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(71) Applicant: **Special Components S.r.l.**
10040 Caselette (IT)

(72) Inventor: **HERNANDEZ MERIDA, Viviana**
10040 Caselette (TO) (IT)

(74) Representative: **D'Angelo, Fabio et al**
Studio Torta S.p.A.
Via Viotti, 9
10121 Torino (IT)

(54) **SAFETY VALVE FOR A GAS BOTTLE AND GAS BOTTLE INCLUDING SUCH VALVE**

(57) The invention relates to a safety valve (10) of a gas bottle (1); the valve (10) is made entirely of an elastically deformable material, has a longitudinal axis (A) and comprises a fixed part (11) and a movable part (12) both being together a single component; the fixed part (11) comprises an annular flange (13) fixable to the inside of the bottle (1) around a pierceable portion (4) thereof; the movable part (12) extends in a cantilever fashion from the flange (13) and comprises a sealing portion (14) arranged in a radially innermost position with respect to the flange (13) and elastically loaded between a normal sealing condition, wherein it is elastically loaded in a first axial direction (R) against a wall (3) of the bottle (1) around the pierceable portion (4), and a condition of opening, obtained by means of an external thrust in a second direction (T) along said axis (A), opposite to said first direction (R); the movable part (12) further comprises a plurality of petals (15) equally spaced angularly from one another around the axis (A), delimiting respective through windows (16) between one another and connecting the flange (13) to the sealing portion (14).

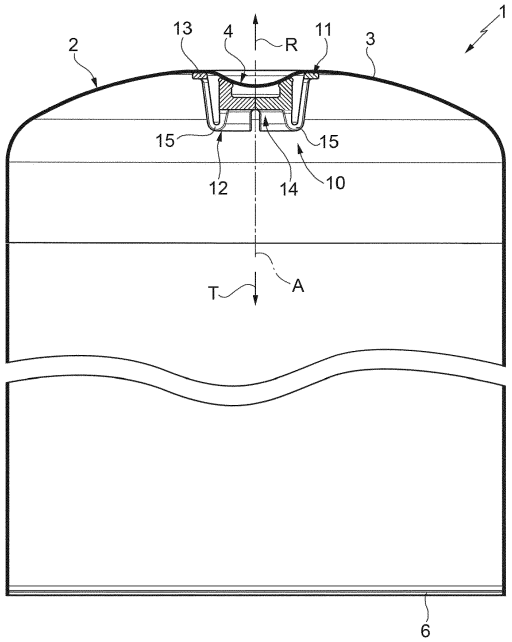

FIG. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority from Italian patent application no. 102018000009658 filed on 22/10/2018.

TECHNICAL FIELD

[0002] The present invention relates to a leakage-limiter or safety valve for a gas bottle, in particular for a portable gas bottle and preferably designed to be used to supply gas to an external user device, such as barbecues, stoves, lamps and similar devices.

[0003] The present invention also relates to a gas bottle including this valve for limiting outflows of gas following the disconnection of the bottle itself, when not yet empty, from the external user device.

BACKGROUND ART

[0004] Gas bottles of the type indicated above are known, essentially comprising:

- a sealed container, filled with pressurised gas, for example butane gas or a mixture of butane and propane gas, and provided, on its upper wall, with a pierceable portion for allowing the supply of gas to the external user device; and
- a leakage-limiter or safety valve positioned inside the container so as to at least limit the outflow of gas in the case in which the pierceable portion has been pierced and the bottle itself is not connected to the external user device.

[0005] In particular, the valve is usually fixed inside the container of the bottle by means of a support structure wedged between the upper wall of the container itself and its lateral wall, on which it rests at a specific internal annular shoulder. This solution is somewhat complex and above all costly in relation to the total cost for marketing bottles of this type.

[0006] Therefore the need to find alternative valve fixing systems, which are simpler and less costly than those currently available, is keenly felt.

[0007] WO 2015/092447 discloses a safety valve for a gas bottle fixed, by means of an adhesive substance or by means of a support frame, around the pierceable portion of the upper wall of the container of the gas bottle.

[0008] In particular, the valve is made entirely of an elastically flexible material and comprises a fixed part, connected in one piece, in use, to the upper wall of the container with the exception of a plurality of gas passages, and a cap-like movable part, which is normally concave towards the pierceable portion of the container and is thrust downwards, in use, by a portion of the external user device after piercing of the pierceable portion of the gas bottle so as to widen the gas passages.

