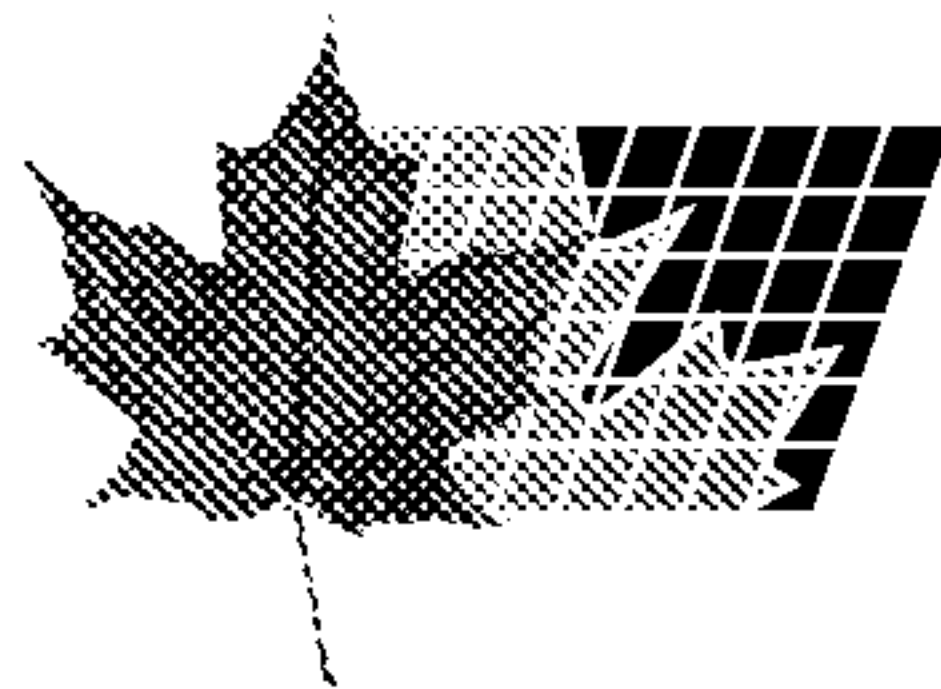




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