(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 897 878 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.02.1999 Bulletin 1999/08

(51) Int Cl.[6]: **B65D 50/04**

(21) Application number: **98306506.1**

(22) Date of filing: **14.08.1998**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **16.08.1997 GB 9717354**

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(54) Child resistant (lockable) closure

(57) A 'press and turn' child-resistant locking closure, for fitment to a threaded container neck, has an inter-nesting inner cap (21) and an outer cap (11), drivably interconnectable by relative axial movement, through a deformable splayed-tab array, to engage an internal ratchet tooth (16) and pawl (25) array on the respective caps (11, 21), and so to allow unthreading and removal of the closure.

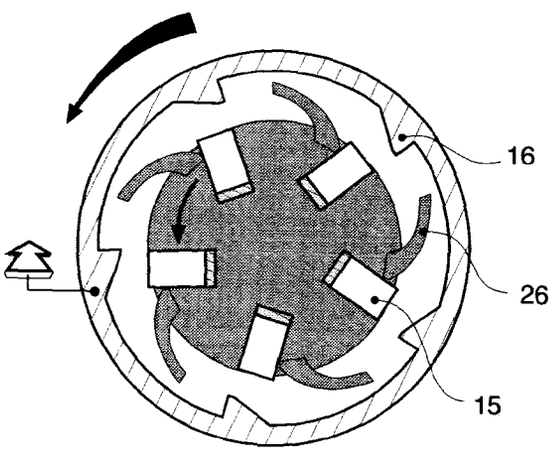


Figure 18

EP 0 897 878 A1

Description

[0001] The present invention relates to container closures, and is particularly, but not exclusively, concerned with so-called 'child-resistant', (lockable) closures.

[0002] The term 'lockable closure' is used herein to embrace fittings, such as screw caps, which are installed and removed by an action of one character, set or sequence, such as rotation - but which can only be 'unlocked' (for opening) by supplementary (prefacing) action of a different (eg linear) character.

[0003] The term 'child-resistant' is used herein to signal that the closure operation is less apparent, or intuitively comprehended.

[0004] Thus a child is less likely to carry out the correct action sequence necessary to open the closure - whether by casual play, repeated (random) trial or determined experiment.

[0005] Certain domestic consumer products - including medicines and cleaning agents such as bleach - are hazardous upon skin contact or intemal consumption - especially to vulnerable younger children.

[0006] It is now common practice for the containers of such hazardous products to have a 'child-resistant' locking closure mechanism.

[0007] Of the various such locking closures, a common type, especially for medicines, is the '(de)press and turn (ie to unscrew or unthread)' mechanism.

[0008] Specifically, a threaded closure cap must be depressed initially, during (or prefacing) rotation (usually anti-clockwise, for a natural unlocking action), to allow engagement with a container neck thread and closure removal.

[0009] In other closure variants, (angular position reference) markings must be aligned correctly before a closure can be removed.

[0010] Another closure cap requires localised squeezing together of particular regions of the cap wall combined with closure rotation.

[0011] An advantage of the 'press and tum' closures is their suitability for direct substitution of a conventional screw cap, without container neck adaptation.

[0012] Known 'press and turn' child-resistant locking closures generally employ two interacting and internesting caps.

[0013] Thus, an inner cap mates with a container neck thread.

[0014] The inner cap is in turn enshrouded by an outer cap - which becomes the only element accessible for user rotation.

[0015] However, inter-engagement of the inner and outer caps required for cap unthreading from the container neck and cap removal requires a supplementary action.

[0016] Thus, if the outer cap is merely rotated, it will not rotatably engage or drive the inner cap.

[0017] The outer and inner caps will only interact and move together to unscrew when the outer cap is simultaneously depressed and rotated.

[0018] More specifically, the caps cannot be rotated in the direction required for unthreading the inner cap from the container neck, unless depressed.

[0019] This unthreading is generally in the anti-clockwise direction.

[0020] The outer and inner caps can remain rotatably fast for rotation in the closure installation direction - generally clockwise - even without outer cap depression.

[0021] When the cap is simply turned in the anti-clockwise direction, the two caps do not interact, the outer cap turning without moving the inner cap - so the inner cap is not unthreaded and disengaged from the container neck, and cannot be removed.

[0022] Generally, the inner and outer caps are shaped so that there is only a sustained interaction between them when the outer cap is turned in one (conventionally clockwise) direction.

[0023] The inner and outer caps simply slide past one another upon rotation in the other (conventionally anti-clockwise) direction, so that there is no interaction - that is rotation of the outer cap does not cause the inner cap to turn.

[0024] A supplementary interaction mechanism between the caps is only implemented or engaged by depressing the outer cap.

[0025] This lowers the outer cap, towards the inner cap, allowing driving inter-engagement between the inner and outer caps for rotation of the outer cap in either direction.

[0026] Known 'press and turn' caps can prove elaborate constructions, with intricate and frail elements, which are complex to mould and expensive to tool, and prone to fatigue failure.

[0027] They may also generate a pronounced ratchet clicking noise, upon (drive) slipping relative rotation of the inner and outer caps.

[0028] Examples of such known press and turn closures are US 4,570,809 (Archer) and WO 86/07035 (Wassilieff), but these rely upon a common selective inter-engagement mechanism between inner and outer caps for closure installation and removal.

[0029] According to one aspect of the invention,
a lockable closure, for a container (threaded neck), comprises
an inner cap,
with a inner thread profile,
for engagement with a threaded container neck,
and one or more pawls,
on the outer surface of the cap ceiling;
an outer cap,
with an array of ratchet teeth,
at juncture of the side wall and cap ceiling,
to engage the pawls of said inner cap,
tabs protruding from the inner surface of the cap ceiling;
said tabs being splayed,
upon contact with the ceiling of the inner cap,
through application of downward pressure

upon the ceiling of the outer cap,
thereby engaging said pawls,
and rotationally entraining the inner and outer caps,
to allow removal of both caps,
when fitted as an integral closure
to a container.

[0030] Such a closure configuration provides differentiated selective inter-engagement mechanisms between inner and outer cap elements, respectively for installation upon and removal from a threaded container neck.

[0031] More specifically, tab and pawl inter-engagement for closure (unscrewing) removal is independent of pawl and ratchet selective inter-engagement for closure (screwing installation)

[0032] This in turn allows a robustness and independence of operational modes.

[0033] The ratchets of the outer cap may be shaped to engage the pawls of the inner cap only when the outer cap is turned in a clockwise direction.

[0034] Thus, when the outer cap is rotated anti-clockwise, its pawls slide past the (inner cap) ratchets without engaging - and the inner cap is not rotated, so the closure as a whole cannot be unthreaded and removed from the container to which it is fitted.

[0035] When downward force is applied to the outer cap, the flat (upper) faces of the two caps are brought closer to one another.

[0036] The outer cap internal locating tabs come into contact with the top side of the inner cap and then splay progressively outwards.

[0037] The ends of the tabs eventually reach far enough outwards to abut or engage the pawls on the inner cap, (rotationally) entraining the inner and outer caps and allowing anti-clockwise rotation of the inner cap by outer cap rotation.

[0038] When the downward force is removed, the outer cap tabs revert to their original, nondeflected position and will no longer engage the inner cap pawls.

[0039] This constructional approach is somewhat easier to mould and reduces or obviates the, to an adult, irritating, or to a child even intriguing, pronounced ratchet over-run clicking noise.

[0040] Such clicking may encourage further play, exploration or experimentation and accidental revelation of the unlocking solution - allowing access to potentially hazardous container contents.

