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54 **An improved tamper-resistant container assembly.**

57 A tamper-resistant container assembly with dogs (7) and teeth (5, 6) characterised in that each of the internal dogs (7) on the tamper-resistant safety band (3) is displaced circumferentially from the adjacent frangible tongues (4) by a distance sufficient to ensure that as each inner dog (7) passes over an outer dog (7) during the capping operation the adjacent tongues (4) are compressed rather than stretched.

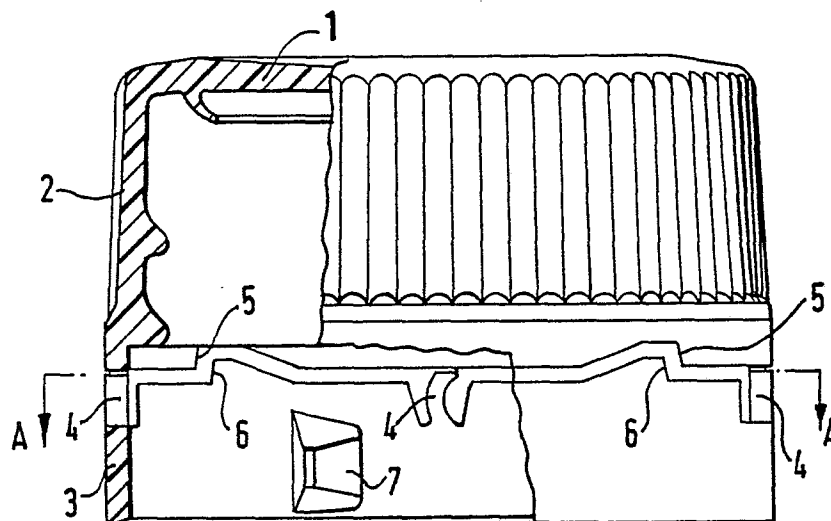


Fig. 5.

AN IMPROVED TAMPER-RESISTANT CONTAINER ASSEMBLY

This invention is concerned with the provision of an improved tamper-resistant container assembly comprising a container body and a closure adapted for screw-threaded engagement with the body. The invention also includes an improved closure for application to a container body.

Tamper-resistant containers are well known. One form of tamper-resistant container which the Applicants have been supplying for a number of years and which in this specification is defined as 'a tamper-resistant container assembly with dogs and teeth', comprises a closure and a body wherein the closure has a top, a depending skirt with an internal screw thread, teeth at the lower edge of the skirt, a safety band below the skirt, frangible tongues connecting the skirt to the safety band, teeth on the upper edge of the safety band and a number of ratchet-shaped internal dogs on the safety band and wherein the container body has a mouth, a neck below the mouth, an external screw thread on the neck and a number of ratchet-shaped external dogs spaced apart around the neck, so that the inner dogs cooperate with the outer dogs to restrain the safety band against rotational movement. In the above known tamper-resistant container assembly each of the frangible tongues connecting the skirt to the safety band was always arranged immediately above one of the inner dogs on the band. There was no particular reason for that arrangement, but it simply seemed to give a neat appearance and was effective in operation until recently when our customers began to complain that some of the frangible tongues were breaking as the closures were applied to the bodies at high speed on a production line. This breakage of tongues was unacceptable because in operation the closures were applied to filled container bodies and the assembled containers were immediately inserted into cartons without inspection so that the breakage only came to light when a final customer (the consumer) opened the carton. To find a broken tongue could mean that the container had been tampered with and for that reason containers were being returned to our customers who sustained a substantial loss on each 'return'.

Investigations showed that the reason for the sudden upsurge of breakage complaints was due to the fact that our customers were operating new or modified capping machines in which the closures were being applied to the bodies with a sudden twist action of greater speed than before. We, therefore, set in motion a series of experiments and investigations to solve the problem. Our first avenue of approach was to strengthen the frangible tongues but we found that in order to

avoid random breakage on capping, it was necessary to make the tongues so strong that many people could not open the container as the tongues would not break without excessive torque.

