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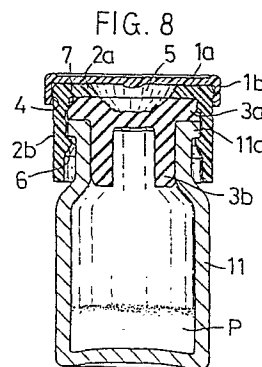
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54 Stopper for vials.

57 A stopper for sealing off vials having a flange at their opening portion without using any aluminum material and without resorting to the crimping step needed for aluminum caps comprising a rubber plug (3) having a top plate (3a) fittable to the flange (11a) in pressing contact therewith, a flexible inner cap (2) for receiving the rubber plug (3) therein and an outer cap (1) fittable over the inner cap (2), the inner cap (2) having an upper wall (2a) formed with a hole (5) in its center and a side wall (2b) formed with at least one projection (6) on the inner peripheral surface thereof, the projection (6) being fittable to the lower face of the flange (11a) with the top plate (3a) of the rubber plug (3) held between the upper wall (2a) and the flange (11a) (Fig. 8).



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This invention relates to a stopper for vials, and more particularly to a stopper for sealing off a vial by a simplified procedure without necessitating the step of crimping an aluminum cap.

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So-called "flip-off caps" of aluminum are widely used for vials containing pharmaceutical preparations, especially powders or the like for preparing injection solutions. Such caps are costly since they are made
10 of aluminum and, moreover, have the drawback of requiring a cumbersome vial closing process because the aluminum cap must be fitted to the vial by crimping after the vial has been sealed with a rubber plug pressed against the flange of the vial.

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According to the present invention these drawbacks are overcome by providing a stopper for sealing off vials without using any aluminum material and also without resorting to the cumbersome crimping step needed for aluminum caps.

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Subject matter of this invention therefore is a stopper for a vial having a flange at its opening portion, characterized by a rubber plug having a top plate fittable to the flange in pressing contact therewith,
25 a flexible inner cap for receiving the rubber plug therein and an outer cap fittable over the inner cap, the inner cap having an upper wall formed with a hole in its center and a side wall formed with at least one projection on the inner peripheral surface
30 thereof, the projection being fittable to the lower face of the flange with the top plate of the rubber plug held between the upper wall and the flange.

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The subclaims 2 to 4 cover preferred embodiments of the stopper of the invention as defined above and in claim 1.

A vial stopper embodying this invention will be
5 described below with reference to the accompanying drawings, in which:

Fig. 1 is a view in vertical section of an outer
cap 1;

10 Fig. 2 is a bottom view of the same;

Fig. 3 is a view in vertical section of an inner
cap 2;

Fig. 4 is a bottom view of the same;

15 Fig. 5 is a view in vertical section of a rubber
plug 3;

Fig. 6 is a bottom view of the same;

Fig. 7 is a view in vertical section showing the
20 stopper placed on the vial before the sealing step;
and

Fig. 8 is a view in vertical section showing the
stopper after the sealing step.

25 The stopper of this invention comprises an outer
cap 1, an inner cap 2 and a rubber plug 3.

The outer cap 1 includes an upper wall 1a and a side
30 wall 1b integral therewith and formed with a projec-
tion 4 on its inner peripheral surface. The projection
4 is engageable with the outer periphery of the

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side wall 2b of the inner cap 2 to hold the outer cap 1 thereon.

The inner cap 2 includes an upper wall 2a integral
5 with the above-mentioned side wall 2b. The upper wall 2a is formed in its center with a hole 5 for permitting an injection needle to penetrate the rubber plug 3. Formed on the inner periheral surface of the side wall 2b are two projections 6 which
10 are fittable to the lower face of the flange 11a of a vial 11 with the top plate 3a of the rubber plug 3 positioned between the upper wall 2a and the flange 11a. Four projections 7 are provided on the inner surface of the side wall 2b at its upper end for
15 engaging the top plate 3a of the rubber plug 3 to retain the plug 3 in the inner cap 2.