[0009] In the case of detachment of the external user device from the bottle, the movable part, thrust by the pressure of the gas, tends to bend upwards changing its concavity into convexity and closing the hole made in the pierceable portion of the bottle. However, it has been found that the pressure of the gas inside the container of the bottle is not generally sufficient to cause the movable part to obstruct the hole of the pierceable portion, as the movement required of the movable part is considerable.

DISCLOSURE OF INVENTION

[0010] Therefore, the object of the present invention is to make a safety valve for a gas bottle, which satisfies the aforesaid requirements and at the same time overcomes the drawbacks of the prior art solutions specified above, in particular allowing, in use, an effective and reliable closing of the bottle following the detachment of the external user device.

[0011] The aforesaid object is achieved by the present invention, as it relates to a safety valve for a gas bottle, as defined in claim 1.

[0012] The present invention also relates to a gas bottle as defined in claim 9.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] For a better understanding of the present invention, a preferred embodiment thereof is described below, purely by way of non-limiting example and with reference to the accompanying drawings, wherein:

- Fig. 1 illustrates, in a partial cross-sectional perspective view, a gas bottle provided with a safety valve made according to the dictates of the present invention;
- Figs. 2 and 3 are perspective views, on an enlarged scale and from opposite sides, of the safety valve of Fig. 1; and
- Figs. 4, 5 and 6 illustrate, on an enlarged scale, a detail of the bottle of Fig. 1, in three different operating configurations.

BEST MODE FOR CARRYING OUT THE INVENTION

[0014] With reference to Fig. 1, the reference numeral 1 indicates as a whole a gas bottle comprising a sealed container 2 filled with pressurised gas, preferably butane gas or a mixture of butane and propane gas, and provided, on its wall 3, for example upper wall, with a pierceable portion 4 (also visible in Figs. 4, 5 and 6) for allowing the supply of gas to an external user device 5 (known and illustrated schematically in Fig. 5), for example barbecues, stoves or lamps.

[0015] As can be seen in Fig. 1, the container 2 preferably has a more or less cylindrical configuration having

an axis A. More precisely, the container 2 is delimited, as well as by the upper wall 3, having a circular profile, by a lower wall 6, substantially disc-shaped, and by a more or less cylindrical lateral wall 7.

[0016] The upper wall 3 is slightly convex outwardly and has a central circular impression, convex towards the inside of the container 2 and defining the pierceable portion 4.

[0017] The bottle 1 further comprises a leakage-limiter or safety valve 10 (visible in all of the accompanying figures), made according to the dictates of the present invention and positioned inside the container 2 so as to limit at least the outflow of gas in the case in which the pierceable portion 4 has been pierced and the bottle 1 itself is not connected to the user device 5.

[0018] The valve 10 is fixed, solely by means of an adhesive substance (not visible in the accompanying figures), to the wall 3 of the container 2 around the pierceable portion 4.

[0019] It should be noted that in the present description and in the claims the term "around" is used both to indicate the peripheral edge of the pierceable portion 4 and the annular area immediately surrounding the pierceable portion 4 itself.

[0020] In the embodiment illustrated in Fig. 1, the adhesive substance is applied around the pierceable portion 4 and is interposed between the valve 10 and the wall 3. Preferably, the adhesive substance is applied to several points spaced from each other.

[0021] The adhesive substance used is preferably an acrylic glue that, following various experiments conducted by the Applicant, has proved suitable to create a particularly long-lasting connection in the dry environment defined by the butane gas or by the mixture of butane and propane gas.

[0022] The valve 10 is made entirely of an elastically deformable material, such as rubber, and is fixed to the container 2 with its central axis coaxial to the axis A (Figs. 1, 4, 5 and 6).

[0023] The following description of the valve 10 will be made, for reasons of simplicity and clarity, with reference to the position of mounting of the valve 10 itself inside the container 2, but this should not be considered as limiting.

[0024] With reference to the accompanying figures, the valve 10 comprises a fixed part 11 and a movable part 12 both being together a single component.

[0025] The fixed part 11 comprises an annular flange 13 with an axis A fixed in use to the inside of the container 2 around the pierceable portion 4. In the example illustrated, the flange 13 extends substantially along a plane orthogonal to the axis A.

[0026] The movable part 12 of the valve 10 extends in a cantilever fashion from the flange 13 and is elastically mobile with respect thereto along the axis A.

[0027] Advantageously, the movable part 12 comprises a sealing portion 14, which is arranged in a radially innermost position with respect to the flange 13 with reference to the axis A and is elastically loaded in a first direction R along the axis A itself for cooperating, in use, against the wall 3 of the container 2 around the pierceable portion 4 so as to define a normal sealing condition (Figs. 1, 4 and 6), wherein at least the outflow of gas towards the pierceable portion 4 itself is limited; the sealing portion 14 is also movable, in use, by the action of an external thrust, exerted in this case by the user device 5, in a second direction T along the axis A, opposite to the direction R, to define a condition of opening (Fig. 5), wherein the sealing portion 14 itself is axially spaced from the wall 3.