Further experiments disclosed that the problem was mainly caused by the fact that each tongue was always placed immediately above an internal dog on the safety band and that arrangement of tongues and dogs led to the fact that during a capping operation each frangible tongue was put under substantial strain as it came in line with the container body neck outer dog. In other words we found that the existing arrangement positioned the inner dogs on the band in such a way that as the crest of an inner dog passed over the crest of an outer dog on the container body with high torque the adjacent tongue was subjected to a substantial shearing force as the band was deformed outwards. This could not be seen with the naked eye at high speed.

To overcome this problem therefore it was decided to reposition the inner dogs relatively to the tongues. Therefore in accordance with the present invention there is provided a tamper-resistant container assembly with dogs and teeth as defined above characterised in that each of the internal dogs on the tamper-resistant safety band is displaced circumferentially from the adjacent frangible tongues by a distance sufficient to ensure that as each inner dog passes over an outer dog during the capping operation the adjacent tongues are compressed rather than stretched or put into a state of shear. Conveniently each inner dog may be disposed substantially midway between two adjacent tongues.

It will also be understood that the circumferential displacement of the inner dogs alters the position of the dogs relatively to the teeth on the skirt and on the safety band in such a way that the dogs on the band are moved nearer to the engagement position of the teeth. We have found that the new relationship between the teeth and the inner dogs is such that the teeth are forced into engagement with each other during screwing on of the closure so that the teeth can accept the higher torque substantially without risk of overriding each other.

The effect of the new relationship between the inner dogs on the one hand and the frangible tongues and the teeth on the other is that instead of making the frangible tongues stronger to withstand the tensile and/or shear stress when applying the closures onto container bodies, e.g. bottles, at high speed, we can now revert to the use of tongues of reasonable breaking strength. During our experiments the tongues had at first been

made so tough to survive capping that, e.g. ladies and arthritic persons found it difficult to break off the safety band when first unscrewing the closure. With the new and improved arrangement in accordance with this invention we have found that the closures can be applied at high torque substantially without the risk of breakage of any of the tongues and with confidence that the tongues will break if the closure be given a quick flick of the wrist when it is desired to open the container for the first time.

We have found that four to six dogs and tongues are all that is needed for optimum performance which makes container production very straightforward.

In order that the invention may be more clearly understood reference is now directed to the accompanying drawings in which:

Figure 1 is a part section through an existing or known form of tamper-resistant container assembly, comprising a closure and a body, with dogs and teeth, with the closure in its fully closed position,

Figure 2 is a part section of the closure shown in Figure 1,

Figure 3 is a part section on the line A-A of Figure 2,

Figures 4, 5 and 6 are views corresponding to Figures 1, 2 and 3 respectively of a tamper-resistant container assembly with dogs and teeth in accordance with the present invention.

Figure 7 is a section on the line A-A of Figure 8, and Figure 8 is a section of the neck profile of the container body.

Referring first to Figures 1, 2 and 3 of the drawings, a closure includes a top 1, a skirt 2, a safety tear band 3 connected by frangible means 4 to the skirt 2, teeth 5 around the lower edge of the skirt 2 and teeth 6 around the upper edge of the band 3. The closure also has ratchet shaped dogs 7 provided on the inner surface of the band 3 for cooperation with ratchet shaped dogs 8 on the outside of the neck of the container body. In Figures 1, 2 and 3 which show the existing arrangement the dogs 7 are substantially immediately below the frangible tongues 4 and are substantially midway between the engagement positions of the teeth 5 and 6 as will be seen especially from Figures 2 and 3.

Passing on to study Figures 4, 5 and 6, the same references as in Figures 1, 2 and 3 are used for the corresponding parts, and it will be observed that while in the construction shown in Figures 4, 5 and 6, the tongues 4 and the teeth 5 and 6 are in the same relative position, the inner dogs 7 on the band 3 have been moved so that the dogs 7 lie substantially midway between adjacent tongues 4 and close to the engagement position of the teeth 5, 6 so that the engagement position of these teeth

5,6 is such that the sharp edge or shoulder of an adjacent dog 7 lies near to the start of the slope of a tooth 6 on the band 3. However, this may not apply to all the teeth 5,6 since the teeth in this illustrated embodiment of the invention are not arranged equally around the circumference in order to facilitate moulding.

Figure 7 of the drawings clearly shows the neck profile of the container in plan with four external dogs 8 one of which can also be seen in Figure 8.

