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(54) Device for forming a fracture slit in a pilferproof ring in screw caps made of plastics.

(57) The device for forming a fracture slit in the pilferproof ring (3) in screw caps (1) made of plastics has a mandrel (22) on which the cap (1) is placed. The mandrel (22) is provided with teeth (30) that engage retaining teeth (9) formed inside the ring (3) whereby to cause the cap (1) to rotate over a cutting blade (18).

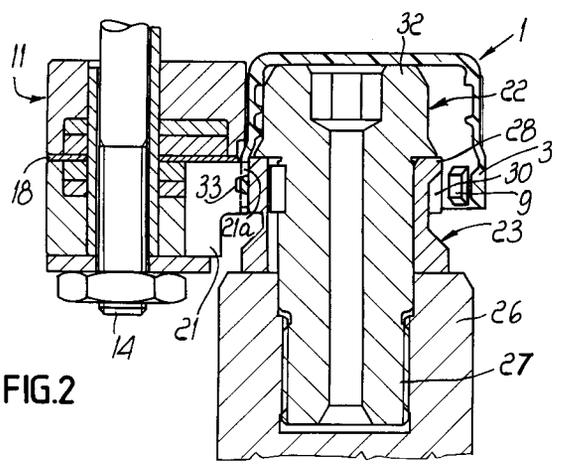

FIG.2

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The present invention relates to a device for forming a fracture slit in the pilferproof ring in screw caps made of plastics.

Screw caps made of plastics are commercially known for closing containers; they are composed of a cup that is internally threaded so that it can be screwed on a threaded portion of the neck of the bottle and is provided with a pilferproof ring separated from the cup by means of a series of peripheral slits divided by narrow bridges.

The pilferproof ring is internally provided with a plurality of mutually angularly equidistant teeth or elastic tabs. The teeth extend inward so that they can engage below a collar formed on the outside of the neck of the bottle.

In this manner, when the cap is unscrewed from the container, the pilferproof ring, by abutting against the collar, separates from the cup along the fracture line constituted by the slits and remains attached to the container. A cap of this type is disclosed for example in US patent no. 4,343,754.

Metal screw caps are known which have a plurality of axial slits formed on the pilferproof ring; when the cap is unscrewed, these slits allow the ring to break into segments that remain attached to the edge of the cup.

The angular position of the axial slits in metal caps is fully random, since it is not conditioned by the constructive characteristics of the cap. Transfer of such a slitting method to caps made of plastics is not possible, since it is necessary to prevent the slits from forming at the internal retaining teeth. However, the currently developing trend of recovering used containers requires these containers made of plastics to be returned without the pilferproof ring attached to the neck of the container.

The technical aim of the present invention is to provide a device that allows to form slits between the teeth of a screw cap made of plastics to fracture the pilferproof rings and remove them when the cap is unscrewed.

Within the scope of this aim, an object of the present invention is to provide a device which is structurally simple and can be easily adapted to closures of various shapes.

With the above aim and object in view, the invention provides a device for forming a fracture slit in the pilferproof ring of screw caps made of plastics having a cup and a pilferproof ring that is separated from the cup by a series of slits arranged along a circumference and mutually separated by mutually angularly equidistant bridges, a plurality of equidistant elements being formed inside said ring, said elements comprising retention means for engaging a collar of the container to fracture the bridges and separate the pilferproof ring from the cup during the unscrewing of the cap; there being also an abutment having a peripheral surface that forms an arc of a circle, and a blade which is concentric with respect to said abutment and protrudes from the peripheral surface of said abutment with its cutting edge, said cutting edge being provided with a plurality of notches the mutual distance whereof corresponds to the mutual distance of said bridges; said device being characterized in that it comprises: at least one chisel located at right angles to said blade and angularly arranged at the region comprised between two successive notches; a mandrel having a rotation axis at right angles to the plane of said blade, a crown provided with an edge in tangent contact with the cutting edge of said blade, and a plurality of angularly equidistant peripheral traction teeth; said mandrel being arrangeable eccentrically inside said cap so as to clamp the peripheral wall of said cup and said ring against the peripheral surface of said abutment, said mandrel furthermore having a rotary motion to move a traction tooth so that it engages one of said equidistant elements and a translatory motion to roll the cap on the peripheral surface of the abutment with consequent slitting of the cap by said blade and chisel, said translatory and rotary motions being mutually synchronized, whereby said chisel slits the pilferproof ring at a region comprised between two successive bridges.