[0028] The movable part 12 further comprises a plurality of petals 15 equally spaced angularly from one another around the axis A, delimiting respective through windows 16 between one another and connecting the flange 13 to the sealing portion 14.

[0029] In particular, the sealing portion 14 comprises a solid central region 18, in the embodiment illustrated consisting of a flat disc orthogonal to the axis A, and a tubular element 19 protruding in a cantilever fashion from the periphery of the central region 18 along the axis A and configured to cooperate in contact, at its free end portion 20, with the wall 3 of the container 2.

[0030] It should be noted that, in the present description and in the claims, the terms "annular" and "tubular" are intended in their broadest sense, i.e., to designate endless elements or portions, not necessarily circular but also oval, polygonal, etc.

[0031] As can be seen in particular in Figs. 4 to 6, each petal 15 and the portion of the flange 13 on which this petal 15 rests, have, as a whole, a substantially S-shaped configuration in a cross-section taken along a plane passing through the axis (A) .

[0032] In practice, each petal 15 extends starting from an area of the sealing portion 14, which is spaced from the free end portion 20 along the axis A.

[0033] In detail, each petal 15 connects a peripheral edge 21 of the central region 18 with a peripheral radially innermost edge 22 of the flange 13.

[0034] Each petal 15 further comprises an end section 23, protruding in a cantilever fashion from the opposite side of the central region 18 with respect to the tubular element 19 and having a curvilinear configuration, and a substantially rectilinear main section 24, having an oblique trend with respect to the axis A.

[0035] In use, the bottle 1 must be pierced at the pierceable portion 4 to be able to supply the user device 5 with gas; this device has a tubular end spout 8 that penetrates inside the container 2 after piercing and has a thrust action along the axis A in the direction T on the central region 18 of the valve 10. In this way, the movable part 12 translates along the axis A towards the inside of the container 2 in the direction T causing the detachment of the free end portion 20 of the tubular element 19 from the wall 3; at the same time, the petals 15 tend to open with respect to one another widening the windows 16. The gas inside the container 2 can then flow towards the

tubular spout 8 of the user device 5 passing first through the windows 16 and then into the space between the free end portion 20 of the tubular element 19 and the wall 3.

[0036] In the case in which the container 2, already pierced but still at least partially full of gas, is detached from the user device 5, the valve 10 allows to at least limit the outflow of gas from the bottle 1.

[0037] In fact, in this case the movable part 12, no longer maintained in the condition of opening by the tubular spout 8, returns towards the wall 3 along the direction R by the effect of its elasticity and under the thrust of the residual pressure of the gas inside the container 2, greater with respect to the atmospheric pressure.

[0038] From an examination of the characteristics of the valve 10 and of the bottle 1, made according to the present invention, the advantages that can be obtained therewith are evident.

[0039] In particular, the fixing of the valve 10 to the upper wall 3 of the container 2 of the bottle 1 can take place through the simple application of traces of adhesive substance on the flange 13, without the need for additional devices to be inserted inside the container 2 itself. Moreover, as the gas sealing function is implemented by the tubular element 19, arranged in a radially innermost position with respect to the flange 13 with respect to the axis A, it is not necessary to apply an endless ring of adhesive substance on the flange 13 itself.

[0040] Finally, due to the structure of the valve 10, the passing from the condition of opening to the normal sealing condition requires a small movement of the movable part 12, and in particular of the tubular element 19, along the axis A; as this small movement can be guaranteed solely by the intrinsic elasticity of the material forming the movable part 12, the presence of a residual pressure inside the container 2, greater than the atmospheric pressure, has the sole effect of furthermore increasing the effectiveness of the seal.

[0041] Therefore, in the case of detachment of the bottle 1 from the user device 5 when it is still full, the valve 10, is able to effectively and reliably control the outflow of the residual gas from the container 2.

[0042] It is clear that modifications and variants can be made to the valve 10 and to the bottle 1 described and illustrated herein without departing from the scope defined by the claims.

