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

(11) EP 1 394 062 A1

# (12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
**03.03.2004 Bulletin 2004/10**

(51) Int Cl.[7]: **B65D 45/32**, B65B 7/28

(21) Application number: **02425534.1**

(22) Date of filing: **28.08.2002**

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

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## (54) Automatic closing device for an airtight container

(57) Automatic closing device for an airtight container comprising an airtight cover with wings (53) that grip onto a wall (47) of a container body, a gasket (10) pressing against the wall (47) whose lip (3) apex squashes the gasket (10), wherein the device operates as a lever as regards a wire element (117) that tightens the wings (53) of the cover reducing the perimeter of the wire element (117).

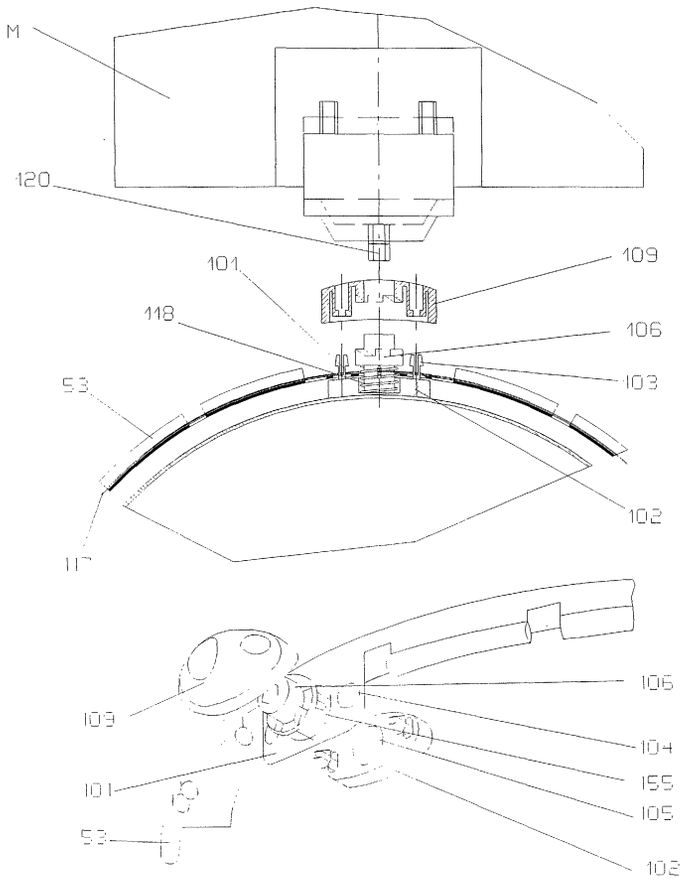


Fig. 3

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## Description

**[0001]** The present invention relates to an automatic closing device for an airtight container for storing foodstuff, paints, resins, glues and all products falling within the so-called "general line" category.

**[0002]** The airtight container taken as reference in the present patent is a can, a cylindrical drum, a tapered bucket. The covering element is a cover, generally made of thin sheet or plastic with a medium-high stiffness. The container body can include one or more recesses arranged in opposite points next to the container body edge and equipped with grips, handles or a band for handling them, generally made of metal or plastic. The container is further of the type that can be used for applying closing elements that ensure keeping the seal of a gasket housed in the cover.

**[0003]** The container shape is such as to confer structural stiffness to the joining flange in which the gasket is housed. Moreover, the shape is such as to allow stacking the containers with equal sizes, that is orderly placing different containers one over the other. A gasket for a pressurized cover is distorted under the action of a squashing force upon closing the cover by keeping its state active due to the resiliency of the cover edges and the container body edge that are in contact. Among the apparata that ensure keeping the squashing state of said gasket, those covers are taken into account that, in addition to resiliency of edges in contact, are equipped with wings or are equipped with a lever or a ring with clamp. A lever applied to the ends of said clamp or ring allows the quick opening of the container and at the same time ensures the gasket squashing under stocking and handling conditions.

**[0004]** The above-mentioned characteristics are known from document US-A-4351449 that deals with a container having an airtight closing plug that can be repeatedly extracted, applied under pressure and equipped with quick closing elements applied onto the container body that clamp the cover in corresponding gripping points, keeping the gasket squashed.