Further characteristics and advantages of the device according to the present invention will become apparent from the following detailed description thereof on the basis of the accompanying drawings, wherein:

figure 1 is a sectional view of a screw cap made of plastics provided with a pilferproof ring;

figure 2 is a vertical sectional view of the device according to the invention;

figure 3 is a vertical sectional view of the device, similar to figure 2 but at a subsequent operating stage;

figure 4 is a plan view of the device, taken along the plane IV-IV of figure 2;

figure 5 is a plan view of a different embodiment of the device.

With reference to figure 1, the reference numeral 1 designates a screw cap formed by molding a plastic material and composed of a cup 2 and a pilferproof ring 3.

The cup 2 has an internal thread 4 for screwing on the neck of a container and an external knurling 5 to improve grip. A disk-like gasket 6 is arranged inside the cup to tightly seal the inlet or mouth of the container.

The pilferproof ring 3 is separated from the cup 2 by a plurality of through slits 7 lying along a circumference and separated from one another by bridges 8.

Means for retaining the cap on the container, constituted by teeth 9, are formed inside the ring 3.

These means can have various shapes and engage a collar of the container so that, when the cap 1 is unscrewed to open the container, the ring 3 remains attached to the container, whereas the cup 2 separates therefrom due to the fracture of the bridges 8 caused by the axial component of the unscrewing force.

If the container must be reused, it is necessary to remove the ring 3 in such a manner that it opens during unscrewing of the cap and remains attached to the cup 2 with one end.

The device according to the invention forms a slit 10 that axially passes through the ring 3 and allows to open it while the cap is being unscrewed. The device furthermore places the slit between two adjacent retention means 9 so as to intersect one of the slits 7 while remaining attached to the cup 2 at one bridge. The bridge 8a adjacent to the slit 10 is larger to ensure that separation occurs circumferentially except at said bridge 8a.

The device is shown in figures 2, 3 and 4 and comprises an abutment 11 formed by two plates 12 and 13 that are mutually superimposed and coupled by screw means 14 and have respective cylindrical front surfaces 15 and 16 (see figure 4).

A blade 18 is secured between the plates 12 and 13 with the interposition of laminas 17 and has a cutting edge 19 protruding from the front surfaces 15 and 16 by an extent equal to the thickness of the ring 3 and lying concentrically with respect to said surfaces 15 and 16. Equidistant notches 20 are formed along the cutting edge 19 and, in a manner specified hereafter, form the bridges 8 while the blade produces the slits 7.

A seat is formed in the lower plate 13 to accommodate a chisel 21 that is at right angles to the blade 18 and has a cutting edge 21a that coincides with the cutting edge 19 and is located adjacent to a notch 20.

The mandrels 22 are arranged on the outside of the abutment 11, support the caps to be slit and have an axis which is at right angles to the plane of the blade 18. The mandrels 22 are rotated about their own axis in the direction A and are mounted on a carousel that rotates concentrically with respect to the front surfaces 15 and 16 so as to perform a circular movement in the direction B. Obviously, any conventional motor means may be employed for rotating the mandrels 22 and carousel. The rotation rates of the carousel and of the mandrels are chosen so that a crown 23 keyed on each mandrel rolls on the surfaces 15 and 16 at zero relative speed with respect to them.

The crown 23 is rotationally coupled to the respective mandrel by means of a key 24 and is axially locked between a shoulder 25 of the mandrel and the top of a hollow shaft 26 in which the mandrel is screwed with a threaded portion 27.

The crown 23 has an edge or collar 28 that is coplanar to the blade 18 and is in tangent contact with the cutting edge 19. Indents 29 are formed below the collar and form teeth 30 that are angularly distributed and internal to the peripheral region of the collar 28. The teeth 30 have a radial front 31 that is wider than the height by which the retention means 9 protrude from the internal surface of the ring 3 of the cap.

Operation of the described device is as follows.

During their movement, the mandrels 22 are external, i.e. spaced, with respect to the abutment 11, and the caps 1 are applied to their top, which conveniently forms a tang 32 (see figure 3) the height whereof is such that the cutting edge 19 is at the level between the cup 2 and the ring 3.