The rubber plug 3, which is a rubber stopper heretofore used for vials, comprises the above-mentioned
20 top plate 3a serving as a packing, and two legs 3b. Each of the legs has on its outer surface a projection 8 engageable with the opening portion of the vial 11.

25 The outer cap 1 and the inner cap 2 are made of a flexible plastic, which is preferably polypropylene, polyethylene, polycarbonate or the like.

The projection 4 on the outer cap 1 and the projections 6 and 7 on the inner cap 2 are not limitative
30 in their arrangement but can be provided as desired insofar as they are serviceable as contemplated.

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For example, the projections 6 on the inner cap 2 may be in the form of a continuous projection extending over the entire inner periphery of the inner cap side wall 2b like the projection 4 on the outer cap 1, or may be in the form of dots resembling the projections 7 on the inner cap 2.

The stopper of this invention will be used in the following manner, for example, for a vial 11 for containing a freeze-dried preparation for injection.

The inner cap 2 is fitted in the outer cap 1 in engagement with the projection 4, with the rubber plug 3 engaged with the projections 7 on the inner cap 2. The stopper is then placed on the vial 11 containing an aqueous solution S of the preparation so that the projections 8 on the rubber plug 3 bear on the opening portion of the vial 11 as seen in Fig. 7. When the stopper is pressed against the vial after the solution S has been freeze-dried to powder P, the projections 6 on the inner cap 2 strike the upper edge of the flange 11a on the vial 11, thereby forcing the side wall 2b of the inner cap 2 radially outward at its lower portion, and thereafter come into fitting engagement with the lower face of the flange 11a, whereupon the inner cap side wall 2b restores itself. Thus the vial 11 containing the powder P is completely sealed off as shown in Fig. 8.

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The vial stopper of this invention, for which no aluminum material is used, can be manufactured at

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a low cost. The stopper is easy to use since it seals off the vial completely when simply pressed on.

Because the sealing step can be performed subsequent to freeze-drying within a freeze-drying chamber in a
5 continuous operation, the stopper is very useful for providing pharmaceutical products free from foreign matter and having an extremely low water content and a high quality.

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C L A I M S

- 5 1. A stopper for a vial having a flange at its
opening portion, c h a r a c t e r i z e d by
a rubber plug (3) having a top plate (3a)
fittable to the flange (11a) in pressing contact
therewith, a flexible inner cap (2) for receiving
10 the rubber plug (3) therein and an outer cap (1)
fittable over the inner cap (2), the inner cap (2)
having an upper wall (2a) formed with a hole (5)
in its center and a side wall (2b) formed with
at least one projection (6) on the inner
15 peripheral surface thereof, the projection (6)
being fittable to the lower face of the flange
(11a) with the top plate (3a) of the rubber plug (3)
held between the upper wall (2a) and the flange
(11a).
- 20 2. The stopper as defined in claim 1,
c h a r a c t e r i z e d in that at least one
projection (7) engageable with the top plate (3a)
of the rubber plug (3) is formed on the inner
25 surface of the inner cap side wall (2b) at its
upper end.
- 30 3. The stopper as defined in claim 1 or 2,
c h a r a c t e r i z e d in that the outer
cap (1) has a side wall (1b) provided on its
inner peripheral surface with a projection (4)
engageable with the outer peripheral surface of

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the inner cap side wall (2b).

4. The stopper as defined in any one of claims 1
to 3, c h a r a c t e r i z e d in that the
outer cap (1) and the inner cap (2) are made
5 of polypropylene, polyethylene or polycarbonate.