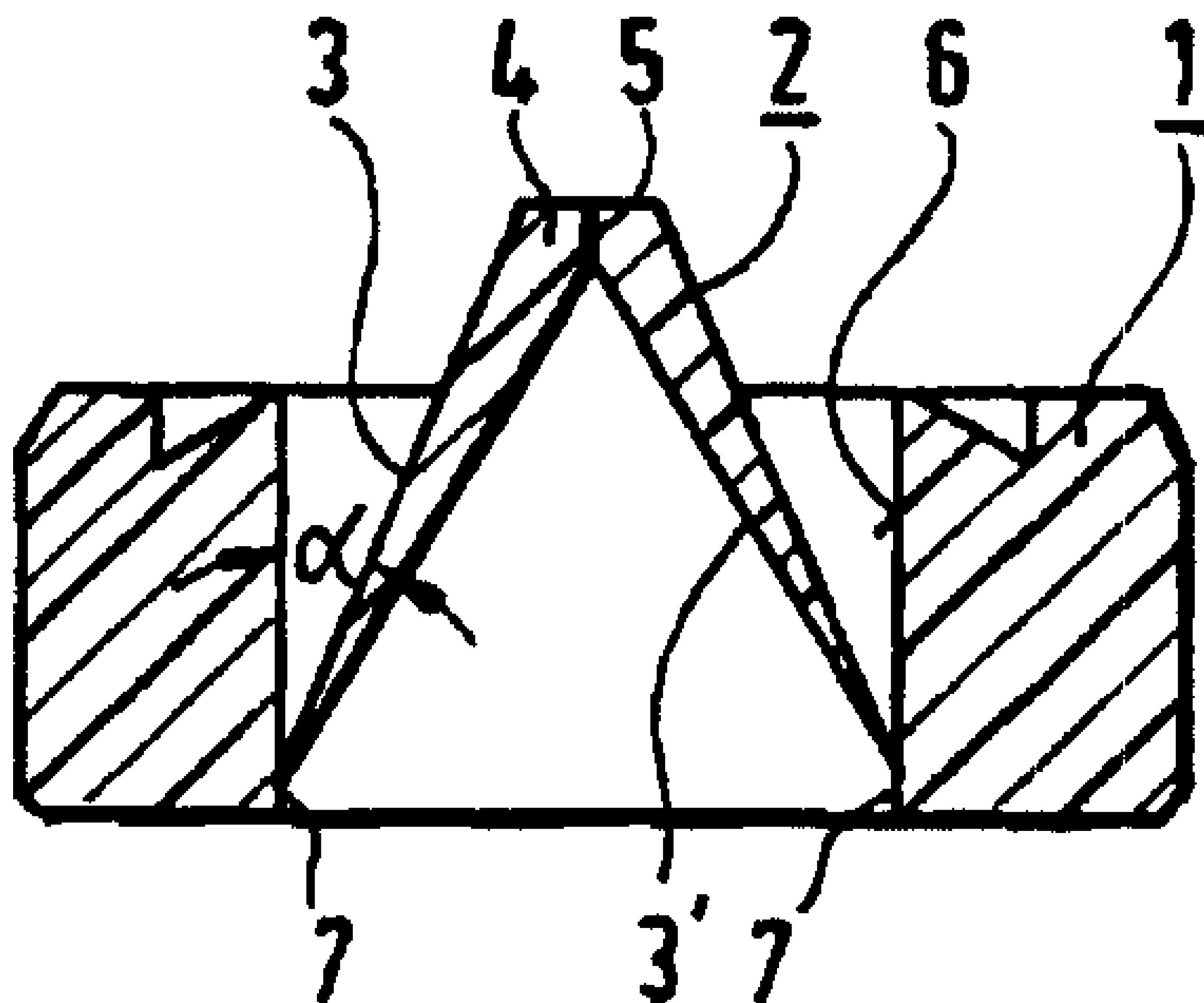
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(51) Int.Cl.⁷ B65D 47/20