[0041] There now follows a description of a particular embodiment of lockable closure cap of the invention, by way of example only, with reference to the accompanying diagrammatic and schematic drawings, in which:

Figure 1 shows an underside plan view of an outer cap;

Figure 2 shows a perspective underside view of the outer cap of Figure 1;

Figure 3 shows a longitudinal sectional view of the outer cap of Figures 1 and 2;

Figure 4 shows an upper plan view of an inner cap;

Figure 5 shows an upper perspective view the inner cap of Figure 4;

Figure 6 shows an underside perspective view of the inner cap of Figures 4 and 5;

Figure 7 shows a longitudinal sectional view of the inner cap of Figure 4;

Figure 8 shows a transverse sectional view of a closure assembled from the outer cap of Figures 1 through 3, fitted upon the inner cap of Figures 4 through 7;

Figure 9 shows, through a generally underside view, relative dispositions of the interfitted closure combination of Figure 8;

Figure 10 shows a perspective underside view of the closure assembly of Figures 8 and 9;

Figure 11 shows a longitudinal sectional view of the closure assembly of Figures 8, 9 and 10;

Figure 12 shows a sectional view of the inner and outer caps of the closure assembly of Figures 8, 9 and 10, in driving dis-engagement;

Figure 13 shows a sectional view of the inner and outer caps of the closure assembly of Figure 12, when the outer cap is depressed, in driving engagement;

Figure 14 shows a transverse sectional (slice) view of the inner and outer caps, with the cap ceiling of the outer cap cut away;

Figure 15 shows the view of Figure 14 upon (clockwise) rotation of the outer cap;

Figure 16 shows the view of Figure 14 upon (anti-clockwise) rotation of the outer cap;

Figure 17 shows the view of Figure 14 upon depression of the outer cap; and

Figure 18 shows the view of Figure 14 upon depression and (anti-clockwise) rotation of the outer cap.

[0042] Referring to the drawings, a child-resistant locking closure 10, for threaded inter-fit with the threaded neck of a container (not shown), comprises an inner cap 21 inter-nested with an outer cap 11.

[0043] A protrusion 24 at the outer bottom edge of the inner cap 21 fits above a ridge 14 on the inside surface of the side wall 12 of the outer cap 11.

[0044] Once fitted beyond this ridge (14), the inner cap 21 is thus (permanently) entrapped within the outer cap 11.

[0045] The outer cap 11 is the only part of the closure mechanism visible once fitted to a container neck.

[0046] The outer surface of the side wall 12 may be profiled, for example multi-facetted, segmented or serrated, stylistically and/or functionally to afford better grip for opening and closing.

[0047] Summary instructions for opening and closing may be printed in the outer cap ceiling surface.

[0048] The side wall 12 is angled so that the outer cap 11 is somewhat wider at the bottom than at the top - that is slightly (truncated) conical overall. Other cap profiles are tenable.

[0049] On the inside of the outer cap 11, at the inner juncture of the cap side wall 12 and a cap ceiling 13, is an array of ratchet teeth 16.

[0050] The ratchet teeth 16 are orientated (progressively) in the same (rotational) sense, around the outer cap 11.

[0051] Arranged in a circle around the centre of the top side of the outer cap 11 is an array of tabs 15.

[0052] The tabs 15 are attached at their (upper) ends to the inner cap ceiling 13.

[0053] The tabs are orientated somewhat towards the side wall 12 of the outer cap 11, to facilitate their outward splay upon cap depression, as described later.

[0054] The inner cap 21 has a smooth outer side wall 22 surface.

[0055] The inner surface has a thread profile 27 to engage a complementary container neck thread profile.

[0056] Attached to the raised ceiling 25 of the inner cap 21 is an array of pawls 26. The ends of the pawls 26 extend outwards towards the outside edge of the inner cap 21.

[0057] When the inner cap 21 is fitted within the outer cap 11, the ends of the pawls 26 deploy to engage the ratchet teeth 16.

[0058] Upon (clockwise - as viewed from above) rotation of the outer cap 11, the ends of the pawls 26 engage with the square abutment surfaces 18 of the ratchets 16, as shown in Figure 15.

[0059] This allows the inner and outer caps to interact, and so rotate together in a clockwise direction for fitment upon a (complementary threaded) container neck (not shown).

[0060] Upon anti-clockwise rotation of the outer cap 11, as illustrated in Figure 16, the ends of the pawls 26 engage with the sloping surface 17 of the ratchet teeth 16. The pawls 26 do not then interact with the ratchet teeth 16, but are deflected inwards and so simply slide past.

[0061] Thus, the inner cap 21 does not turn with the outer cap in an anti-clockwise sense, necessary for closure removal from the container neck.

[0062] When the outer cap is depressed relatively to the inner cap, fitted to the neck of the container, the ratchet teeth 16 of the outer cap move downwards until they abut the (lower) ceiling surface 23 of the inner cap 21. This engagement is effectively a (downward) travel limit stop.

[0063] At the same time the tabs 15 are each splayed outwards, through contact of their remote ends with the raised ceiling area 25 of the inner cap, as shown in Figure 17.

[0064] As they splay, the ends of the tabs 15 move progressively outwardly to engage the pawls 26.

[0065] Upon rotating the outer cap 11, while applying downward pressure, as illustrated in Figure 18, the splayed tabs 15 are disposed in driving inter-engagement with the pawls 26 - allowing the outer and inner caps 11, 21 to rotate together in the anti-clockwise direction, as necessary for closure unthreading and removal from the container neck.

Component List

[0066]

10 closure
11 outer cap
12 side wall
13 cap ceiling
14 ridge
15 tab
16 ratchet
17 sloped surface of ratchet
18 squared surface of ratchet

21 inner cap
22 side wall
23 cap ceiling
24 protrusion
25 raised ceiling surface
26 pawl
27 (inner surface) screw profile

Claims

1. A (child-resistant) lockable closure (10),
for a threaded container neck,
the closure comprising
an inner cap (21),
with a inner thread profile (27) and
one or more pawls (26),
on the outer surface of the cap ceiling (25);
and an outer cap (11),
with an array of ratchet teeth (16),
abutting the side wall and cap ceiling,
to engage the pawls of said inner cap,
and tabs (15),

depending from the inner cap ceiling (13);
said tabs being splayed,
upon contact with the inner cap ceiling (25),
through application of (downward) pressure
on the outer cap,
to inter-engage said pawls and teeth,
making the inner and outer caps rotatably fast,
and in turn allowing closure removal from a container.

2. A lockable closure, as claimed in Claim 1,
wherein a protrusion (24),
at the outer bottom edge of the inner cap,
fits above a ridge (14),
on the inside of the outer cap wall (12),
entrapping the inner cap within the outer cap.

3. A lockable closure,
as claimed in either of the preceding claims,
wherein the tabs are orientated,
to promote their outward splay,
upon contact with the ceiling of the inner cap.

4. A lockable closure,
as claimed in any of the preceding claims,
wherein the inner cap ceiling
has a raised portion (25)
upon which the pawls are positioned,
and beyond which the ratchets (16) move downwards,
to allow the tabs to contact said raised portion
and splay to contact the pawls.

5. A lockable closure,
as claimed in any of the preceding claims,
wherein the ratchets have squared surfaces, positioned for engagement with the pawls,
only upon clockwise rotation of the outer cap,
to cause interaction between the caps.

6. A container
with a complementary threaded neck
fitted with a locking closure
as claimed in any of the preceding claims.