In Figures 4, 5 and 6 which shows a preferred embodiment of the invention, the dogs 7 have been moved angularly relatively to the tongues 4 and to the teeth 5, 6 by an angle of substantially 28° which has been achieved by rotating sections of the core pin of the mould in which the closure is made through an angle of 28° so that the size and shape of the parts of the closure remain the same as before but the position of the inner dogs 7 relative to the other parts of the closure has been changed.

In this specification, references to the neck of the container body refer to the relatively smooth outer profile of the body below and surrounding the mouth of the body. The neck may be of the same diameter as the main part of the body or may have a different diameter.

Claims

1. A tamper-resistant container assembly with dogs and teeth as herein defined characterised in that each of the internal dogs on the tamper-resistant safety band is displaced circumferentially from the adjacent frangible tongues by a distance sufficient to ensure that as each inner dog passes over an outer dog during the capping operation the adjacent tongues are compressed rather than stretched.

2. A tamper-resistant container assembly with dogs and teeth comprising a closure having a top, a depending skirt with an internal screw thread, teeth at the lower edge of the skirt, a safety band below the skirt, frangible tongues connecting the skirt to the safety band, teeth on the upper edge of the safety band and a number of ratchet-shaped internal dogs on the safety band and also comprising a container body having a mouth, a neck below the mouth, an external screw thread on the neck and a number of ratchet shaped external dogs spaced apart around the neck, so that the inner dogs cooperate with the outer dogs characterised in that each of the internal dogs on the tamper-resistant safety band is disposed at a position intermediate between the position of two adjacent tongues connecting the skirt to the band so that as each inner dog passes over an outer dog during

the capping operation the adjacent tongues are compressed rather than being stretched.

3. An assembly according to claim 1 or 2 wherein the circumferential displacement of the inner dogs alters the position of the said dogs relative to the teeth on the skirt and on the safety band in such a way that the dogs on the band are moved nearer to the engagement position of the teeth.

4. An assembly according to claim 3 wherein some of the inner dogs lie substantially midway between adjacent tongues and close to the engagement position of the teeth so that a sharp edge or shoulder of an inner dog lies close to the start of a slope of a tooth on the band.

5. An assembly according to any of the preceding claims wherein the inner dogs have been moved relative to the tongues by an angle of substantially 28°.

6. An assembly according to any of the preceding claims wherein the displacement of the inner dogs is effected by rotating sections of the core pin of a mould by an appropriate angle.

7. A closure for use in an assembly as claimed in claim 1 or 2 characterised in that each of the internal dogs on the tamper-resistant safety band is disposed at a position intermediate between the position of two adjacent tongues connecting the skirt to the band.