(30) 1999/05/04 (299 07 933.3) DE

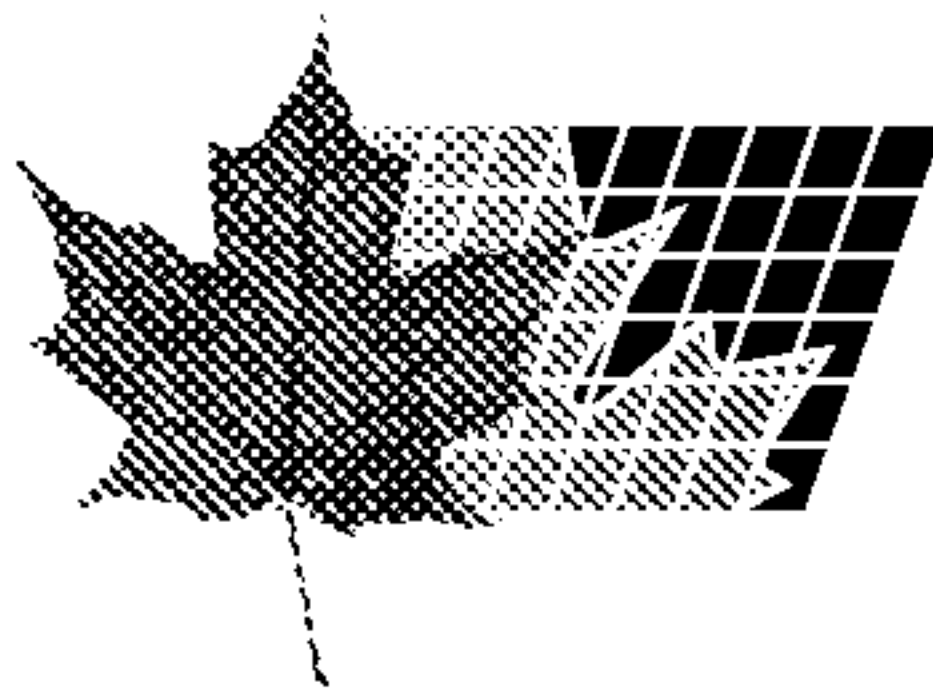
(54) **CLAPET DE FERMETURE A FENTE POUR OUVERTURES DE
RECIPIENTS**

(54) **SLOTTED CLOSING VALVE FOR OPENINGS OF CONTAINERS**



(57) L'invention concerne un clapet de fermeture pour ouvertures de récipients ou similaires, comprenant une partie membranaire (2) en matériau élastique, contenant un orifice de sortie (5) sous forme de fente, aligné de manière au moins unidirectionnelle, ainsi qu'une partie de base (1) entourant la partie membranaire en périphérie extérieure, qui est liée à ladite partie membranaire. L'orifice de sortie est maintenu en position de fermeture grâce à la propriété élastique du matériau utilisé, mais peut néanmoins être placé en position d'ouverture sous l'effet d'une surpression différentielle s'exerçant sur une face de la partie membranaire, à l'encontre de la force de précontrainte élastique du matériau. Une zone de paroi périphérique (6) de la partie de base et une zone de paroi (3) adjacente de la partie membranaire comprennent

(57) The invention relates to a slotted closing valve for openings of containers or the like comprising a membrane part (2) which is made of a flexible material and which contains at least one unidirectionally aligned slotted outlet opening (5). The inventive slotted closing valve also comprises a base part (1) which surrounds the membrane part on the outer periphery thereof and which is connected to said membrane part. The outlet opening is held in a closing position due to the elastic property of the material. However, it can be moved, under a defined differential overpressure which acts upon one side of the membrane part, against the pretensioning force of the elastic material into an opening position. A peripheral wall area (6) of the base part and an adjacent wall area (3) of the membrane part form an acute angle α together.



(21) (A1) **2,336,552**

(86) 2000/05/02

(87) 2000/11/09

entre elles un angle aigu α . Il est prévu dans la zone de la paroi de la membrane, à proximité de la partie de base, au moins un autre orifice de passage (8) sous forme de fente, aligné sensiblement en périphérie, qui est maintenu en position de fermeture grâce à la propriété élastique du matériau. Cet orifice de passage peut être placé dans une position de dégagement, sous l'effet d'une dépression différentielle exercée sur la partie membranaire du côté de la face pouvant être exposée à l'action de la surpression différentielle. Le clapet permet ainsi de compenser la pression entre l'intérieur et l'environnement extérieur d'un récipient, ce qui favorise sa reprise élastique, après que sa paroi ait été comprimée manuellement pour en vider le contenu.

In the membrane wall area, at least one additional slotted continuous opening (8) is provided in the vicinity of the base part. Said additional slotted continuous opening is aligned in an essentially peripheral manner, is held in a closing position due to the elastic property of the material, and can be moved into a releasing position under a differential low pressure exerted on the membrane part by the side that can be subjected to the action of the defined differential overpressure. As a result, the valve enables an equalization of pressure between the inner and the outer surroundings of a container, thus having a favorable effect on the restoring ability of the container after the container wall has been compressed by hand in order to empty the contents of the container.