**[0005]** Figures 1 and 2 show an airtight container of the known type; in particular, Figure 1 shows the view of a container 1 comprising an airtight cover 2 of the lever type (not shown), a body 1A of the container delimited by an edge 3 having a "lip" shape. The airtight cover 2, in the embodiment a lever cover made of thin sheet, is composed of a portion of a plane surface 6 delimited by a shaped edge, shaped as a recess, formed by an intrados wall 7 and an extrados wall 8, respectively, with an approximately plane shape with an approximately vertical and concave slanting. These walls are joined by means of a plane annular length 9 with suitable width that imparts stiffness to the cover in case of opening with the help of a lever of the screwdriver type, or in case of manual handling by means of a handle secured to the container.

**[0006]** Such recess houses a gasket 10 made of silicone- or polyuretane-based material or any other plastic or rubber material, and is joined with the lip edge 3 by pressing the intrados wall 7 onto the internal lip wall 3, the lip 3 apex squashing the gasket 10. In order to keep the airtightness, a metal clamp 11, of a concave shape and equipped with a lever 12 (not shown) for a quick release, tightens the external edge 8 belonging to the cover 2 guaranteeing the squashing state of the gasket during stocking and handling. A seal made of flexible material, adhesive and plastics or paper, shaped as a small disk or clamp, applied on the package as guarantee of product integrity, seals the closure till the operator opens the container for its first use checking its integrity.

**[0007]** Figura 2, instead, shows another type of container whose winged airtight cover 42, in the embodiment made of thin sheet, is composed of a portion of a plane surface 46 delimited by a shaped edge, shaped as a recess, comprising an intrados wall 47 and an extrados wall 48, respectively, with an approximately plane shape with an approximately vertical and concave slanting. These walls are joined by means of a surface length 49 with suitable width that imparts stiffness to the cover in case of opening with the help of a lever of the screwdriver type, or in case of manual handling by means of a handle. In particular, the extrados wall 48 has projecting surface lenghts 53 - the wings. The recess houses a gasket 10 and is joined with a lip edge 3 by pressing the intrados wall 47 against it, the lip edge 3 squashing the gasket 10. The wings 53 snap in closing position, opening when sliding on the external lip 3 edge. In order to open the cover the operator must apply a separating force that is enough to allow the wings to open due to the external lip edge.

**[0008]** The production cycle for filling and airtightly closing the above-described lever container provides for the approach of the cover to the container body and the actuation of the lever to pull the closing band integral with the cover. These actions are nowadays directly performed through a manual intervention. In some "general line" sectors, particularly in the foodstuff sector, the set of standards dealing with cleaning and care of industrial production processes provides for the use of automation in all production steps, including the cover approaching and closing steps, always more and more underlying the trend towards removing those operations that are directly, manually performed by an operator.

**[0009]** The container in Fig. 1 is a container equipped with a ring with lever as guarantee of keeping the adherence conditions between container body lip and cover recess containing the gasket. The operator operates on the lever to tighten the ring around the external cover edge in order to create the adherence conditions between the components themselves; in particular the gasket remains pressed guaranteeing the airtightness due to the fact that the ring (11), tightened around the container, keeps the coupled elements in position. Complying with health standards that are more and more stringent, this arrangement is not prone to be automat-

ically handled, especially when filling the container.

**[0010]** The container schematically shown in Figure 2 can be used for automatically handling the airtight closure since the airtight seal is guaranteed by the elastic thrust of the wings without the help of any other distortion element; it however has the inconvenience that it is not able to oppose an adequate force to keep the cover adherent to the container body lip and therefore keep an adequate squashing of the sealing gasket 10.

**[0011]** Object of the present invention is thereby disclosing a device that allows inserting the automatised closing step of the above-described containers.

**[0012]** This is obtained starting from the container with winged cover, free from a shrinking ring, and equipping it with an arrangement that performs the function performed by the ring with lever. This arrangement allows automatically carrying out the cover closure once the container has been filled.

**[0013]** The above and other objects and advantages of the invention, as will appear from the following description, are obtained by an automatic closing device for an airtight container according to Claim 1. Preferred embodiment and non-trivial variations of the present invention are the subject matter of the Dependent Claims..

**[0014]** The present invention will be better described by some preferred embodiments thereof, provided as a non-limiting example, with reference to the enclosed drawings, in which:

- Figures 1 and 2 show an airtight container of a known type;
- Figure 3 shows the axonometric and the plan views of the assembly comprising the device, object of the invention, applied to a cover and interacting with the container body; and
- Figure 4 shows a set of components that, once assembled, are the device of the invention: a stop pin; an external shaped cover; a base equipped with elastic pegs.