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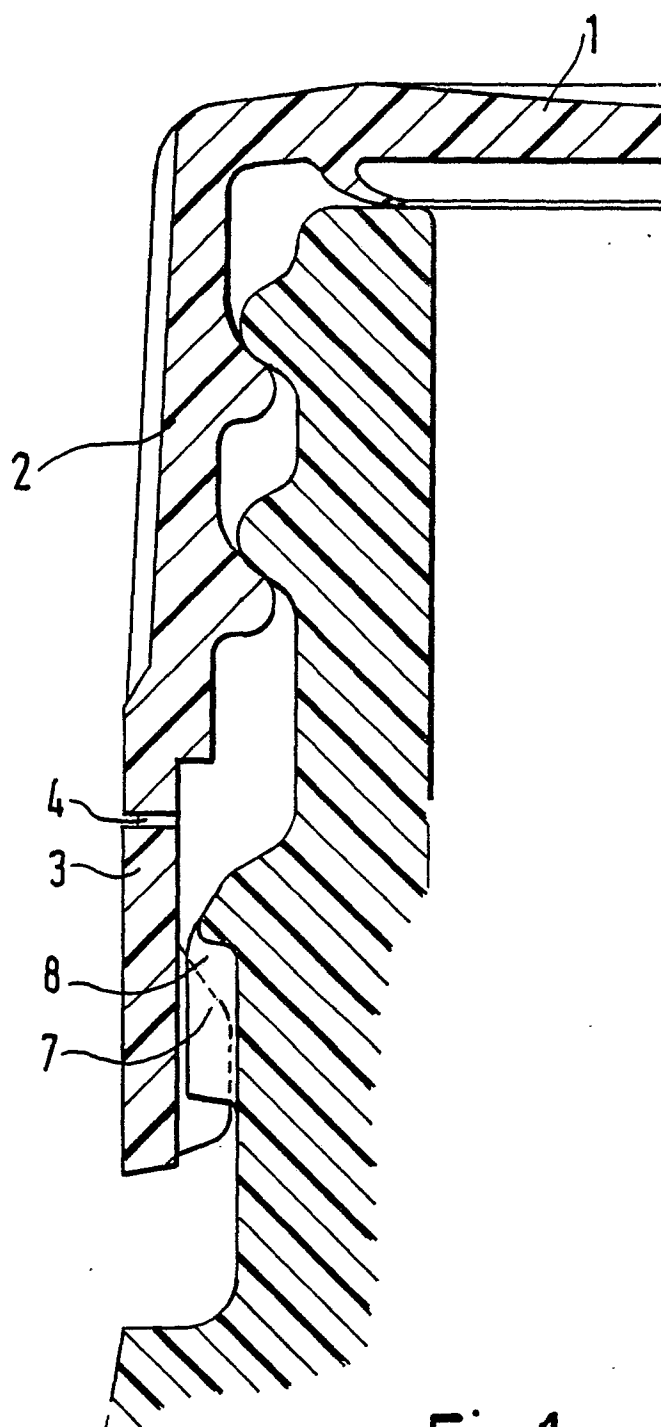


Fig.1.

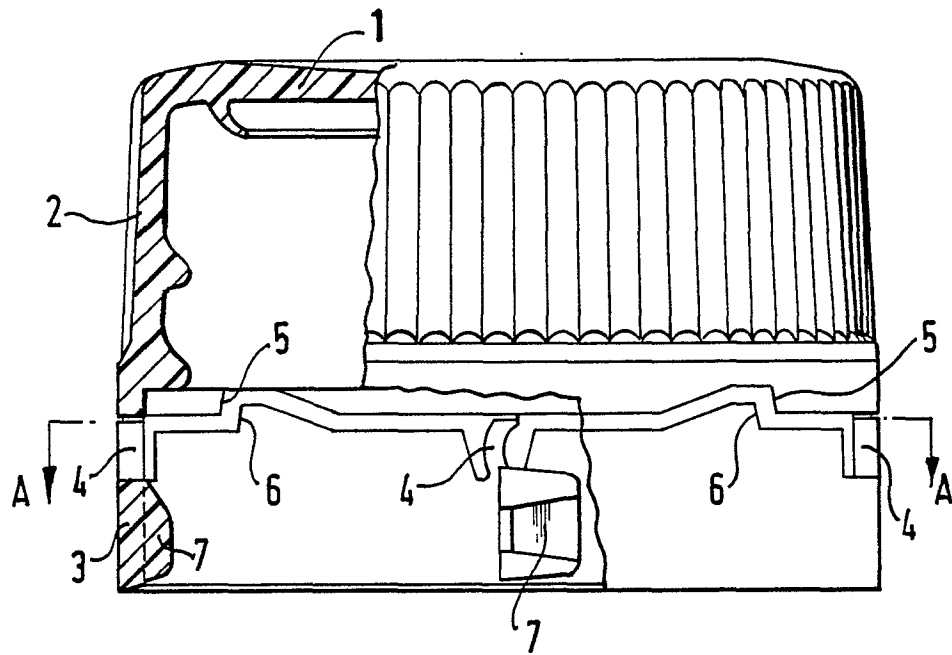


Fig.2.