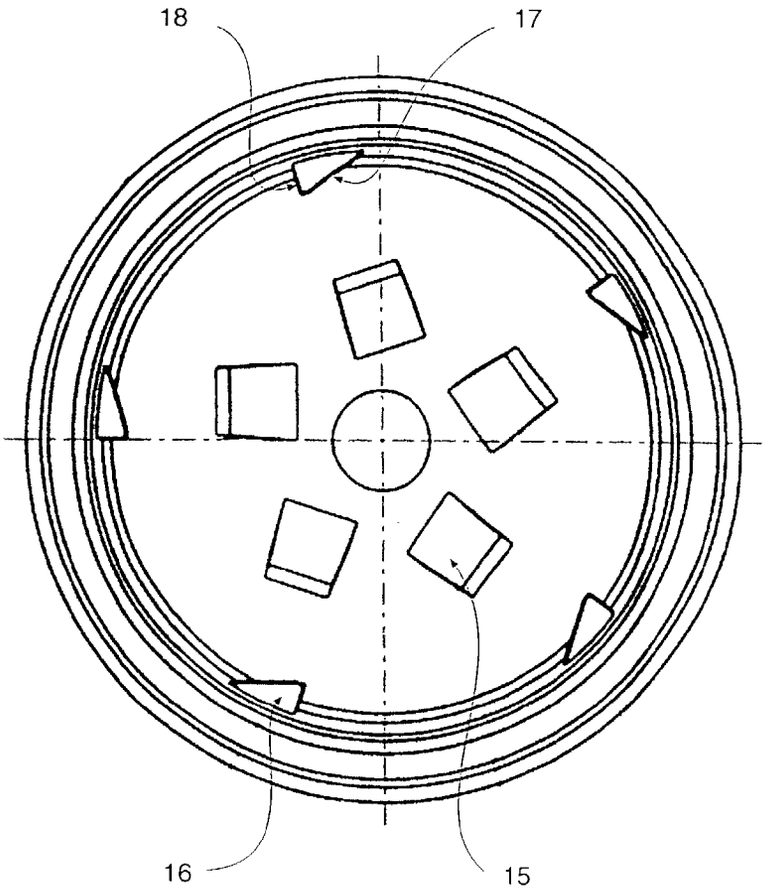


Figure 1

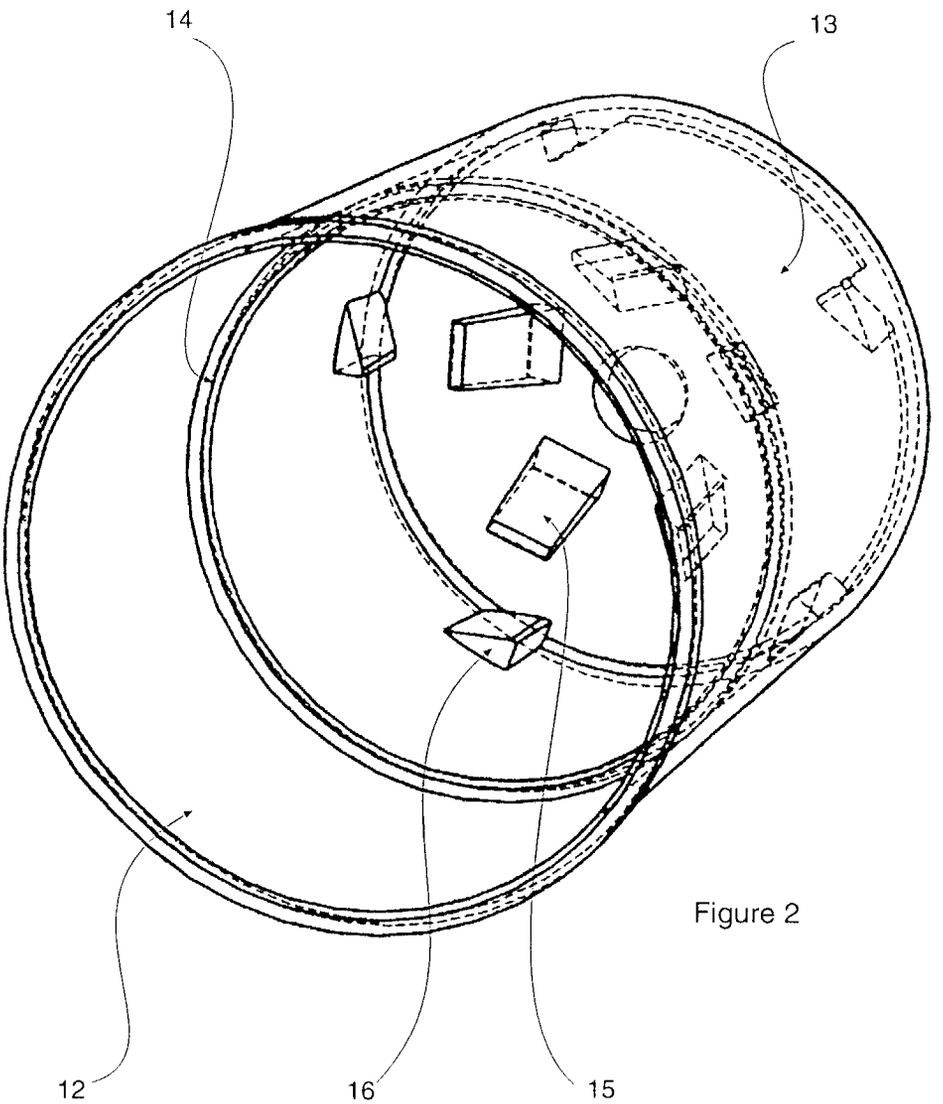
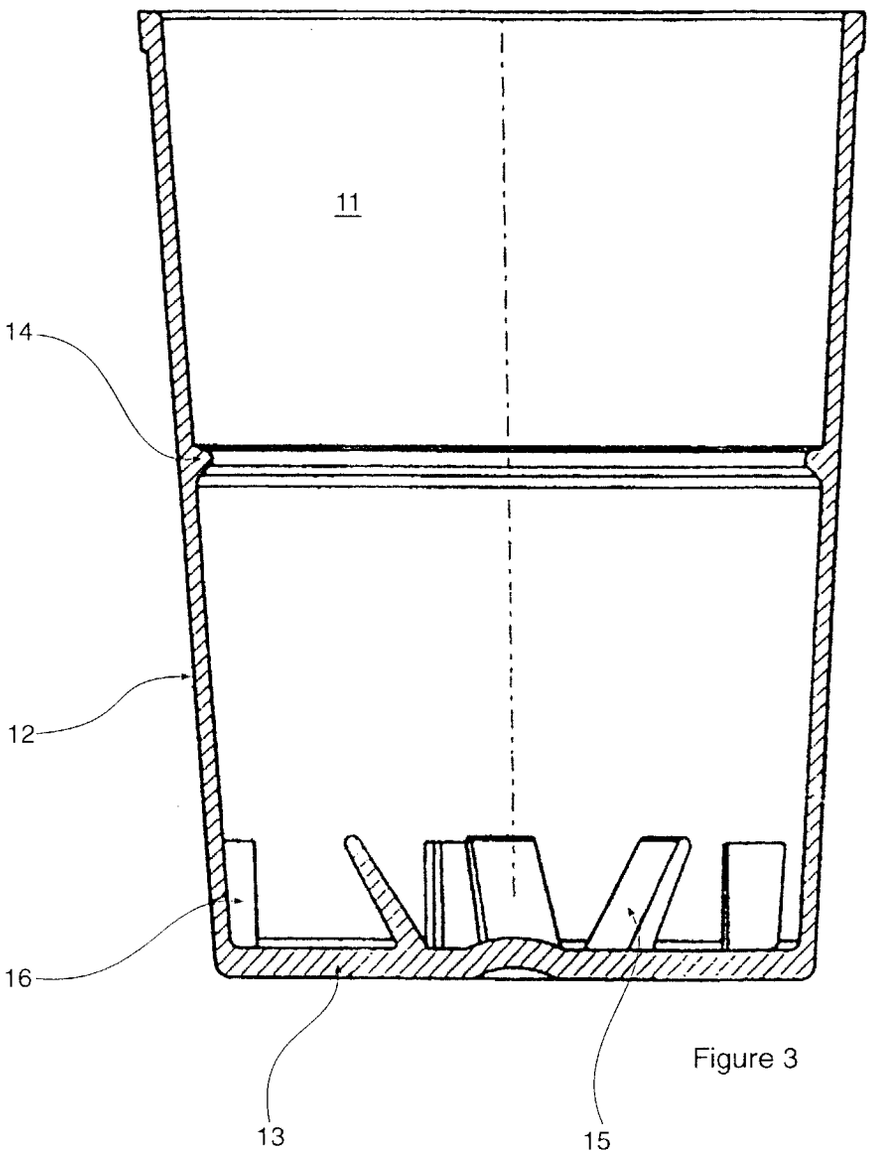