Claims

1. A safety valve (10) for a gas bottle (1) designed to feed an external user device (5), said valve (10) being made entirely of an elastically deformable material, having a longitudinal axis (A) and comprising a fixed part (11) and a movable part (12) both being together a single component; said fixed part (11) comprising an annular flange (13) fixable to the inside of said gas bottle (1) around a pierceable portion (4) of the same; said movable part (12) extending in a cantilever fashion from said flange (13) and being elastically mobile in respect thereto along the said axis (A); **characterised in that** said movable part (12) comprises:

   - a sealing portion (14) arranged in a radially innermost position in respect to said flange (13), elastically loaded in a first direction (R) along said axis (A) for cooperating, in use, against a wall (3) of said gas bottle (1) around said pierceable portion (4) so as to define a normal sealing condition, wherein at least the outflow of gas towards the pierceable portion (14) itself is limited, and movable, in use, upon the action of external thrusts, in a second direction (T) along said axis (A), opposite to said first direction (R), to define a condition of opening, wherein said sealing portion (14) is axially spaced from said wall (3) of said gas bottle (1); and
   - a plurality of petals (15) equally spaced angularly from one another around said axis (A), delimiting respective through windows (16) between one another and connecting said flange (13) to said sealing portion (14).

2. The valve according to claim 1, wherein said sealing portion (14) comprises a solid central region (18) and a tubular element (19) protruding in a cantilever fashion from said central region (18) along said axis (A) and configured to cooperate, at its free end portion (20), with said wall (3) of said container (2).

3. The valve according to claim 2, wherein each of said petals (15) and a flange portion (13) on which said petal (15) rests, have, in a cross section taken along a plane passing by said axis (A), a substantially S-shaped configuration.

4. The valve according to claim 2 or 3, wherein each of said petals (15) extends from an area of said sealing portion (14), which is spaced from said free end portion (20) along said axis (A).

5. The valve according to any one of the claims 2 to 4, wherein each of said petals (15) connects a peripheral edge (21) of said central region (18) to said flange (13).

6. The valve according to claim 5, wherein each of said petals (15) protrudes from a peripheral radially innermost edge (22) of said flange (13).

7. The valve according to claim 6, wherein each of said petals (15) comprises an end section (23) protruding in a cantilever fashion from the opposite side of said central region (18) in respect to said tubular element (19).

8. The valve according to claim 7, wherein said end section (23) of each of said petals (15) has a curvilinear configuration, preferably U-shaped in its position of use (figures 1, 4, 5 and 6), and converges in a main section (24) of the petal (15) itself, having an oblique trend in respect to said axis (A).

9. A gas bottle (1) comprising:

- a sealed container (2), filled with said gas and provided, on its wall (3), with a pierceable portion (4) for allowing the supply of gas to an external user device (5); and
- a safety valve (10) made according to any one of the preceding claims and positioned inside said container (2) so as to at least limit the outflow of gas towards said pierceable position (4) when said container (2) is not connected to said user device (5);

wherein said flange (13) of said valve (10) is fixed to said wall (3) of said container (2) around said pierceable portion (4) ; and

wherein said sealing portion (14) is elastically loaded in said first direction (R) against said wall (3) around said pierceable portion (4) for defining said normal sealing condition, and is movable to the opening position due to the effect of a thrust action exerted by said user device (5) in said second direction (T).

10. The gas bottle according to claim 9, wherein said flange (13) is fixed to said wall (3) of said container (2) solely by means of an adhesive substance, in particular applied in several points spaced from each other.