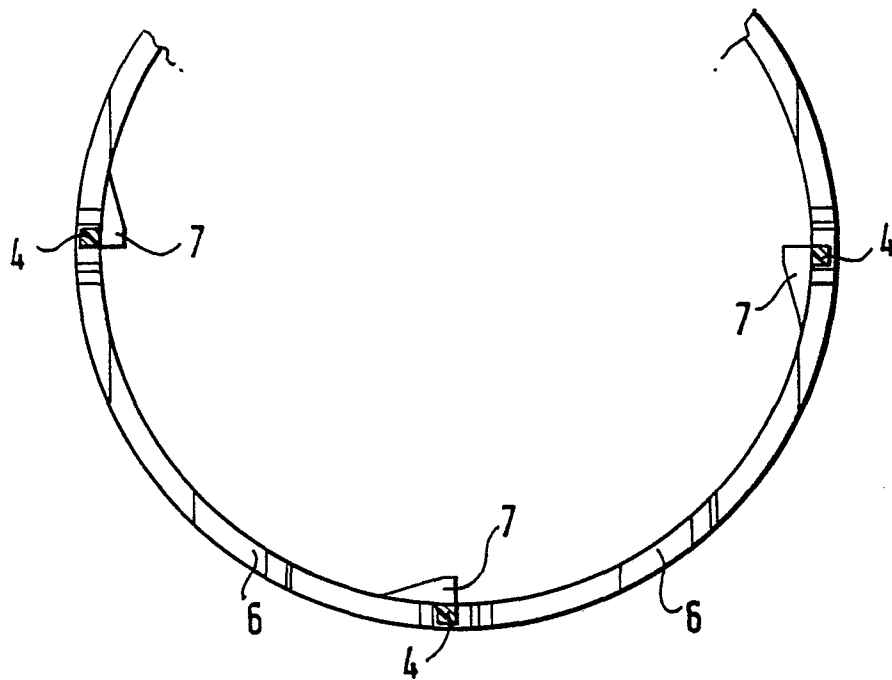


Fig.3.

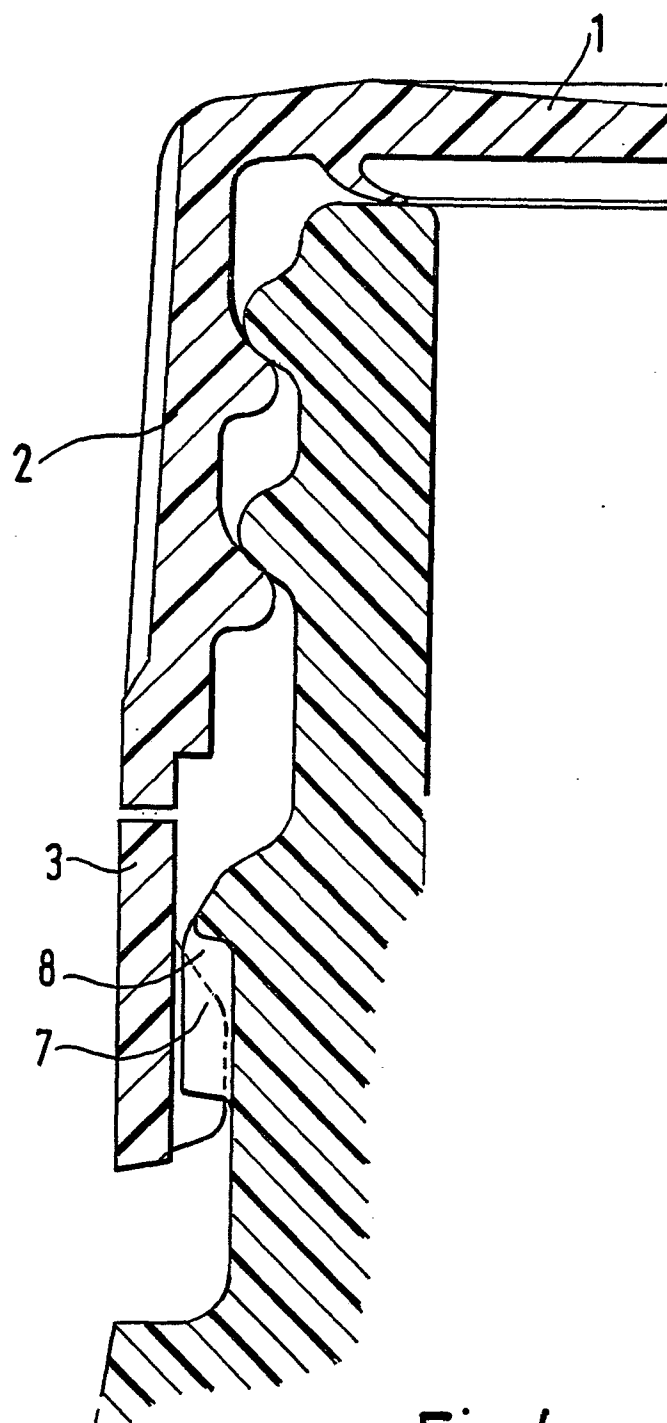


Fig.4.