Figure 2



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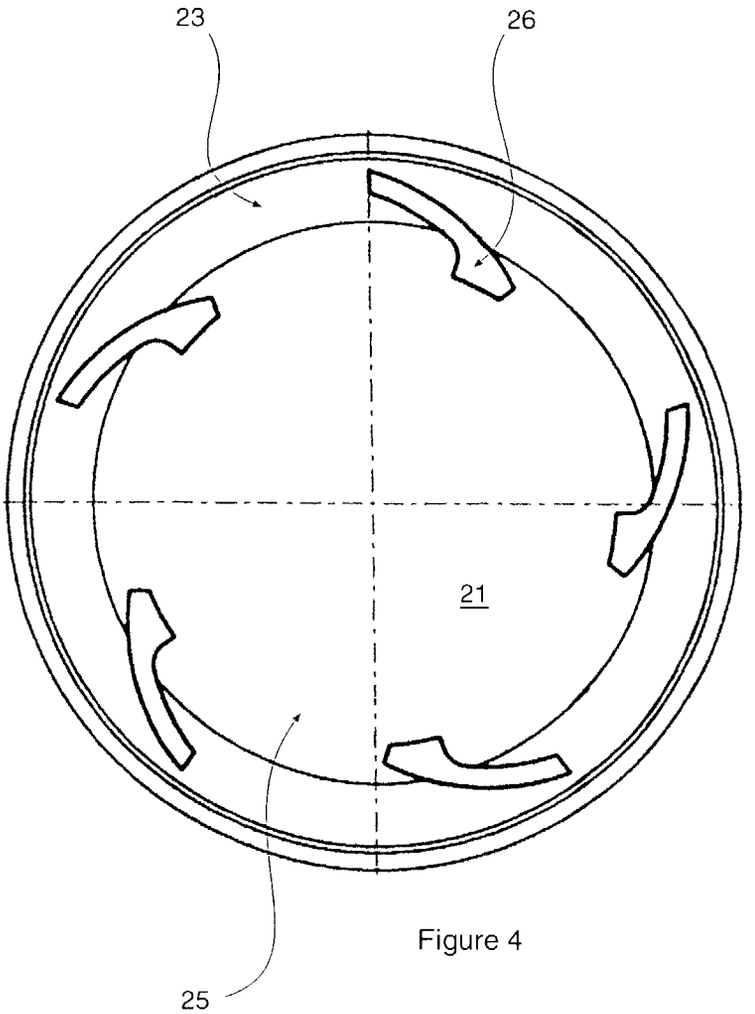

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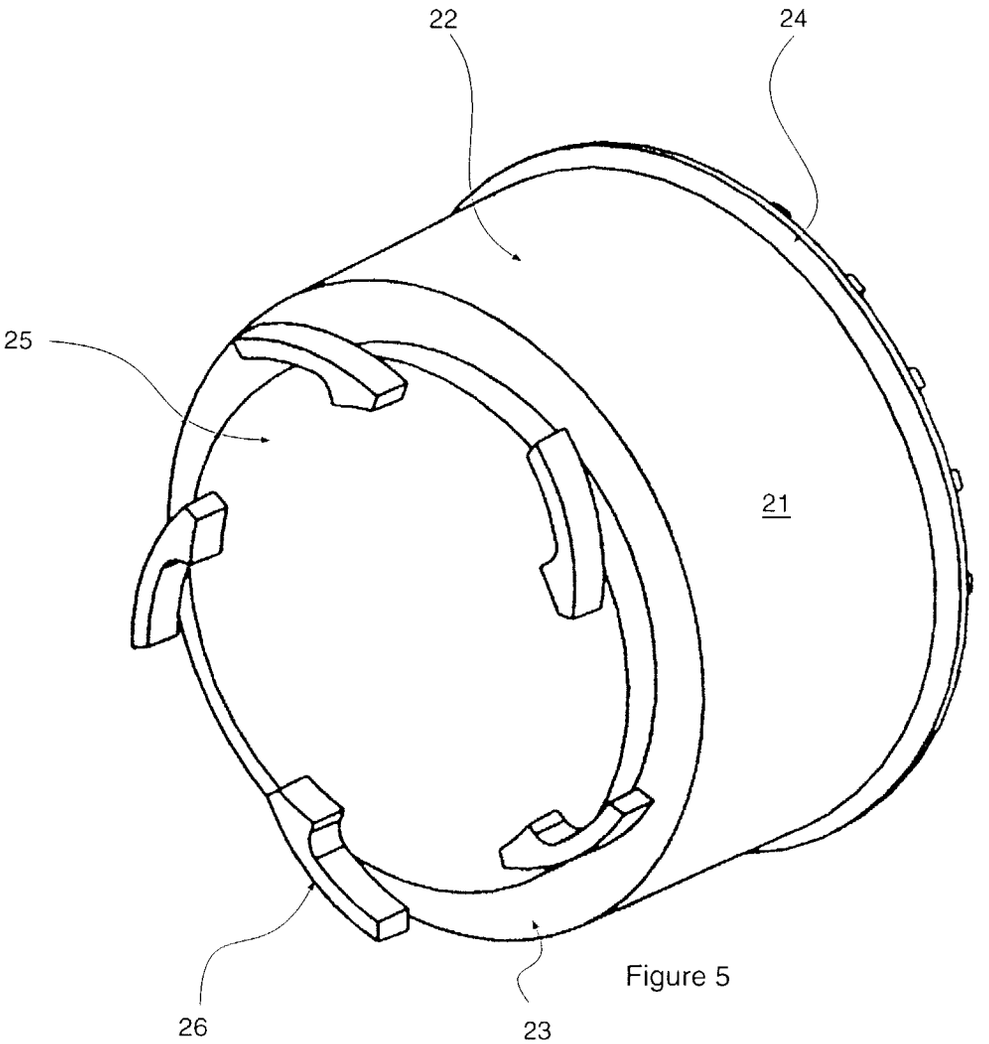