When a mandrel 22, during rotation of the carousel in the direction B, is located opposite to the abutment 11, the cylindrical wall of the cup 2 remains clamped between the front surface 15 of the plate 12 and the surface of the tang 32, whereas the ring 3 is interposed between the surface 16 and the region of the crown having the teeth 30. Due to the rotary motion in direction A, the thrust applied by the collar 28 against the wall of the cap produces the slits 7 and the bridges 8. However, as soon as the cap 1 makes contact with the blade 18, the mandrel 22 moves within the cap 1; this movement stops when a tooth 30 engages a retention means 9. Since the rotation A of the mandrel is constantly related to the translatory motion of the carousel, the angular distance of the teeth 30 from the chisel 21 at the point of tangency with the blade 18 is also constant, and therefore the slit 10 can always be produced between two retention means 9 so as to ensure that the ring 3 opens when the cap is unscrewed.

Conveniently, the number and angular distance of the teeth 30 of the mandrels 22 is chosen so that during the rolling of the cap 1 on the blade 18 the teeth 30 cooperate with the retention means 9 like the teeth of a gear that meshes with a second internally-toothed ring gear. In this manner it is always possible to rotate the cap regardless of the angular position that it randomly assumes when it is applied to the mandrel.

Numerous modifications and variations are possible in the practical embodiment of the device, and all are within the scope of the same inventive concept. In particular, after removing the mandrel 22 it is possible to replace the crown 23 with another one having a number, shape and angular distribution of teeth matching those of the retention means provided in the cap.

Advantageously, the chisel 21 has a recess 33 (see figure 2) to form a bridge, transversely to the axial slit 10, that gives greater solidity to the ring 3 prior to fracture. In a further embodiment, it is

possible to provide two or more chisels 21 to open the ring 3 in multiple angularly distributed points.

Figure 5 illustrates a version suitable for caps made of plastics provided with internal recesses 34 distributed below the retention means 9. In this version, the mandrel 22 has teeth 35 protruding radially from the peripheral region of the collar 28 of the crown 23 to engage in the recesses 34 and move the caps.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the scope of each element identified by way of example by such reference signs.

Claims

1. Device for forming a fracture slit (10) in the pilferproof ring (3) of screw caps (1) made of plastics having a cup (2) and a pilferproof ring (3) that is separated from the cup by a series of slits (7) arranged along a circumference and mutually separated by mutually angularly equidistant bridges (8), a plurality of equidistant elements being formed inside said ring (3), said elements comprising retention means (9) for engaging a collar of the container to fracture the bridges (8) and separate the pilferproof ring (3) from the cup (2) during the unscrewing of the cap; there being also an abutment (11) having a peripheral surface (15, 16) that forms an arc of a circle, and a blade (18) which is concentric with respect to said abutment (11) and protrudes from the peripheral surface of said abutment with its cutting edge (19), said cutting edge being provided with a plurality of notches (20) the mutual distance whereof corresponds to the mutual distance of said bridges (8); said device being characterized in that it comprises: at least one chisel (21) located at right angles to said blade (18) and angularly arranged at the region comprised between two successive notches (20); a mandrel (22) having its rotation axis at right angles to the plane of said blade (18), a crown (23) provided with an edge (28) in tangent contact with the cutting edge (19) of said blade (18), and a plurality of angularly equidistant peripheral traction teeth (30); said mandrel (22) being arrangeable eccentrically inside said cap so as to clamp the peripheral wall of said cup (2) and said ring (3) against the peripheral surface (15, 16) of said abutment (11), said mandrel (22) furthermore having a rotary motion to move a traction tooth (30) so that it engages one of said equidistant elements (9) and a translatory motion to roll the cap (1) on the peripheral surface (15, 16) of the abutment (11) with consequent slitting of the cap by said blade (18) and chisel (21), said translatory and rotary motions being mutually synchronized, whereby said chisel (21) slits the pilferproof ring (3) at a region comprised between two successive bridges (8).

2. Device according to claim 1, characterized in that said mandrel (22) is screwed with a threaded portion (27) in a hollow shaft (26) mounted on a carousel which rotates concentrically with respect to said abutment (11) and has a shoulder (25) to secure said crown (23) against the top of said hollow shaft (26), said crown (23) having a collar (28) that is co-planar to the blade (18) and is in tangent contact with said cutting edge (19) and multiple recesses (29) that are formed below said collar (28) and form said traction teeth (30) that are suitable to engage said retention means (9).