**[0015]** The winged extrados wall 53 comprises, in addition to a set of elastic wings 53, a straight wing 101 equipped with two aligned holes 104 and a central hole 155.

**[0016]** A base 102, made of metal or plastics, supports two elastic pegs 103 arranged at a suitable distance in order to counteract a torque reaction along the horizontal median line. Each elastic peg 103 is composed of a pin 103A ending with two half-cones 103B longitudinally separated by a space that allows joining the two half-cones when they are subjected to the action created when coupling with a holed component. Each elastic peg 103 is centered in fact with its respective hole 104 belonging to the straight wing 101. The base 102 is further equipped at its center with a circular seat 105.

**[0017]** A stop pin 106 is composed of a cylinder made of metal or plastic material that is coupled with the circular seat 105 belonging to the base 102. The stop pin 106 comprises a toothed crown 107 delimited below by a circular crown 119 and above by a set of chutes 114 interleaved by a set of approximately horizontal planes 107A and a set of approximately vertical abutment walls 113. The stop pin 106 has at its upper end a seat 108 for a tool, for example a wrench for an hexagonal-head screw.

**[0018]** An external shaped cover 109, made of metal or plastic material, has two holes 110 that guide and keep their respective pins 103A; the cover 109 and the base 102 are in fact joined due to the action of the two elastic pegs 103 equipped with elastically expanding half-cones 103B.

**[0019]** The cover 109 comprises a recess inside which a toothed crown 111 is housed, made of an interleaved set of chutes 114 and horizontal planes 115 that are coupled with the respective planes of the crown projecting from the cylinder base 112 of the stop pin 106.

**[0020]** The circular seat 105 of the base 102 houses the cylinder base 112 of the stop pin 106.

**[0021]** The stop pin 106 further comprises a vertical slot 116 that performs the function of a lever as regard a wire 117 made of metal or plastic or any other flexible material that is able to tighten the cover gripping the recess obtained in each one of the projecting wings 53.

**[0022]** The cylinder base 112 of the stop pin 106 guides an helical spring 118 which is axially counteracted by the lower base 119 of the stop pin 106 and by the circular seat 105 of the base 102. The cylinder spring 118 is of such sizes as to be able to bias into mutual contact the two toothed profiles of crown 107 and crown 111 respectively integral with the stop pin 106 and the cover 109, at the same time keeping the stop cover 106 separated with respect to the circular seat 105 of the base 102.

**[0023]** The above-described components are assembled onto the winged cover 53, which is equipped with a straight wing 101, according to the following procedure:

- the cover with elastic projecting wings 53 and with the straight wing 101 supports the base 102 which is applied with the elastic pegs oriented towards the cover outside;
- the stop pin 106 equipped with an helical spring 118 is joined to the base 102 by inserting it into the central recess 105 from the cover outside and inserting it into the hole 155 placed centrally in the straight wing 101 integral with the winged cover;
- the two ends of the metal wire length (that already tightens the cover by levering into each seat obtained in the wings 53) are inserted and suitably secured onto the vertical slot 116 obtained in the stop pin 106, such slot 116 operating as grip due to a certain wire curvature and to the friction existing between said wire and the stop pin itself;
- the cover 109 is coupled with the base 102 making the two half-cones of the elastic pegs 103 snap with

the coupling holes 110; the cover 109 covers the mechanism made of stop pin and two ends of the flexible wire 117 housed in the recess obtained in the cover 109; after this latter coupling; the cylinder spring is compressed and, due to an elastic reaction thereof, the stop pin 106 is joined to the cover 109 due to the coupling of the two toothed profiles, respectively the toothed crown 107 and the toothed crown 111.

**[0024]** The closing operation comprises the following steps:

- joining the cover equipped with the closing device assembled in the above-described way with the container body;
- rotating, by means of an external tool, the stop pin 106 in order to load the system made of the stop pin itself and the flexible wire. After the rotation of the stop pin, the flexible wire presses in the recess in which it is housed inside each projecting cover wing. The airtight closure is thereby obtained due to the circumference reduction of the wire tightening the winged cover edge. The annular wire 117 presses the extrados winged wall 53.

**[0025]** The closing operation can be easily performed by an automatic system comprising a machinery M that aligns the cover resting onto the container body filled with material to be stored with respect to a tool 120 integral with the machinery M.