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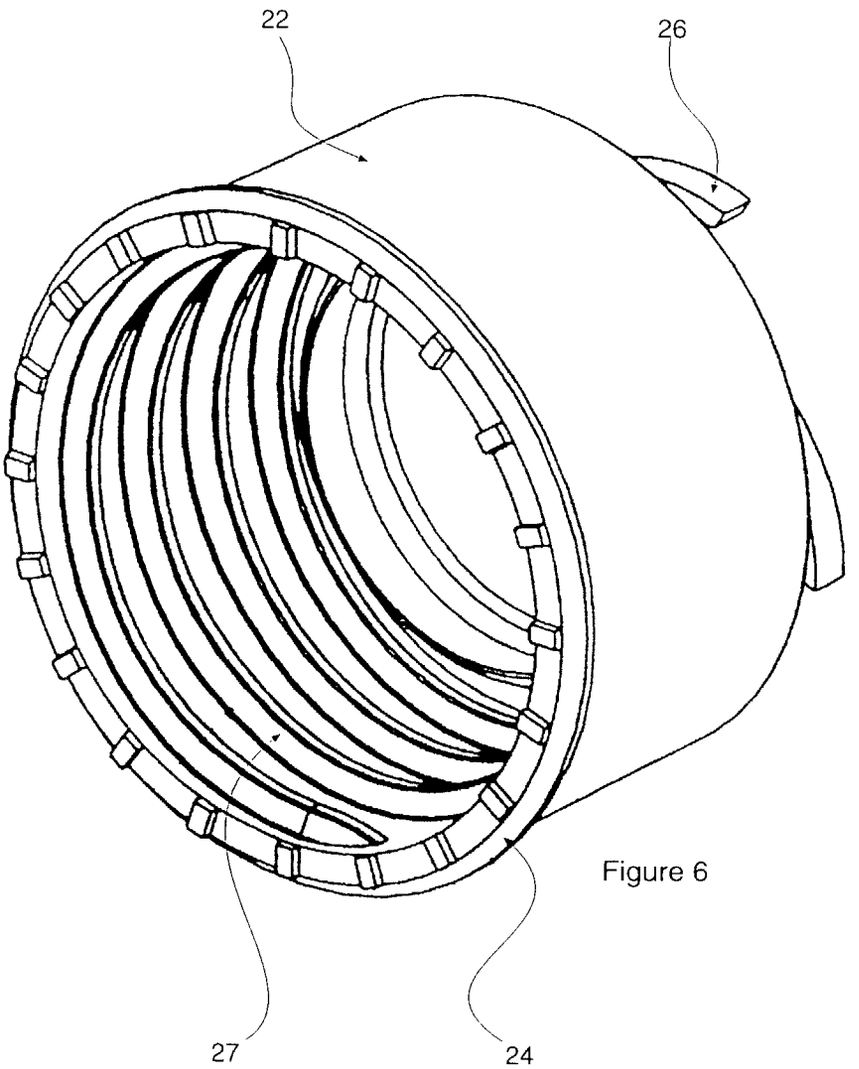


Figure 6

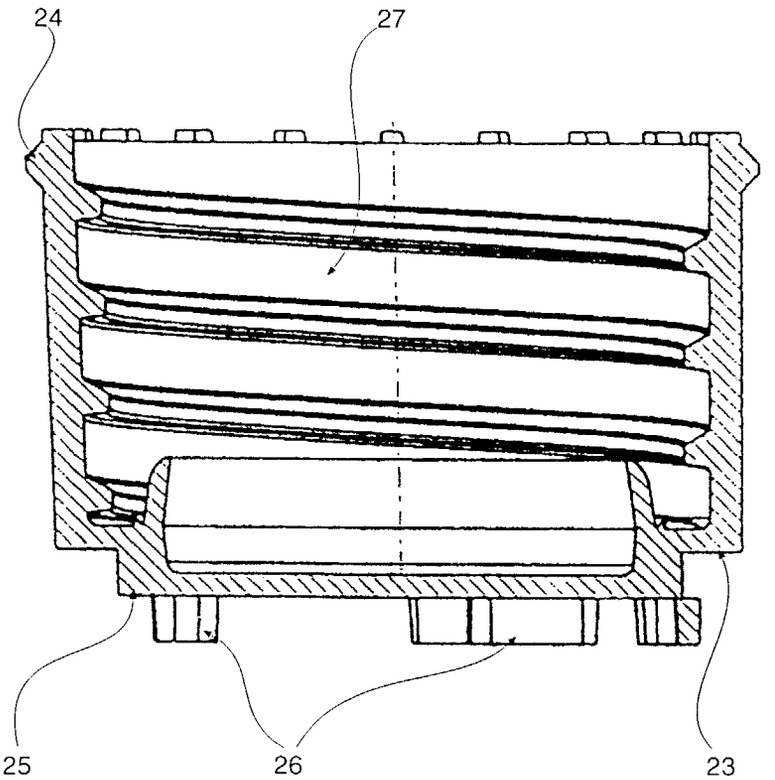
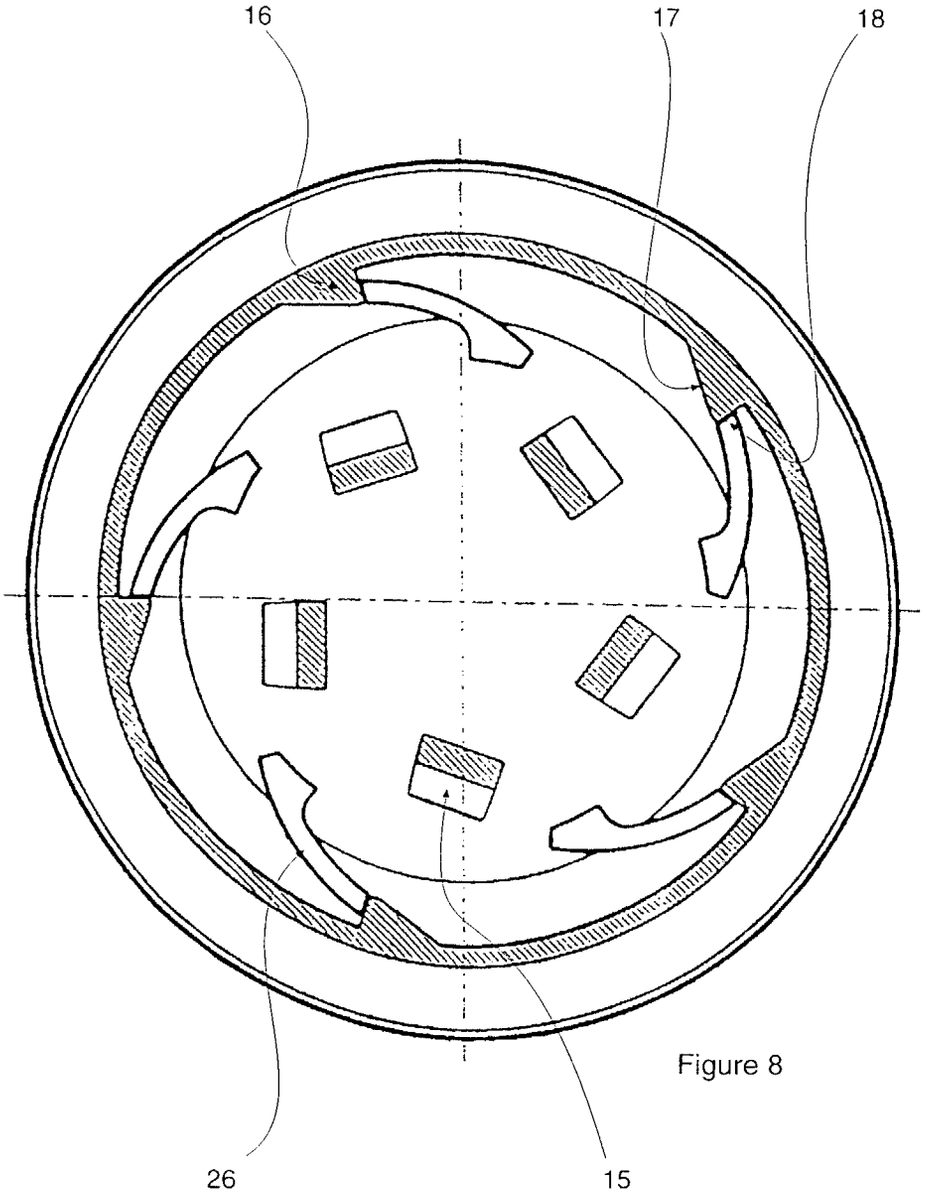