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FIG. 1

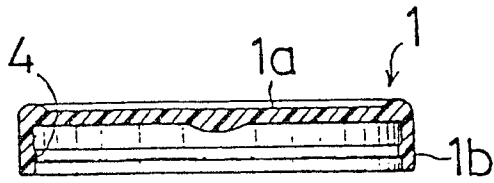


FIG. 2

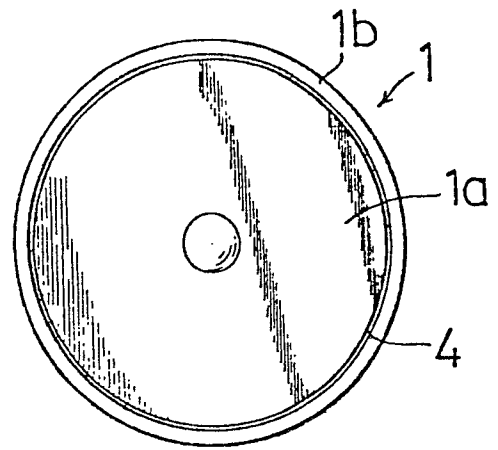


FIG. 3

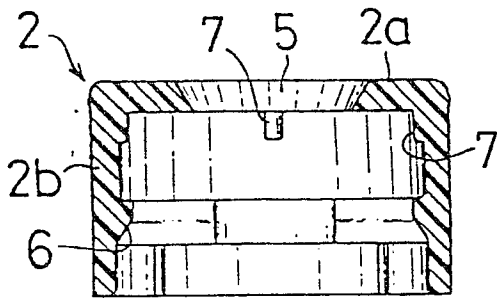


FIG. 4

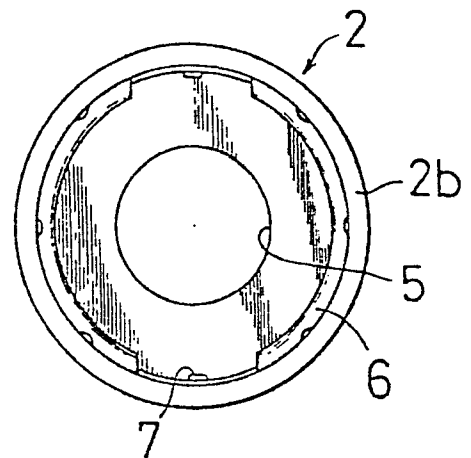


FIG. 5

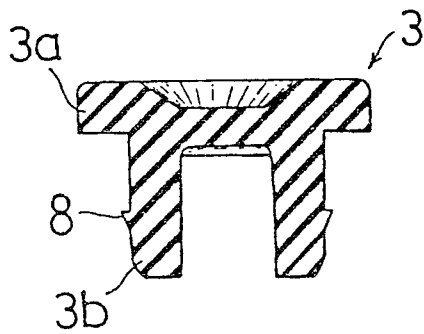
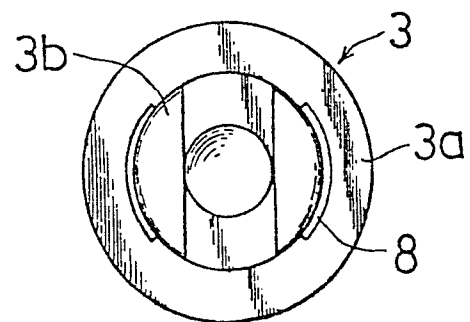