**[0026]** This operation occurs automatically and solves the problem of the presence of an operator where a health precaution is required.

**[0027]** The opening operation is simply performed by pushing towards the container interior, now with any tool, the stop pin 106 that appears facing the operator. Due to the axially applied force, a detachment occurs between the profiles of the two toothing 107 and 111 with the following loosening of the flexible wire 117 tension, freeing the wings for being withdrawn with respect to the projecting outline of the container body edge.

## Claims

1. Automatic closing device for an airtight container comprising an airtight cover (42) with wings (53) that grip onto an intrados wall (47) of a container body, a gasket (10) pressing against the intrados wall (47) whose lip (3) apex squashes said gasket (10), **characterised in that** said device operates as a lever as regards a wire-shaped (or band-shaped) element that tightens said winged cover, reducing the perimeter of said wire element.

2. Automatic closing device for an airtight container according to Claim 1, **characterised in that** the wire element that tightens the winged cover edge has at least one of its two ends connected to a stop pin (106), said stop pin (106) being rotating around an axis that is integral with the cover, and **in that** the perimeter variation of the wire element is function of the rotation performed by the stop pin (106).

3. Automatic closing device for an airtight container according to Claim 2, **characterised in that** the stop pin (106) rotates in phase with a toothed profile (107) that is coupled with a toothed profile (111) integral with the winged cover (42), said toothed profile (107) being free of axially sliding with respect to the stop pin (106).

4. Automatic closing device for an airtight container according to Claim 3, **characterised in that** said toothed profile (107) is integral with the stop pin (106).

5. Automatic closing device for an airtight container according to Claim 3, **characterised in that** a biasing spring (118) keeps the two toothed profiles (107) and (111) joined together.

6. Automatic closing device for an airtight container according to Claim 3, **characterised in that** at least one of said toothed profiles is made of a multi-tooth toothing.

7. Automatic closing device for an airtight container according to Claim 3, **characterised in that** said toothed profile (111) is integral with a small cover (109).

8. Automatic closing device for an airtight container according to Claim 3, **characterised in that** the detachment of the two toothed profiles (107) and (111) is obtained by applying an external force operating on the toothed profile (107).

9. Automatic closing device for an airtight container according to Claim 1, **characterised in that** the winged extrados wall (53) comprises, in addition to a set of elastic wings (53), a straight wing (101) equipped with two aligned holes (104) and a central hole (155).

10. Automatic closing device for an airtight container according to Claim 1, **characterised in that** a base (102) supports two elastic pegs (103).

11. Automatic closing device for an airtight container according to Claim 10, **characterised in that** each elastic peg (103) is centered with its respective hole (104) belonging to the straight wing (101).

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according to Claim 10, **characterised in that** the base (102) is equipped on its center with a circular seat (105) that houses the stop pin (106).

**13.** Automatic closing device for an airtight container according to Claim 1, **characterised in that** said stop pin (106) comprises a toothed crown (107) delimited below by a circular crown (119) and above by a set of chutes (114) interleaved with a set of approximately horizontal planes (107A) and a set of approximately vertical abutment walls (113) .

**14.** Automatic closing device for an airtight container according to Claim 1, **characterised in that** said stop pin (106) has at its upper end a seat (108) for a tool, for example a wrench for an hexagonal-head screw.

**15.** Automatic closing device for an airtight container according to Claim 1, **characterised in that** an external shaped cover (109), made of metal or plastic material, has two holes (110) that guide and keep the respective pins (103A) .

**16.** Automatic closing device for an airtight container according to Claim 1, **characterised in that** the cover (109) comprises a recess inside which a toothed crown (111) is housed, said crown (111) being realised by an interleaved set of chutes (114) and horizontal planes (115) .

**17.** Automatic closing device for an airtight container according to Claim 1, **characterised in that** the stop pin (106) comprises a vertical slot (116) that performs the function of a lever as regards a wire (117) that tightens the cover gripping onto the recess obtained in each one of the projecting wings (53).

**18.** Automatic closing device for an airtight container according to Claim 1, **characterised in that** the cylinder base (112) of the stop pin (106) guides an helical spring (118) which is axially counteracted by the lower base (119) of the stop pin (106) and the circular seat (105) of the base (102).