Figure 7



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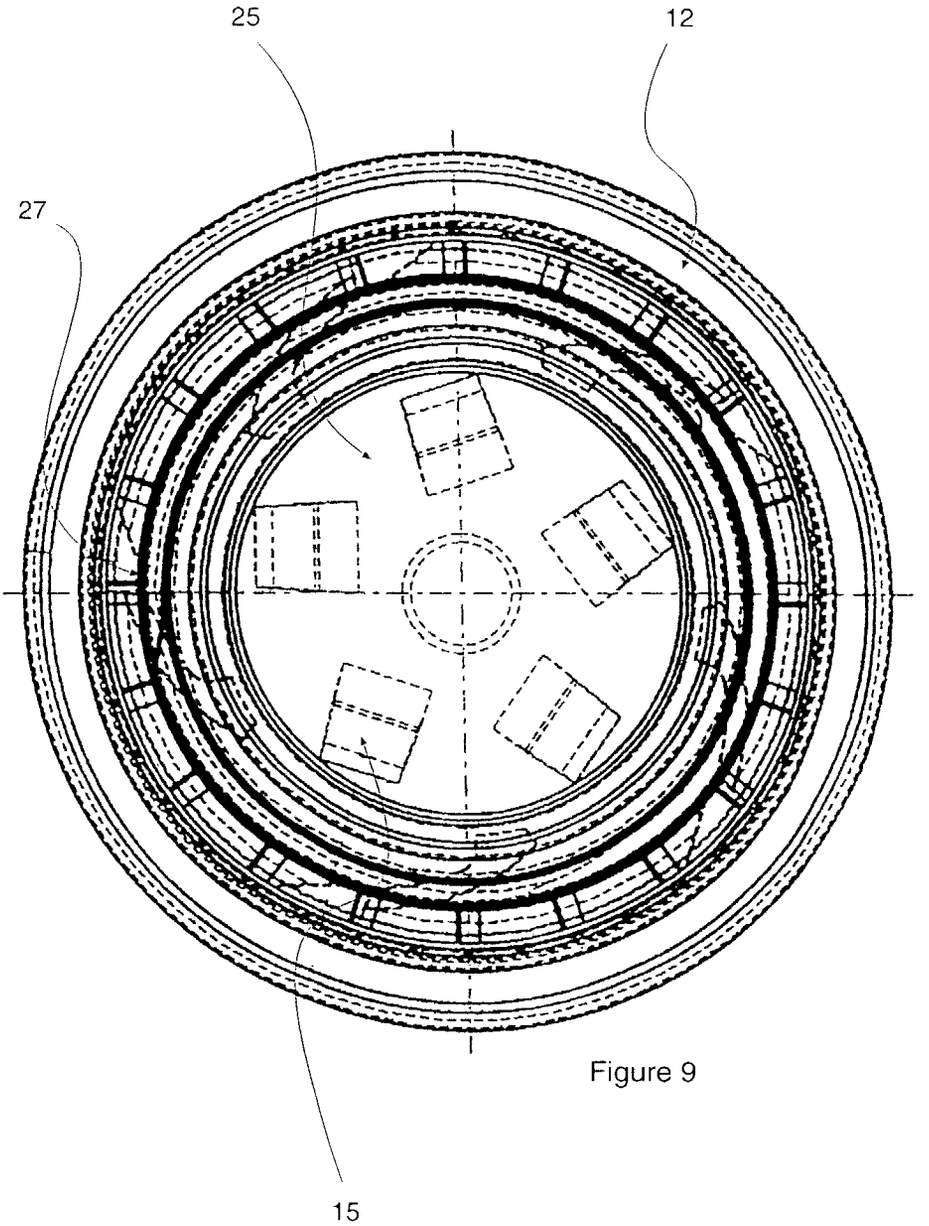

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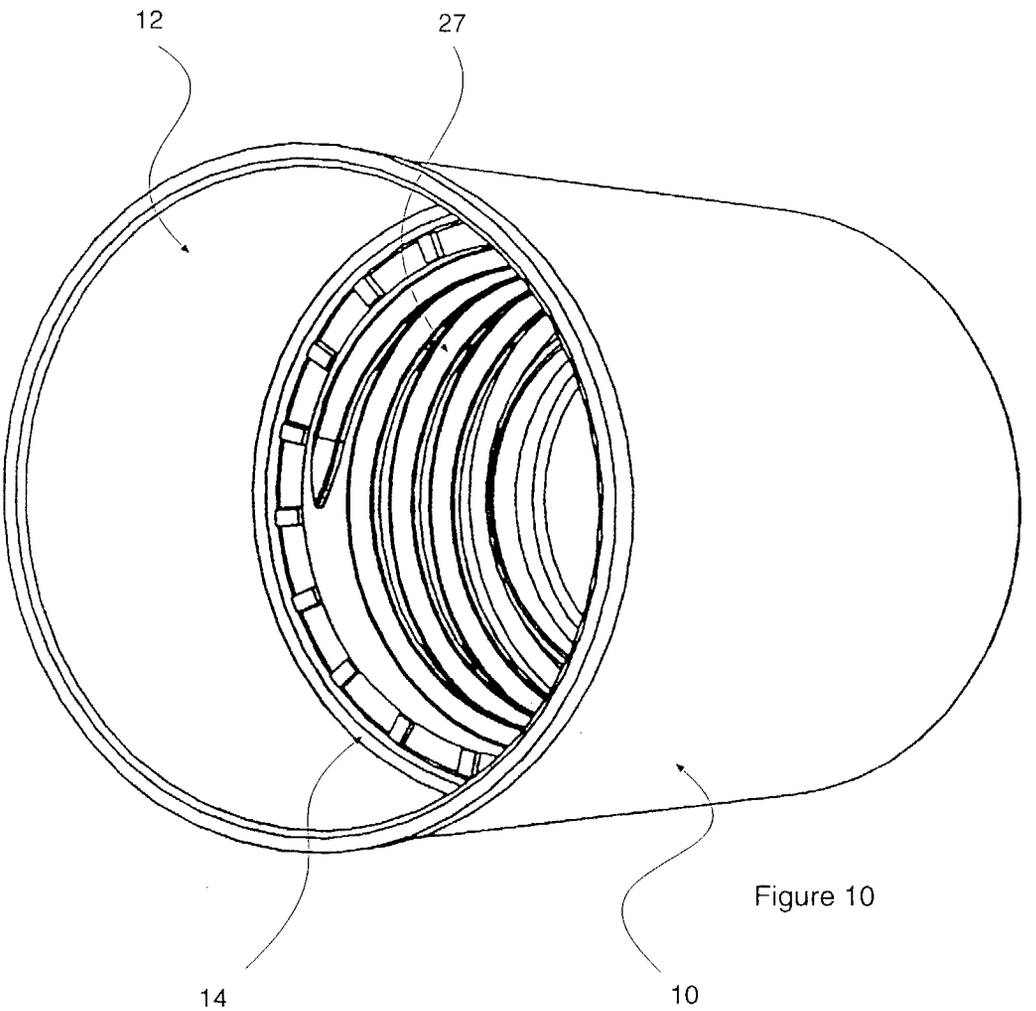