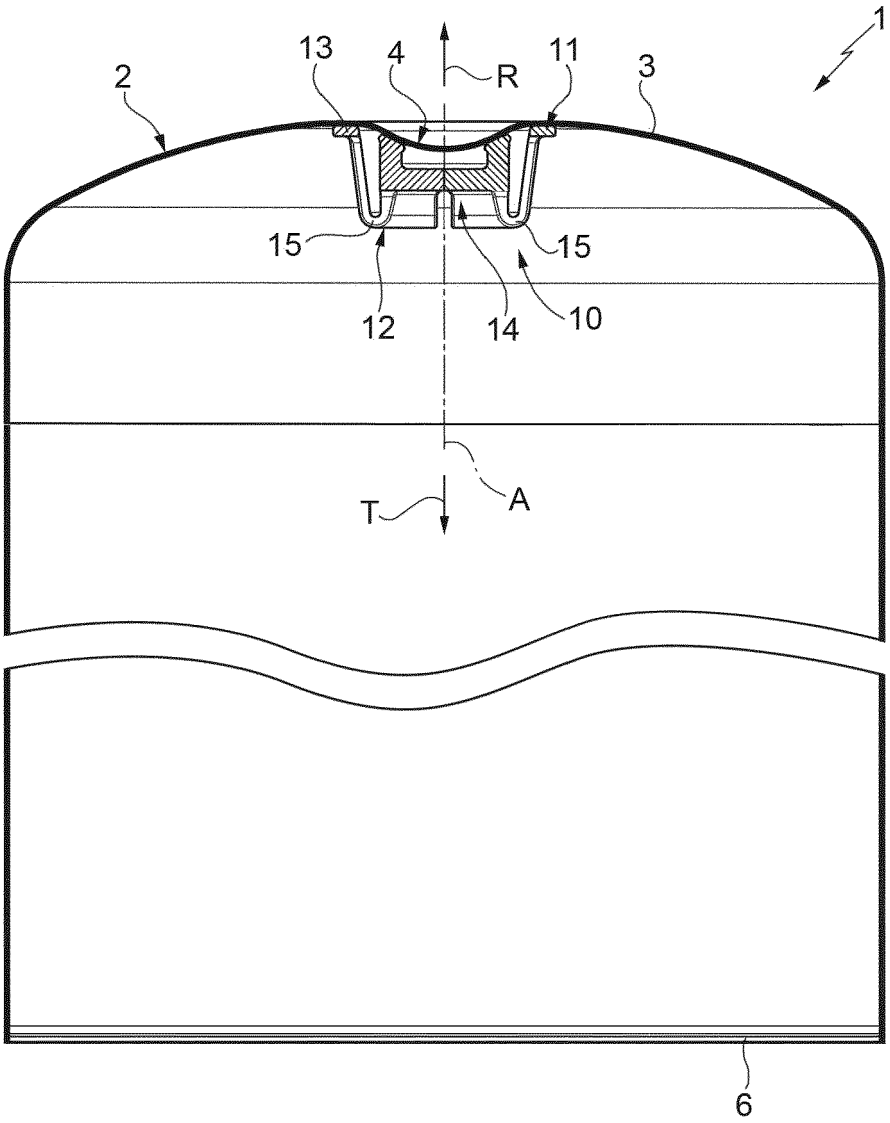

FIG. 1

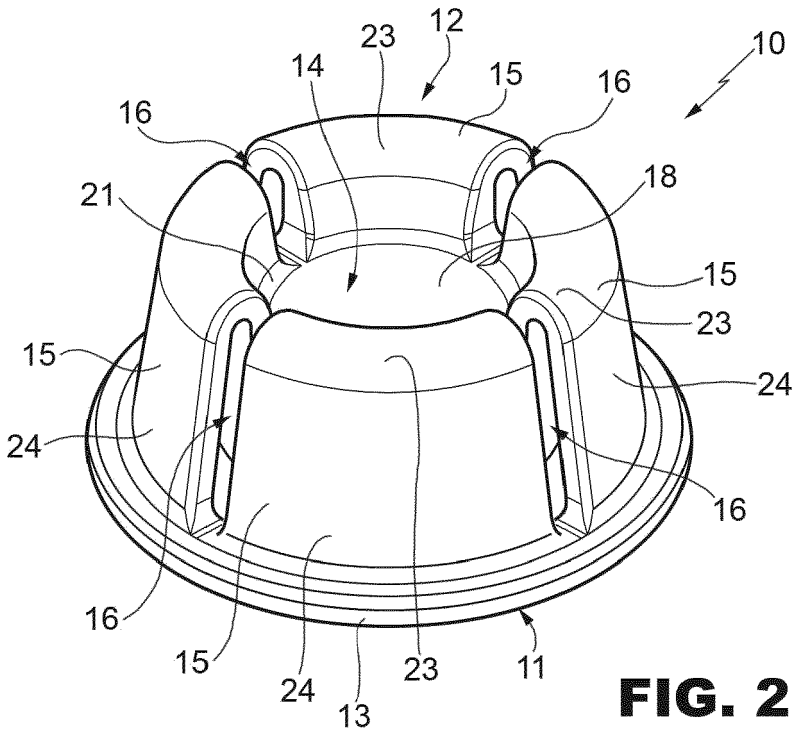
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FIG. 2