3. Device according to claim 1, characterized in that said mandrel (22) is screwed with a threaded portion (27) in a hollow shaft (26) mounted on a carousel which rotates concentrically with respect to said abutment (11) and has a shoulder (25) to secure said crown (23) against the top of said hollow shaft (26), said crown (23) having a collar that is co-planar to the blade (18) and is in tangent contact with said cutting edge (19) and multiple teeth (35) arranged below the collar and protruding radially therefrom, said teeth being suitable to engage in recesses (34) formed inside the pilferproof ring (3).

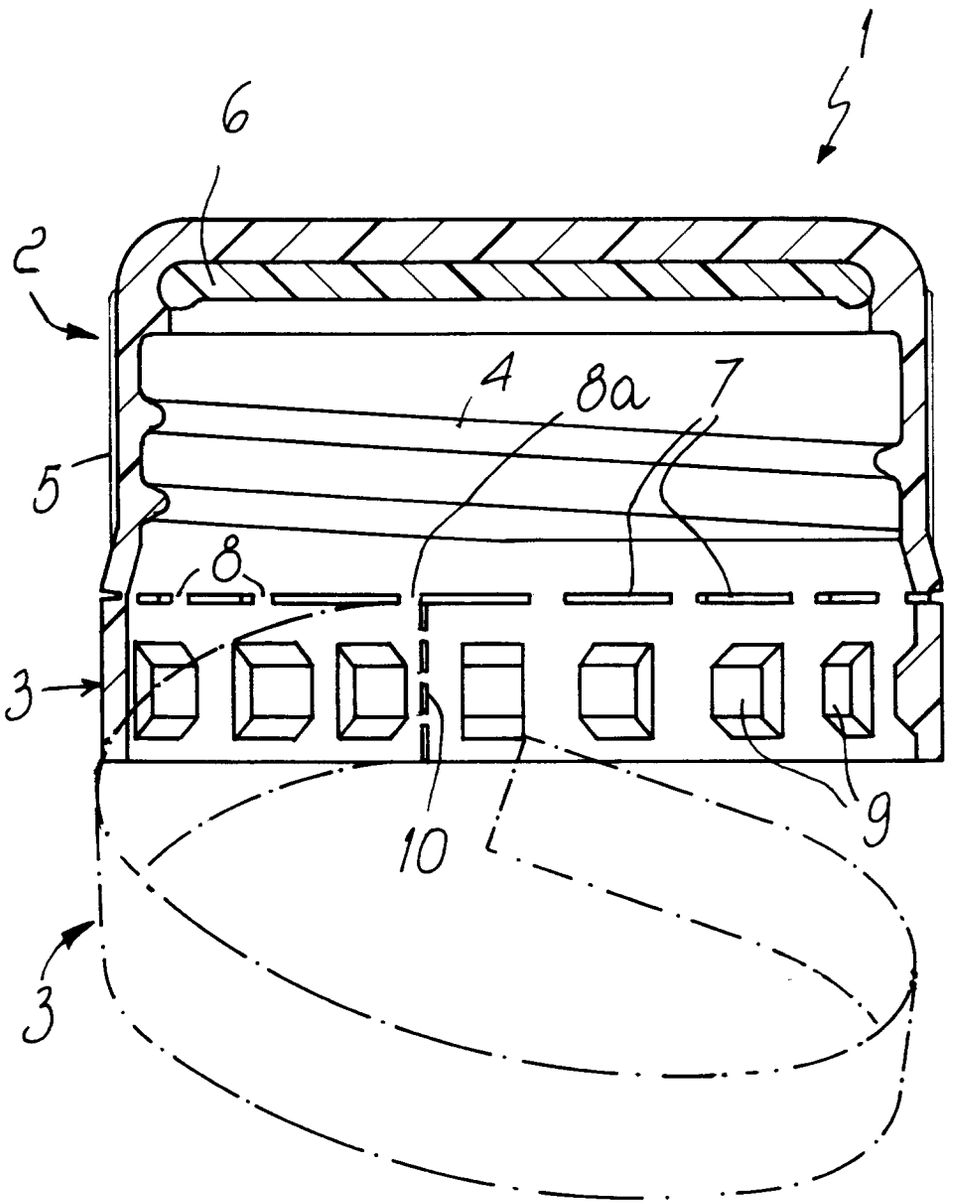
4. Device according to one of claims 1, 2 and 3, characterized in that said chisel (21) has a recess (33) to form a bridge transversely to the axial slit (10) in the pilferproof ring.