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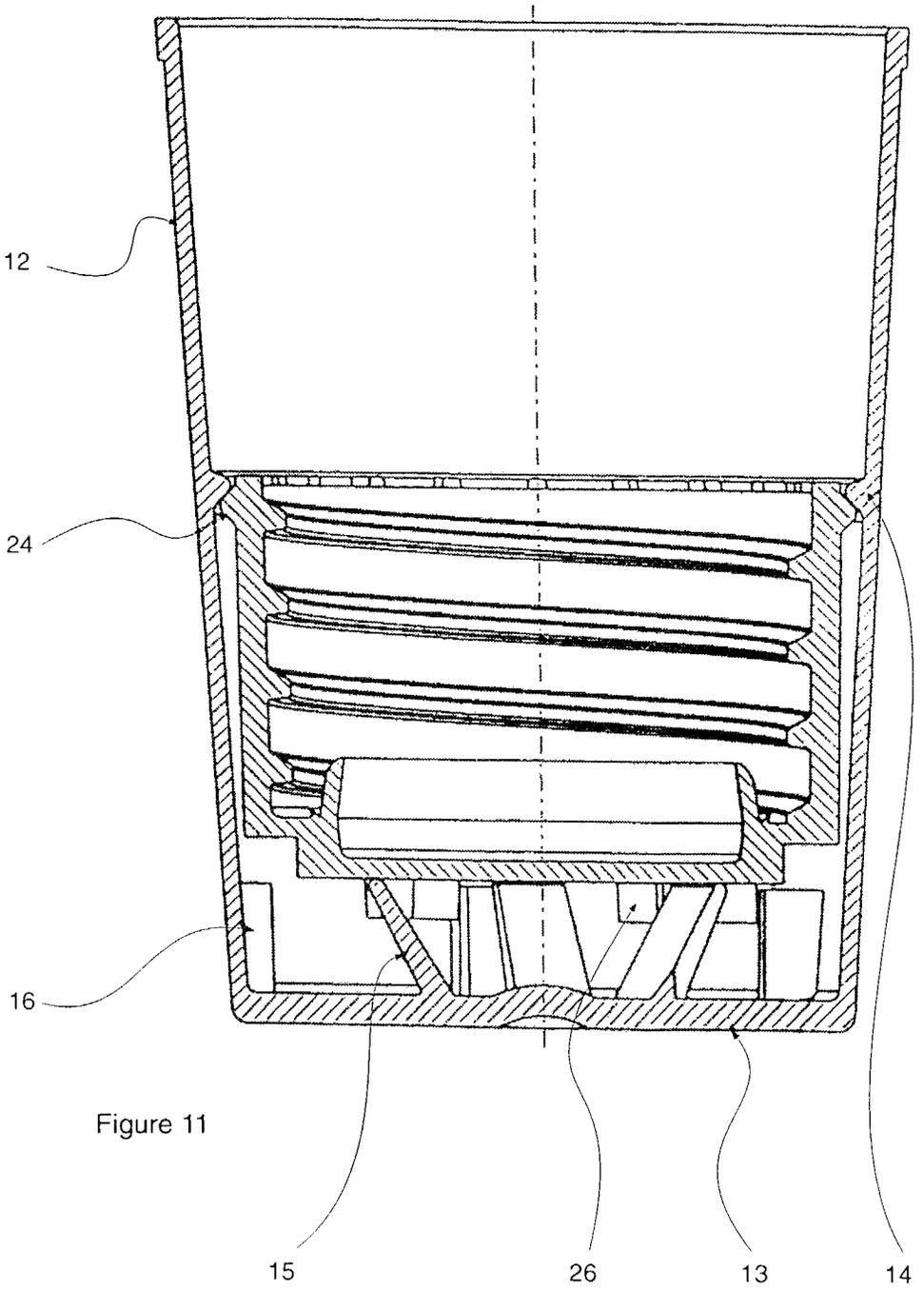

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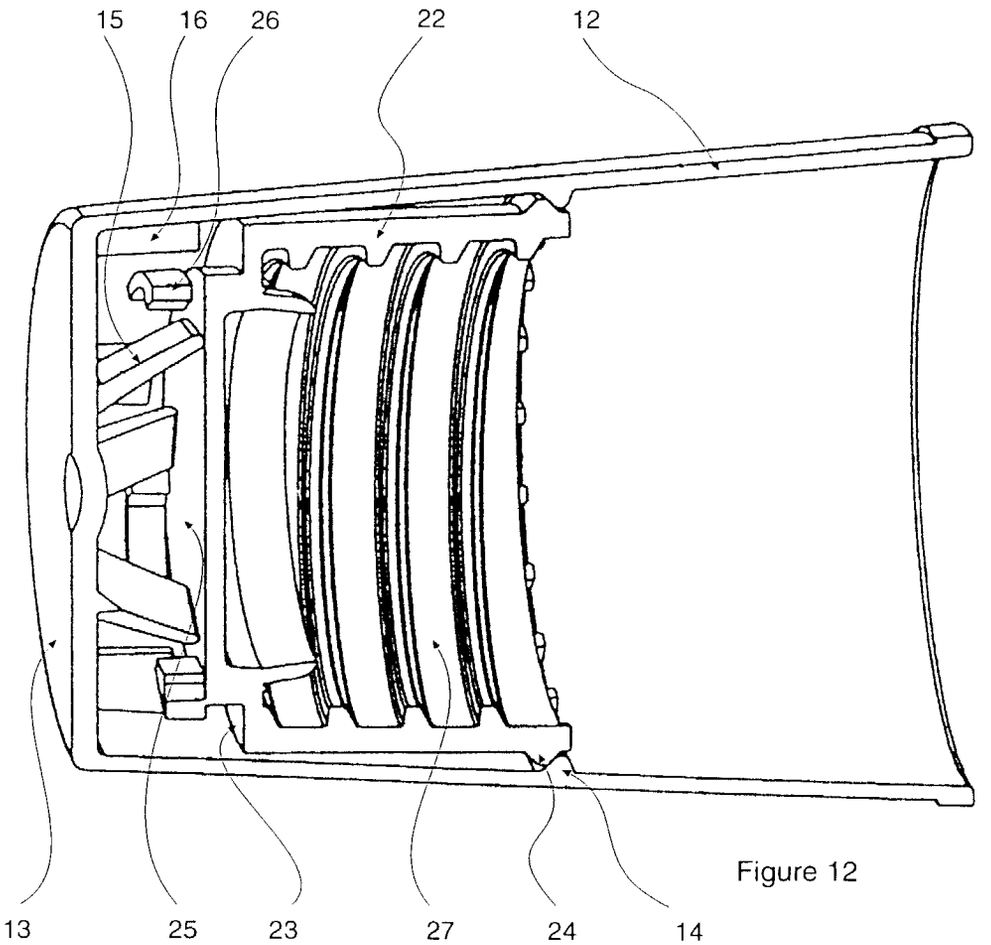