FIG. 6



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FIG. 7

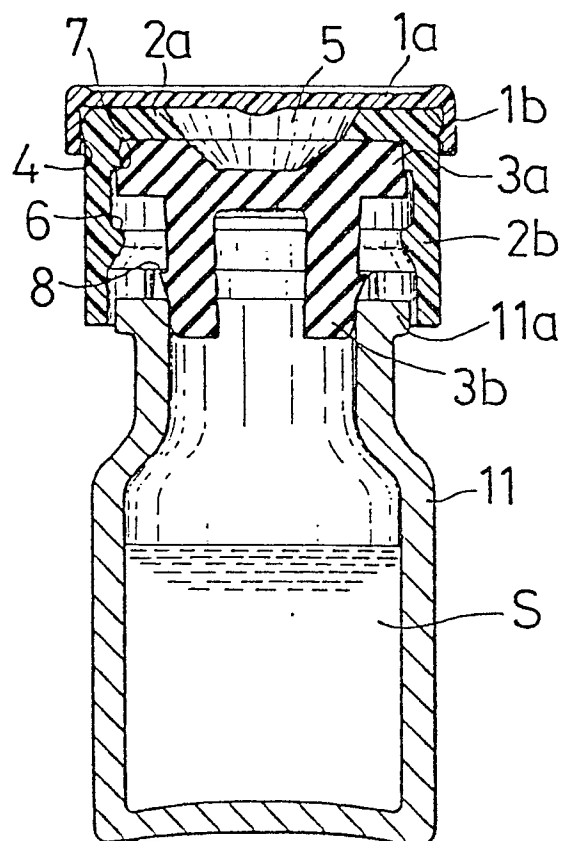
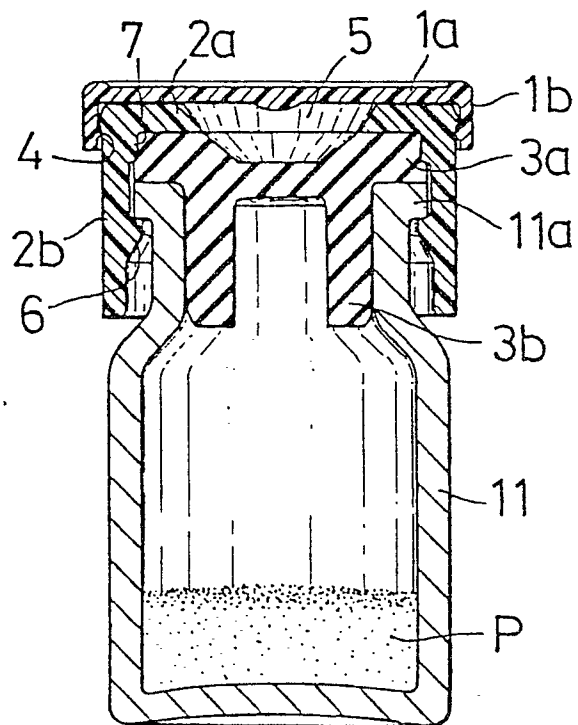


FIG. 8



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)	
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim		
P	EP - A1 - 0 006 032 (MERCK & CO. INC.) (12-12-1979) + Totality + & DK-A-1 320/79 (06-12-1979) --	1	B 65 D 39/00 B 65 D 45/02 B 65 D 51/18 B 65 D 49/12// A 61 J 1/00	
	DE - A1 - 2 734 846 (ABBOTT LABORATORIES) + Page 18, line 3; claim 17 + --	1,4		
	DE - A1 - 2 405 169 (SANNER KG) + Totality + --	1,3		TECHNICAL FIELDS SEARCHED (Int.Cl. 3)
	DE - B1 - 2 361 350 (FAENSEN) + Totality + --	1	B 65 D A 61 J	
	DE - B2 - 1 946 566 (PHARMA GUMMI) + Totality + --	1		
	GB - A - 1 406 776 (BAXTER LABORATORIES) + Totality + --	1		
	US - A - 3 746 196 (SAKO et al.) + Column 1, lines 65,66; column 3, lines 21-30; tables 2,3,4 + --	1,4		CATEGORY OF CITED DOCUMENTS
	US - A - 3 092 278 (JÄRNHÄLL) + Totality + --	1		X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
	US - A - 3 073 471 (HAYES) + Totality + --	1		
X	The present search report has been drawn up for all claims			
Place of search		Date of completion of the search		Examiner
VIENNA		19-01-1981		WOLF



European Patent
Office

EUROPEAN SEARCH REPORT

0028411

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EP 80106715.8

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<u>US - A - 1 949 902</u> (DESSER) + Totality + --	1,3	
	<u>AU - B - 453 898</u> (SCHERICO) + Totality + ----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)