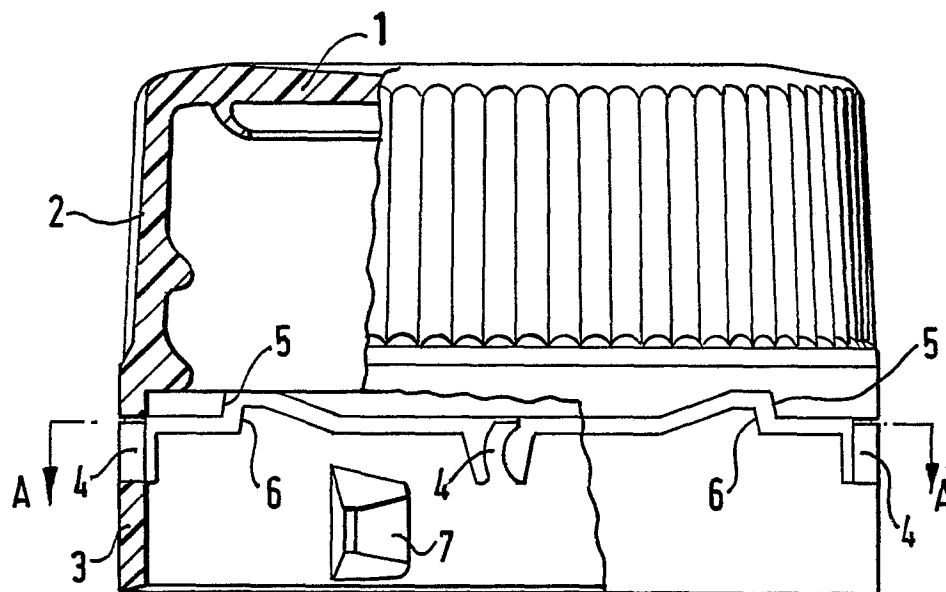


Fig. 5.

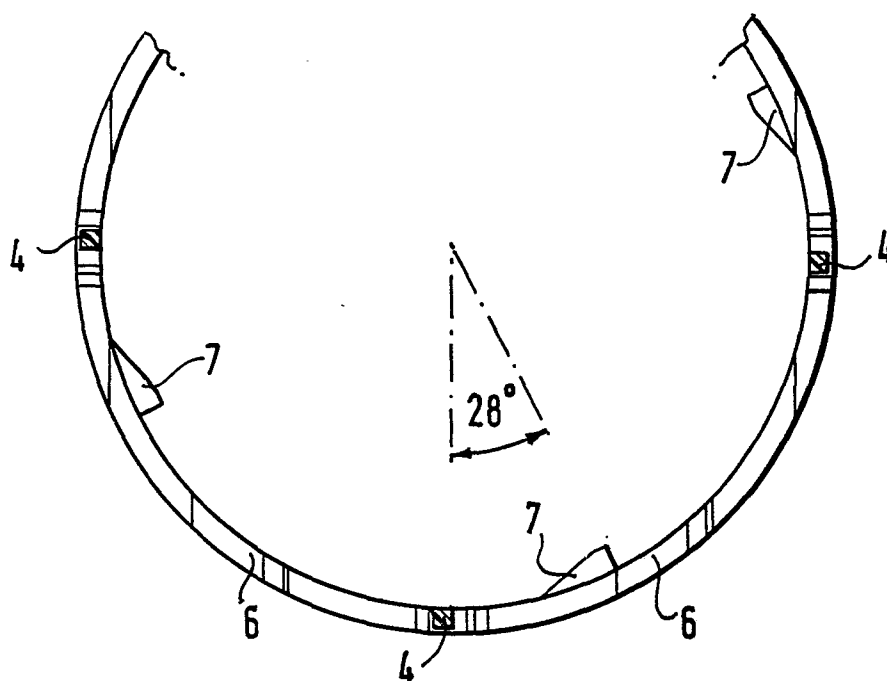


Fig. 6.