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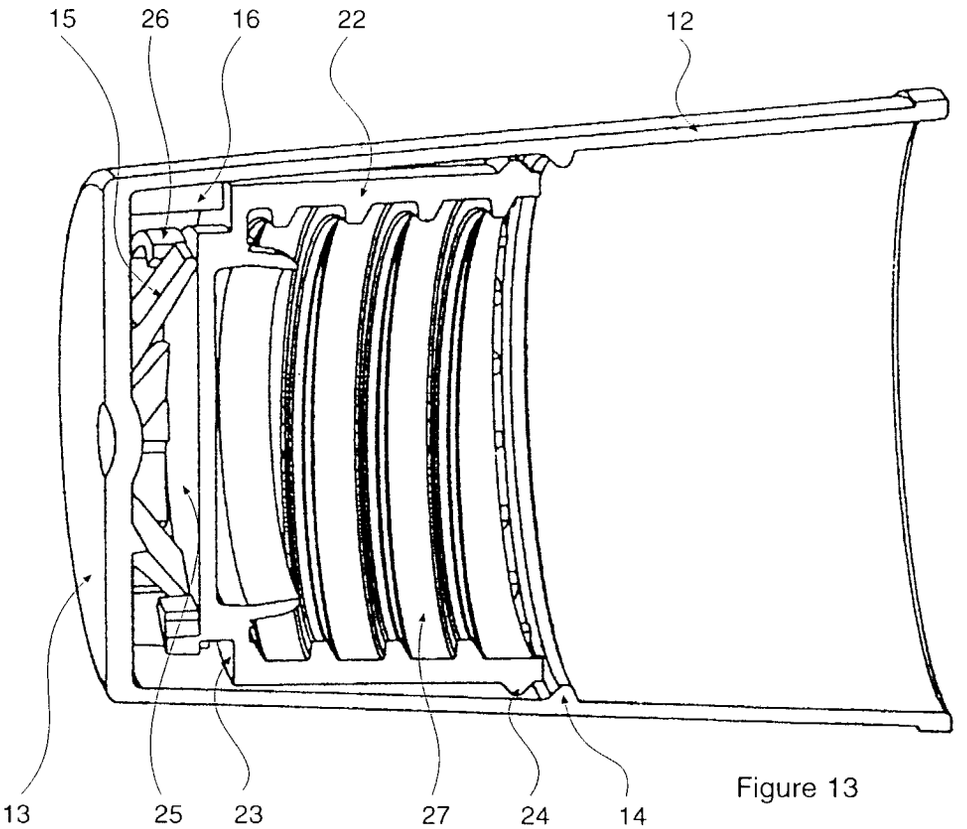

Figure 13

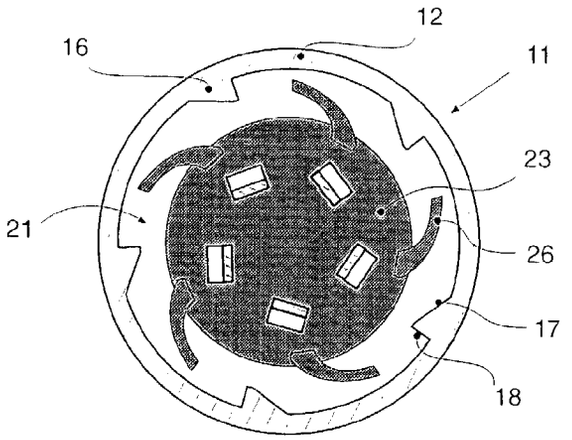

Figure 14

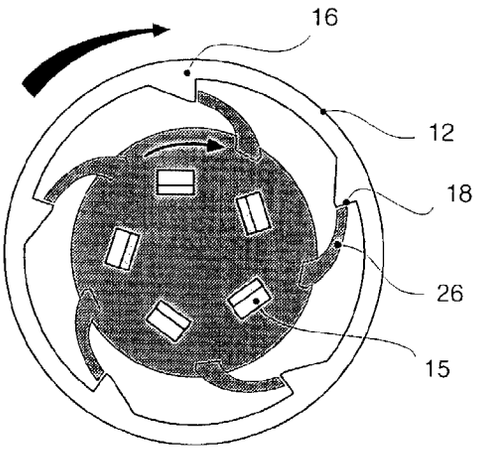

Figure 15

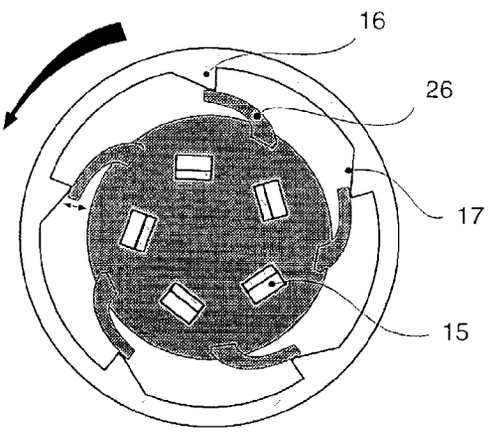

Figure 16

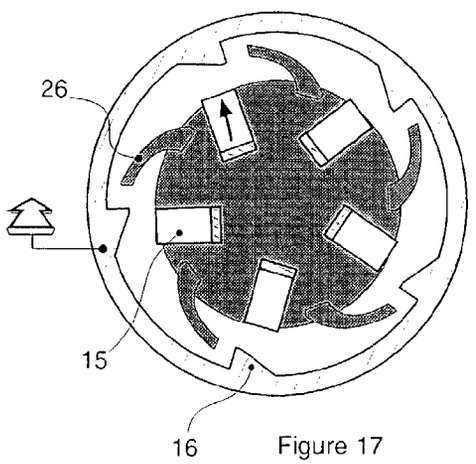

Figure 17

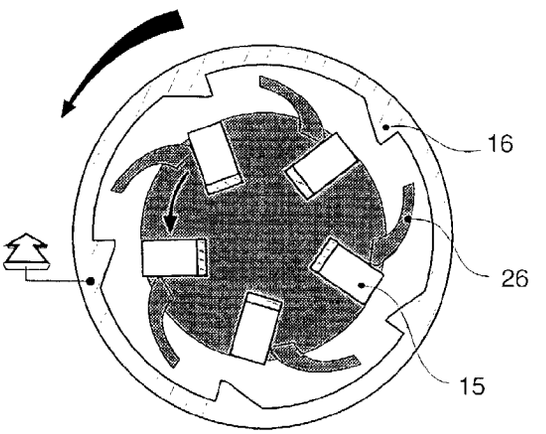

Figure 18

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 30 6506

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.6)
A	DE 21 15 720 A (EYELET SPECIALTY) 27 January 1972 * page 8, line 4 - page 9, line 23; figures 1-6 *	1,6	B65D50/04
A,D	WO 86 07035 A (WASSILIEFF) 4 December 1986 * page 1-15; figures 1-15 *	1,6	
A,D	US 4 570 809 A (ARCHER) 18 February 1986 * column 1-4; figures 1,2 *	1,6	
A	GB 1 388 729 A (TAKEDA YAKUHIN KOGYO KABUSHIKI KAISHA) 26 March 1975		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	3 December 1998	Vollering, J

CATEGORY OF CITED DOCUMENTS

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03-12-1998

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2115720 A	27-01-1972	CA 943494 A	12-03-1974
		GB 1334023 A	17-10-1973
		US 3682343 A	08-08-1972
WO 8607035 A	04-12-1986	AU 589641 B	19-10-1989
		AU 5862686 A	24-12-1986
		DK 25287 A,B,	16-01-1987
		EP 0252087 A	13-01-1988
		US 4782965 A	08-11-1988
US 4570809 A	18-02-1986	NONE	
GB 1388729 A	26-03-1975	DE 2262222 A	05-07-1973
		US 3843006 A	22-10-1974

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82