5. Device according to one of claims 1, 2 and 3, characterized in that the top of the mandrel (22) comprises a tang (32) constituting a support for a cap (1) and having such a height as to allow to place the cap so that the cutting edge (19) of the blade (18) is at the level between the cup (2) and the pilferproof ring (3).

6. Device according to one of the preceding claims, characterized in that it comprises a plurality of equidistant chisels (21) so as to produce angularly equidistant axial slits (10) on the pilferproof ring (3) of the cap.

7. Device according to one of the preceding claims, characterized in that the cutting edge (19) of said blade (18) has a notch (20) so as to form a thicker bridge (8a) proximate to the axial fracture slit (10) in the pilferproof ring (3).

FIG.1



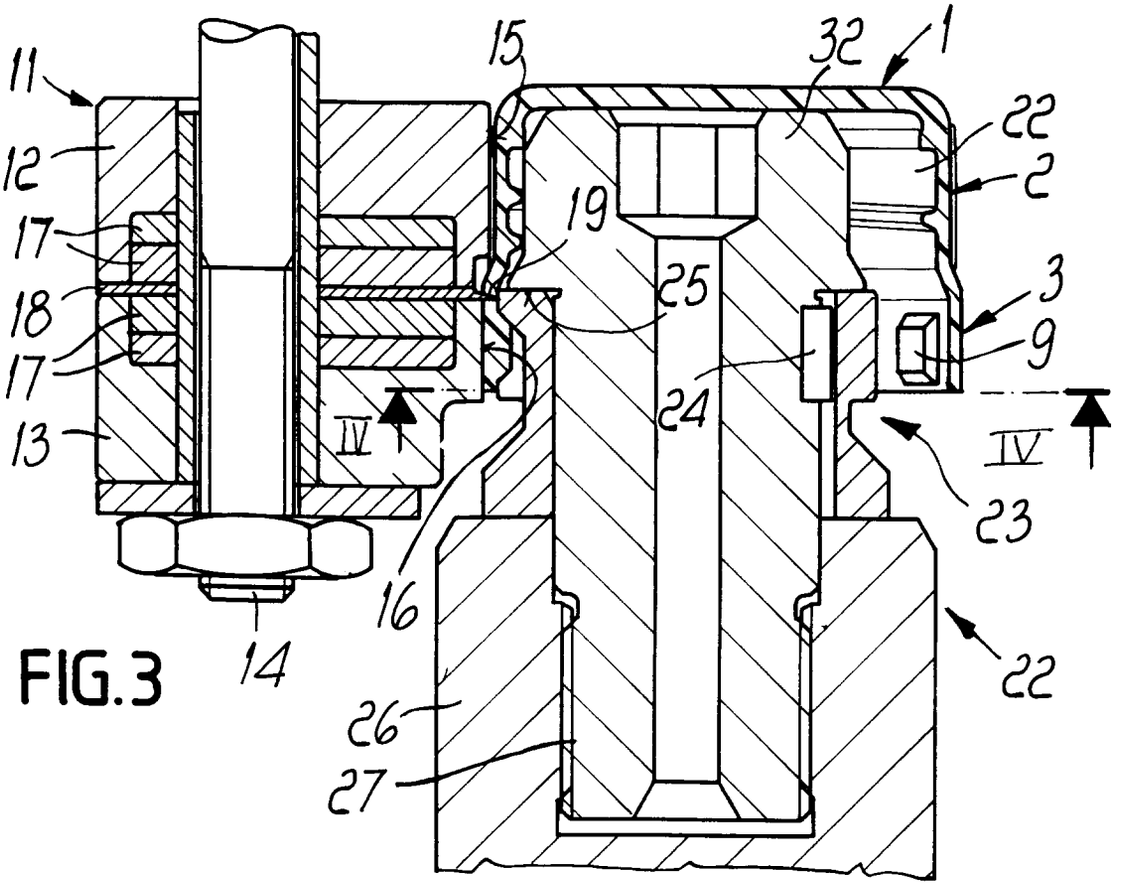

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FIG.3

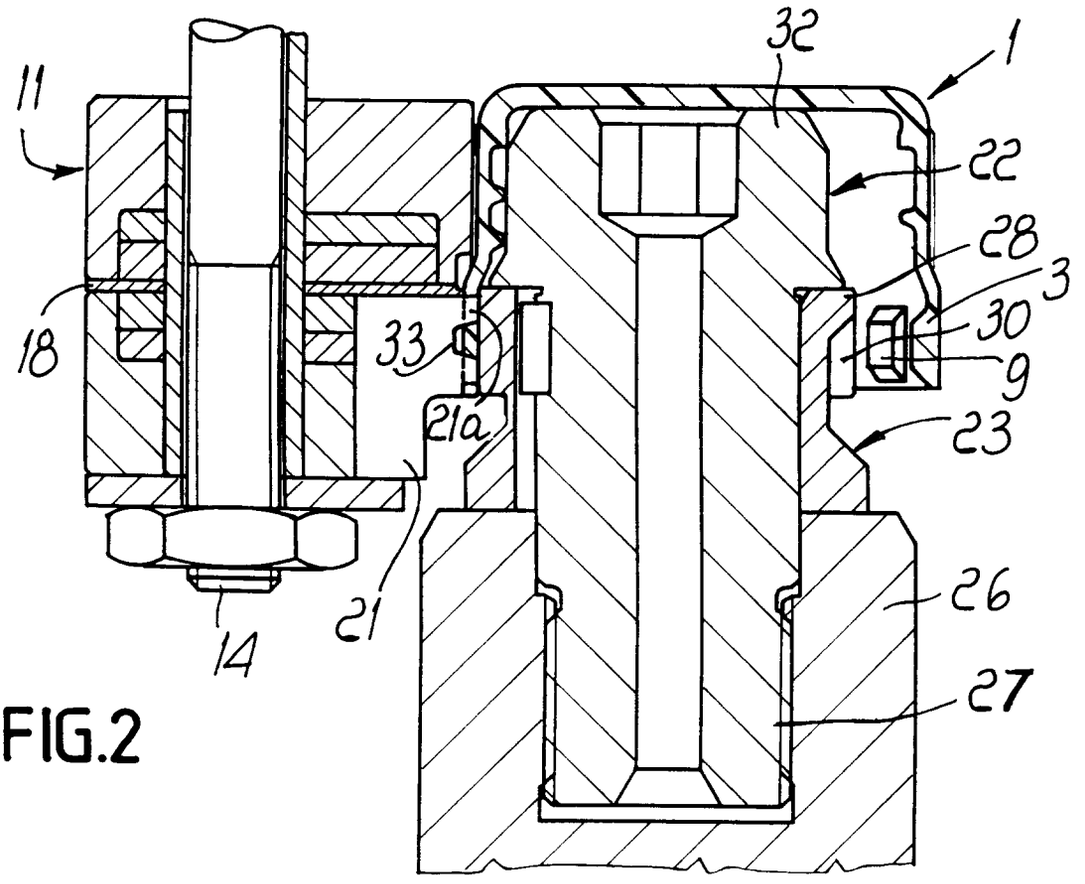
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FIG.2

