bottle either with a screw cap or a crimp cap may be desirable.

30

Typically a glass vial or bottle in accordance with the invention is made by forming a pre-form from tubular stock having a cylindrical side wall, a bottom end wall and an open top; heating the upper part of the pre-form with a flame while the pre-form is rotated about its longitudinal axis; forging the upper part of the pre-form whilst hot to form an upper cylindrical head immediately above or lower cylindrical reduced neck; and rolling an external screw thread onto the head whilst hot.

35

Claims

1. A glass or plastic vial or bottle having an upper part formed with an upper cylindrical head immediately above a lower cylindrical reduced neck and adapted to be closed by a crimp cap fitted to the head, wherein the head is formed with an external screw thread so that the vial or bottle can be alternatively closed by a screw cap.

40

2. A vial or bottle as claimed in Claim 1, wherein the upper cylindrical head comprises a plinth having a first diameter and on the outside of which the screw thread is formed and wherein the lower reduced neck is formed immediately adjacent the plinth and has a second diameter less than the first diameter; whereby a shoulder is formed at the junction between the head and the reduced neck and the thread or threads of the screw thread terminate at the shoulder and form part thereof.

45

3. A vial or bottle as claimed in Claim 1 or Claim 2 wherein the screw thread is a multi-start screw thread.

50

4. A vial or bottle as claimed in Claim 3 wherein the thread has three starts.

5. A vial or bottle as claimed in any preceding claim wherein the shoulder is inclined slightly upwardly outwardly to provide a frustoconical surface for a crimp cap and wherein the lower ends of the or each screw thread form part of the frustoconical surface.

55

6. A vial or bottle as claimed in Claim 5 wherein the shoulder is inclined to the horizontal by an angle of up to 15°.

5 7. A vial or bottle as claimed in any preceding claim wherein the thread on the head extends for substantially the entire axial length thereof.

8. A method of making a glass or plastic vial or bottle comprising the steps of:

(a) forming a pre-form having a cylindrical side wall, a bottom end wall and an open top;

(b) heating the upper part of the pre-form;

10 (c) forging the upper part of the pre-form whilst hot to form an upper cylindrical head immediately above a lower cylindrical reduced neck; and

(d) rolling an external screw thread onto the head whilst hot.

15

20

25

30

35

40

45

50

55

Fig 1

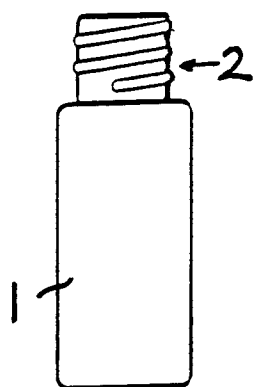


Fig 2

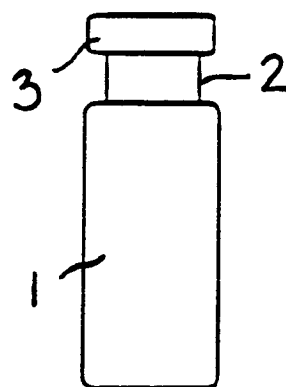


Fig 3