**19.** Method for automatically closing an airtight container according to Claim 1, comprising the following steps: joining the cover equipped with the closing device assembled with the container body; rotating by means of a tool the stop pin for loading the system composed of the stop pin (106) and the flexible wire (117).

**20.** Method for automatically closing an airtight container according to Claim 19, comprising a machinery (M) that aligns the cover resting on the container body with respect to a tool (120) integral with the machinery, and said machinery actuates said tool in order to load the system composed of the stop pin (106) and the flexible wire (117).

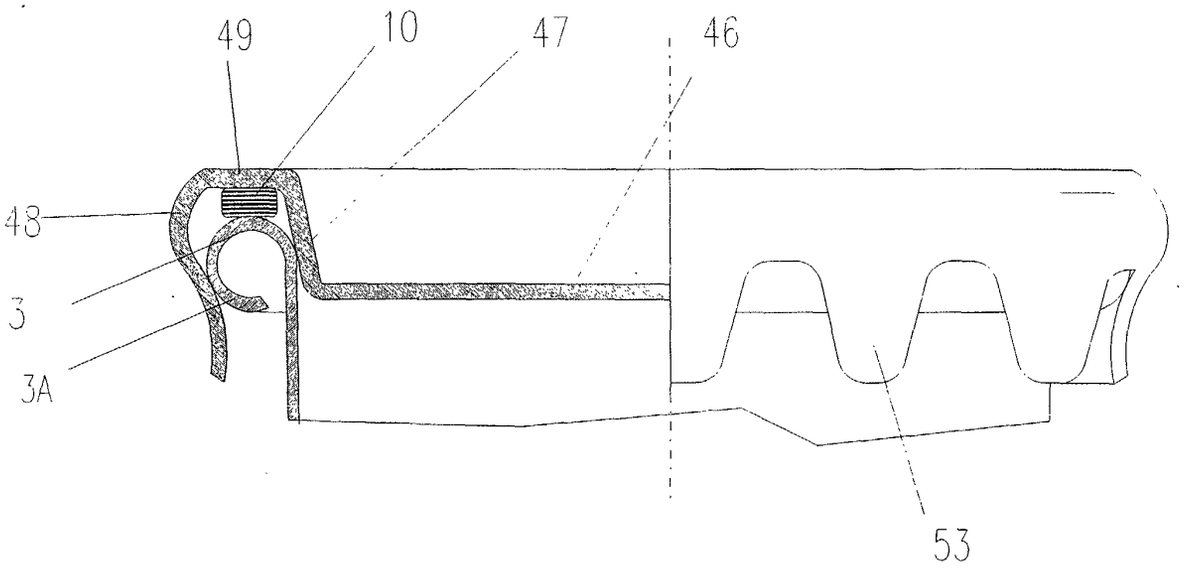



Fig. 2

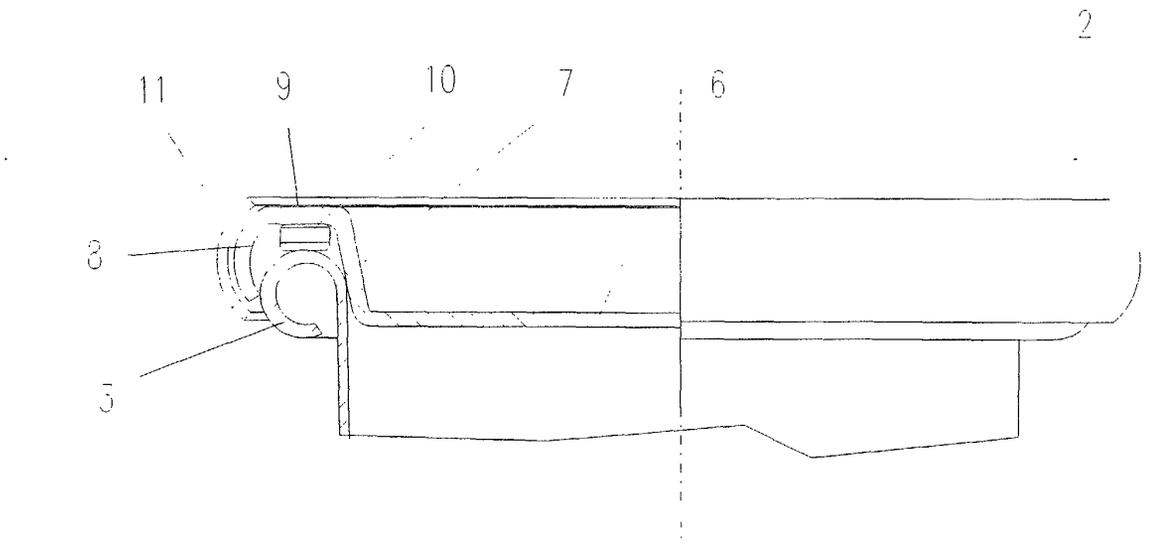
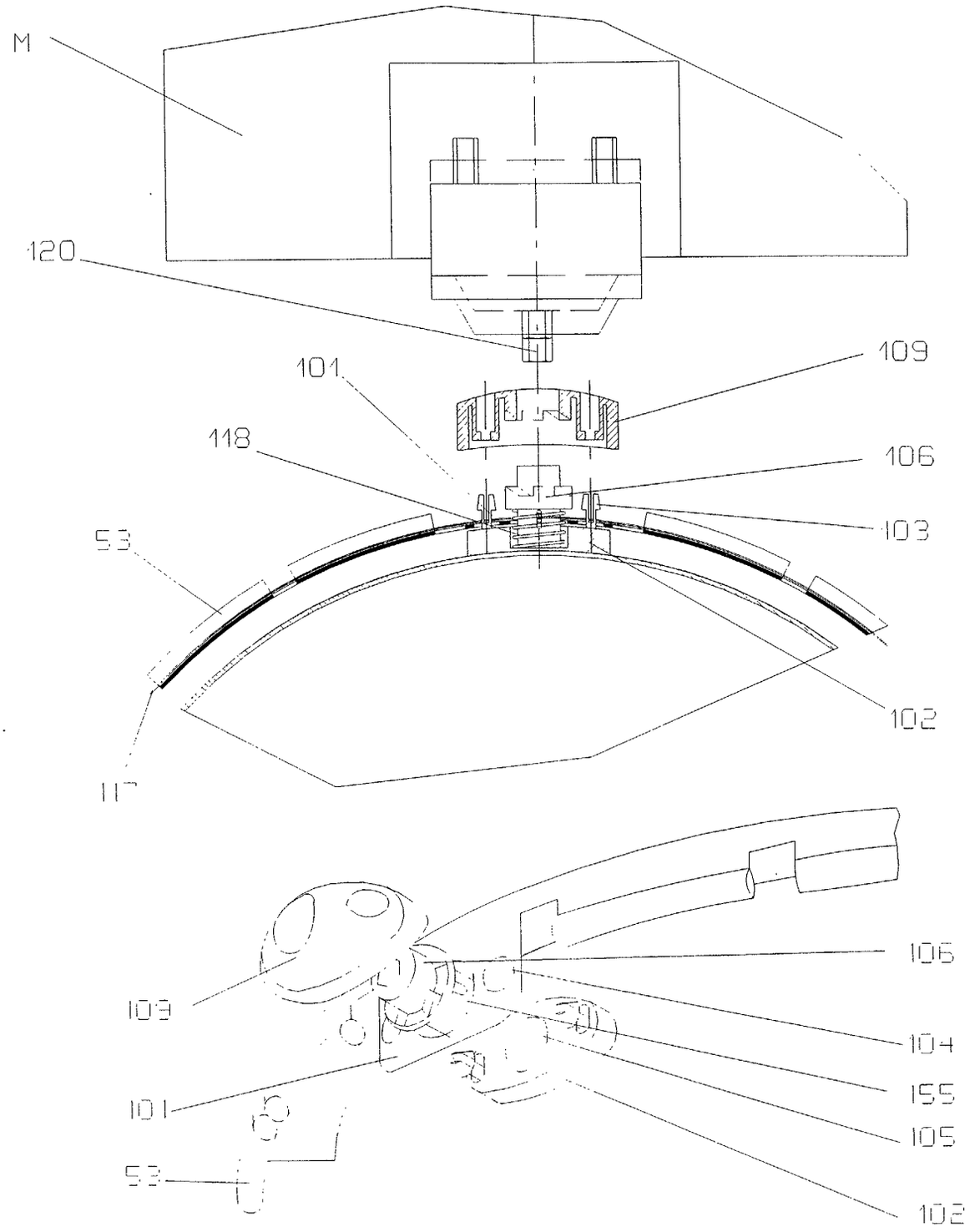