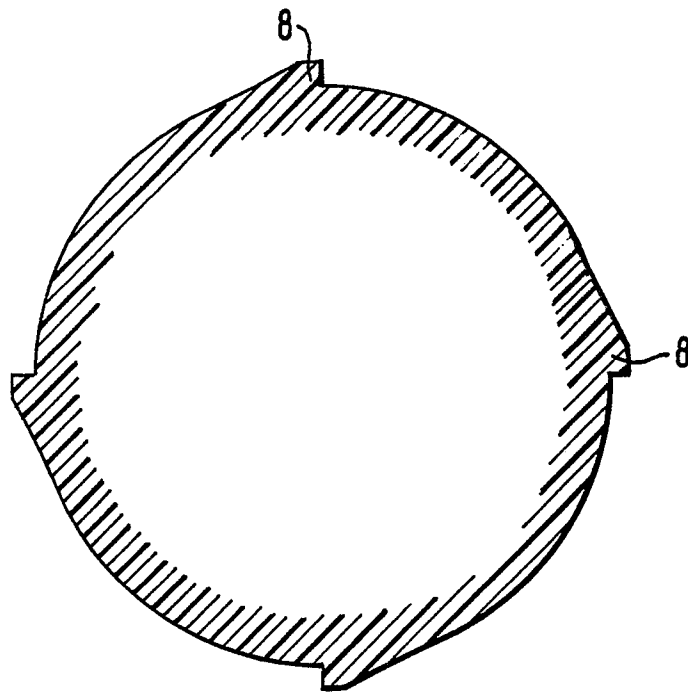


Fig.7.

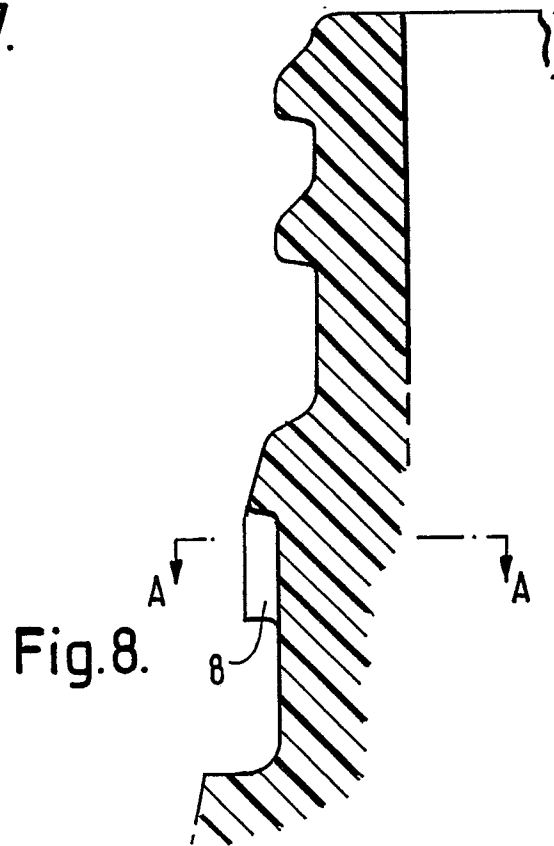


Fig.8.



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	EP-A-0 133 348 (JOHNSEN & JORGENSEN) * Page 3, line 19 - page 5, line 5; page 7, lines 1-13; figures 1-7 *	1	B 65 D 41/34
A	---	2-4	
Y	EP-A-0 204 425 (JOHNSEN & JORGENSEN) * Page 3, lines 10-16; figures 1,2 *	1	
A	---		
A	GB-A-2 163 413 (JOHNSEN & JORGENSEN) * Page 1, lines 70-129; figures 1-14 *	1-4	
A	---		
A	GB-A-1 159 029 (POPLAR PLAYTHINGS LTD) * Page 1, lines 64-76; figures 1-4 *	1,2	
A	---		
A	EP-A-0 219 946 (JOHNSEN & JORGENSEN) * Figures 1,2 *	1	

			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B 65 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22-11-1989	Examiner BERRINGTON N.M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			