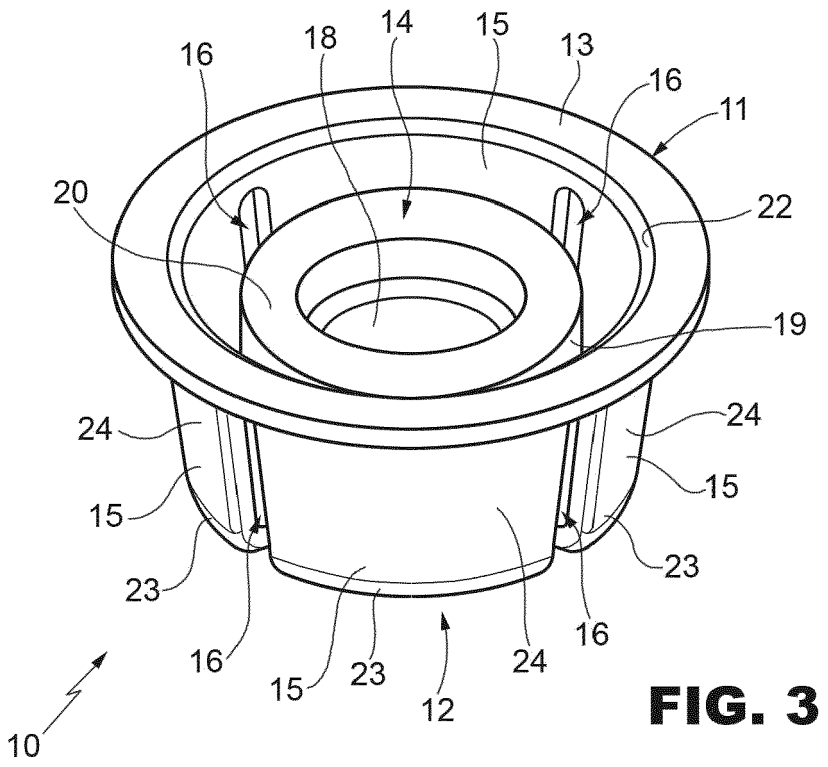
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FIG. 3