Fig. 1


M
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53
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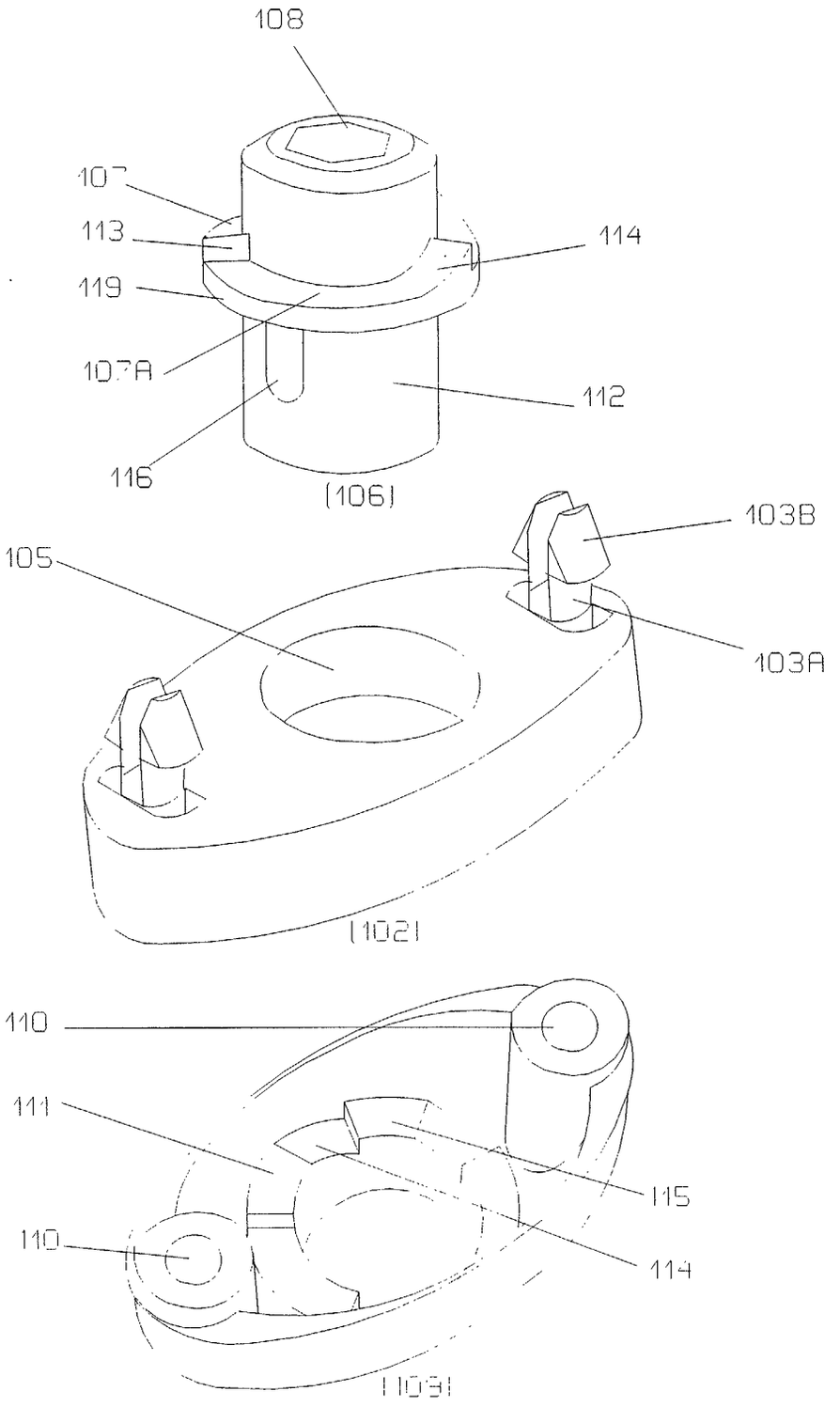
102

Fig. 3


108
107
113
114
119
107A
112
116
106
103B
105
103A
102
110
111
115
110
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103

Fig. 4

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# EUROPEAN SEARCH REPORT

Application Number
EP 02 42 5534

## 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.7) |
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| A | * page 1, right-hand column, line 8 - page 2, left-hand column, line 24; figures 1-8 * | 19 | |
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TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65D
B65B
B67B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| MUNICH | 22 January 2003 | Galli, M |

CATEGORY OF CITED DOCUMENTS

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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 42 5534

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