FIG.4

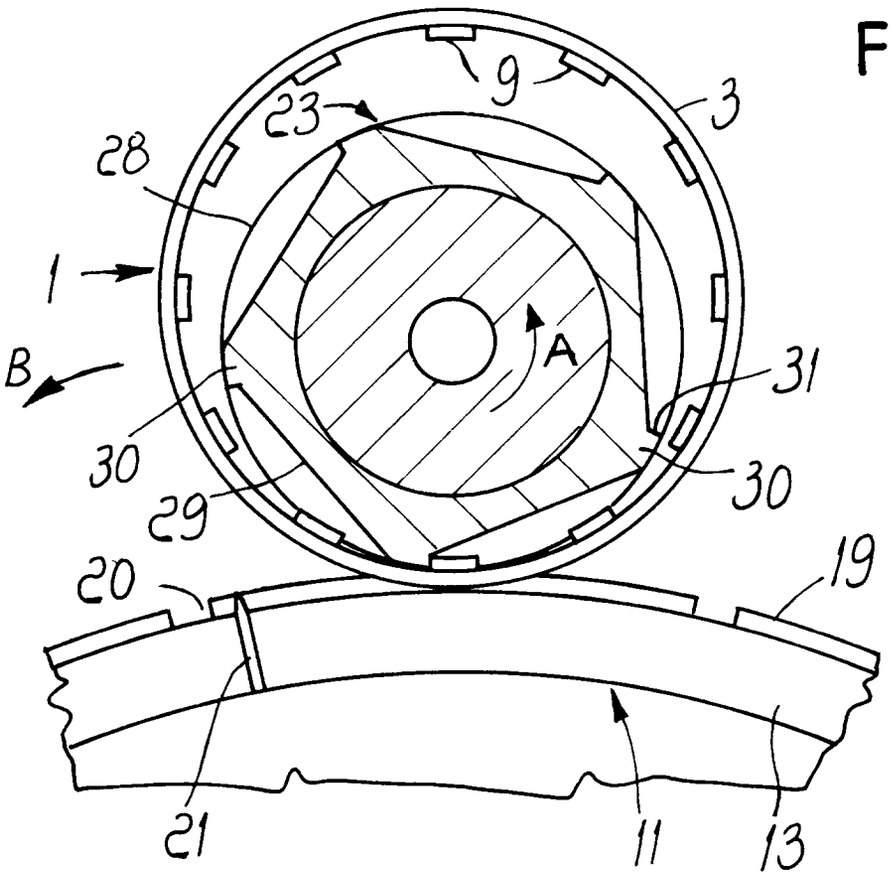
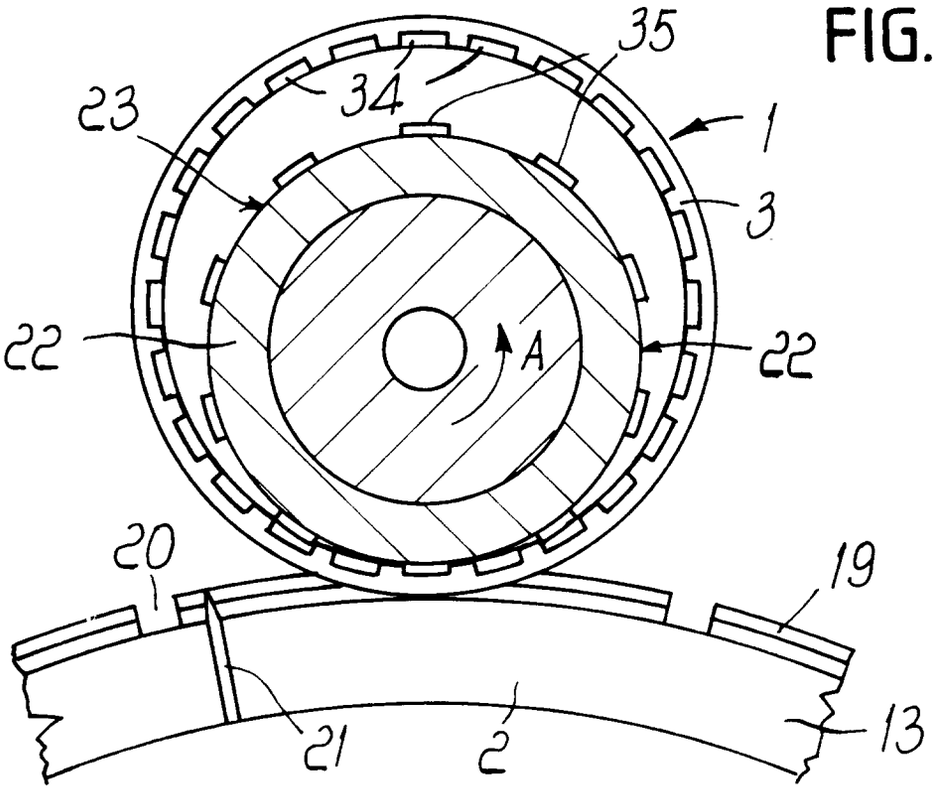


FIG.5



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EUROPEAN SEARCH REPORT

Application Number
EP 94 10 0776

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)
E	DE-U-93 14 485 (CROWN CORK AG) * page 5, paragraph 4 * * page 6, paragraph 4; figures *	1	B26F1/20 B65D41/34
A	US-A-3 824 941 (HANNON) * column 3, line 65 - column 4, line 30 * * column 5, line 25 - column 6, line 20; figures *	1-3,5,6	
A	US-A-4 666 053 (CORCORAN) * column 4, line 25 - line 40 * * column 6, line 5 - line 35; figures *	1,4	
A	WO-A-92 13773 (MHK MAX HÜBNER GMBH) * page 7, paragraph 3; figure 2 *	7	
A	GB-A-2 003 765 (NATIONAL CAN CORPORATION)		

TECHNICAL FIELDS SEARCHED (Int.Cl.5)
B26F B65D B21D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	3 May 1994	Vaglienti, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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