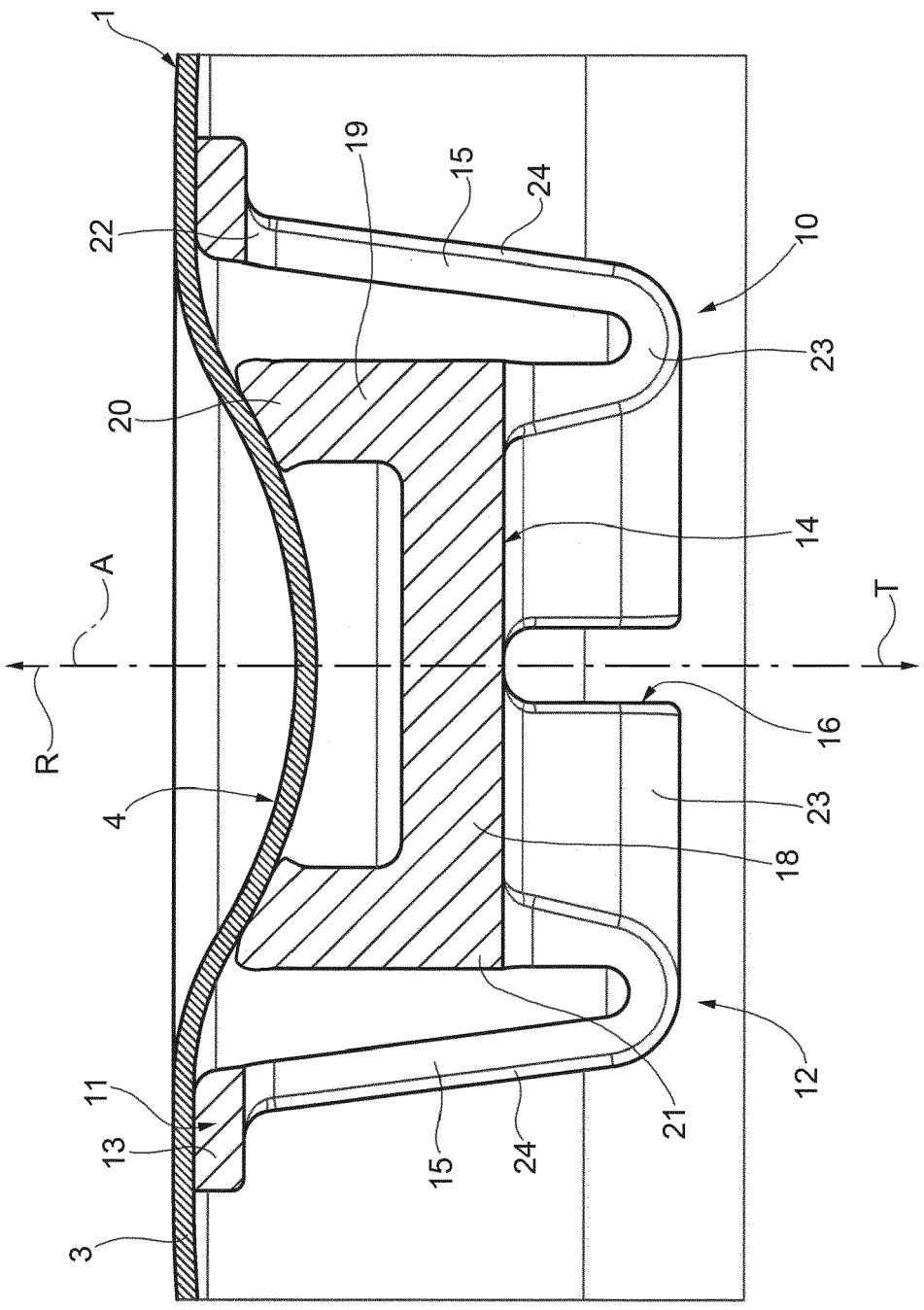

FIG. 4

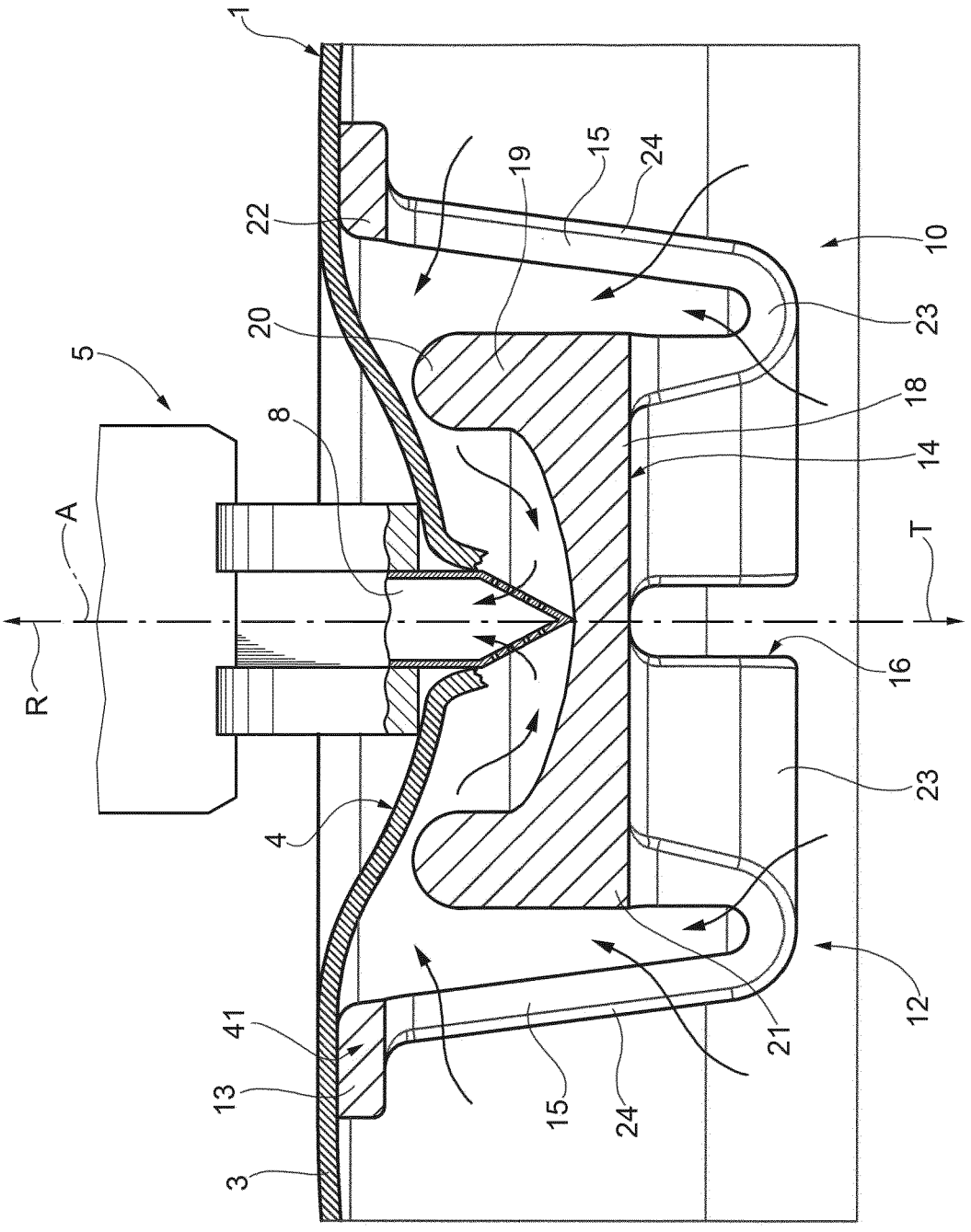

FIG. 5

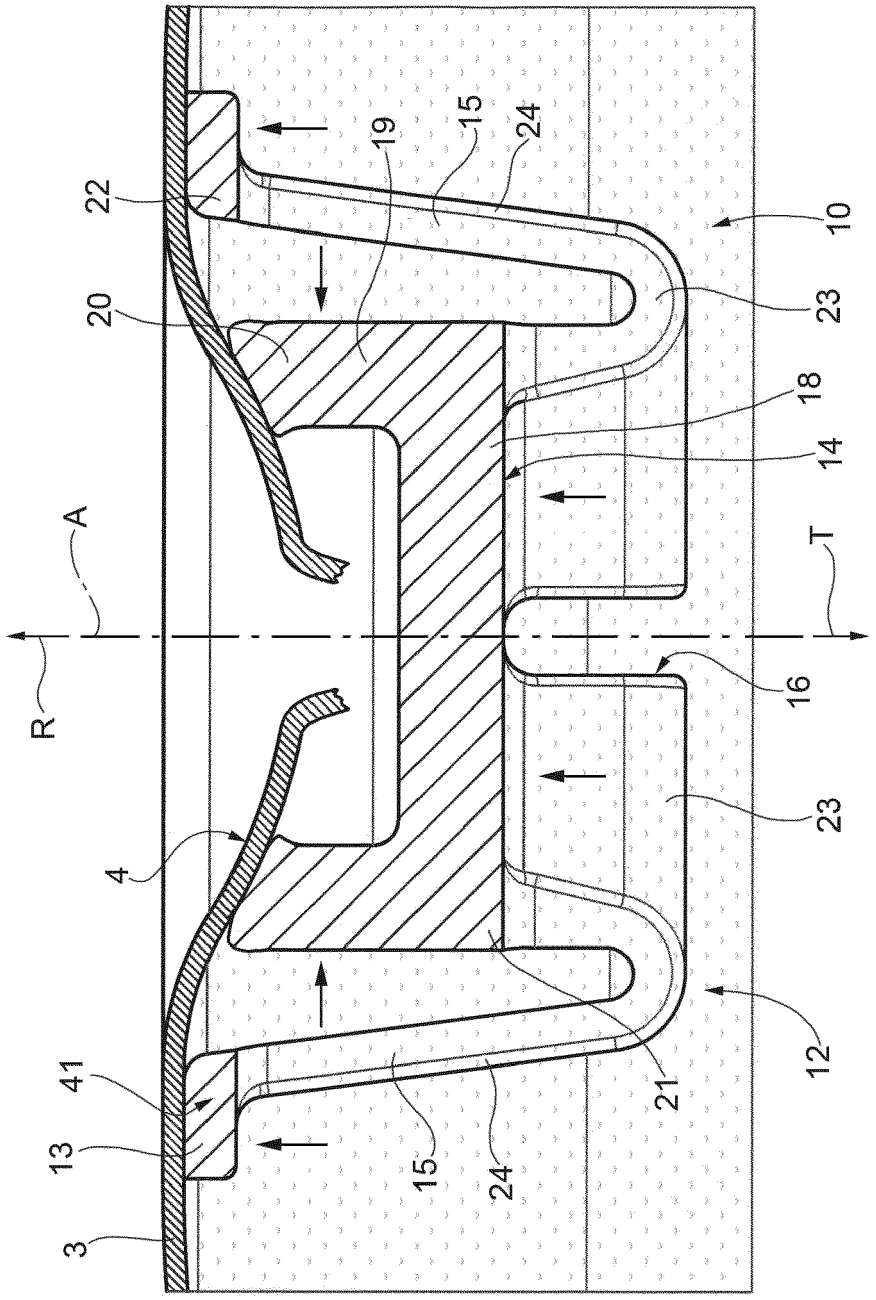

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 19 20 4706

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	EP 3 287 686 A1 (SPECIAL COMPONENTS S R L [IT]) 28 February 2018 (2018-02-28) * figures 2-6 *	10	
A	GR 2015 0100 357 A (NIKOLAOS BAZIGOS ANONYMI VIOTECHNIKI KAI EMPORIKI ETAIREIA KATASKEVIS) 10 April 2017 (2017-04-10) * figures 1-5 *	1	
			TECHNICAL FIELDS SEARCHED (IPC) F17C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 March 2020	Papagiannis, Michail

CATEGORY OF CITED DOCUMENTS

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02-03-2020

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

REFERENCES CITED IN THE DESCRIPTION

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