Abstract

A slit closure valve for container openings or the like, including a membrane member (2) of flexible material having an at least unidirectionally aligned slit-like outlet opening (5) and a base member (1) peripherally surrounding the membrane member and connected to the membrane member. The outlet opening is held in its closed position by the resilient properties of the material although it is adapted to be moved into its open position against the resilient bias force of the material by a predetermined differential positive pressure exerted on one side of the membrane member. A peripheral wall portion (6) of the base member (1) and an adjacent wall portion (3) of the membrane member include therebetween an acute angle α of less than 90° . At least one further, substantially peripherally aligned slit-like passage opening (8) held in its closed position by the resilient properties of the material is provided in the membrane wall portion near the base member, said passage opening being adapted to be moved into its unblocking position by a differential negative pressure exerted on the membrane member from the side thereof subjected to said predetermined differential positive pressure. The valve thereby enables the pressure between the interior of a container and its surroundings to be equalised thus assisting in the restoration of the container after its walls have been pressed-in manually for emptying the contents of the container.

Fig. 2

A SLIT CLOSURE VALVE FOR CONTAINER OPENINGS

The invention relates to a slit closure valve for container openings or the like in accordance with the preamble of claim 1. The invention especially relates to self-closing and self-opening valves for installation in an opening of a container or for completing a closure cap.

A one-piece slit closure valve, which can be produced in a single operational step by a two component injection moulding process using different thermoplastic plastics materials is known (c.f. e.g. EP-A-0 743 259). The substantial manufacturing advantages attained hereby are however countered by the fact that the restoration to its original configuration of a container provided with such a valve, after the container has been compressed so as to exert pressure on the contents of the container, is frequently incomplete, or, only occurs after a long period of time since the pressure between the interior of the container and its surroundings cannot equalise. Thus various alternative designs of self-closing valves incorporating a pressure equalising function have already been proposed (c.f. e.g. DE-U-298 17 571, 298 18 414). A specially designed and arranged closure element for closing an outlet opening which has no slit is necessary for performing the pressure equalising function. The advantage of such a specific pressure equalising arrangement is thereby obtained at the expense of a valve which is less convenient to manufacture.

Hence, there is a need for a slit closure valve of the type described hereinabove which has a pressure equalising function but which, at the same time, is of simple construction and is convenient to manufacture. In particular, the slit closure valve should be capable of being formed, ready for use, in a single operational step.

The slit closure valve of the invention is distinguished by the features of claim 1. According thereto, the slit closure valve is constructed such that a wall portion of a membrane member is connected to a base member at an acute angle. One or more slit-like passage openings are provided in the area of the joint section. The purpose of these passage openings is to produce an equalisation of the pressure by enabling the surrounding air to enter into the interior of the container when negative pressure conditions exist therein. By contrast, the slit-like passage openings are kept closed when there is an positive pressure in the interior of the container so that this positive pressure can only be expressed by releasing the slit-like outlet opening at an e.g. central portion of the membrane member. The slit closure valve of the invention is of particularly simple and uncomplicated construction and it can be manufactured economically together with said openings in a single operational step e.g. by injection

moulding. An embodiment of the slit closure valve lending further assistance to the manufacturing process whilst simultaneously improving the above-mentioned functions provides for the membrane member to have a peak-roofed configuration. Further embodiments of the invention are mentioned in the claims.

The invention will be explained in more detail hereinafter with the help of an embodiment and the drawing. Therein shows

Fig. 1 a top view of a slit closure valve constructed in accordance with the invention,

Fig. 2 a section along the section line II-II in Fig. 1, and

Fig. 3 a section along the section line III-III in Fig. 1.

The slit closure valve in accordance with the invention comprises a base member bearing the general reference number 1 and a membrane member bearing the general reference number 2. The base member 1 has an annular configuration and serves for mounting the slit closure valve in an opening that needs to be closed of a container or a closure cap or the like. The membrane member 2 is formed integrally with the base member 1 at a suitable intermediate portion between the axial ends of the base member 1 and preferably near one axial end of the base member 1 such as is indicated by 7, and it preferably has a substantially peak-roofed configuration as can be appreciated especially from Fig. 2. Accordingly, the membrane member 2 comprises side wall portions 3, 3' which are inclined inwardly at an angle α relative to an inner peripheral surface 6 of the base member 1 that may be concentric with the central axis of the slit closure valve. In addition, the membrane member 2 has a central ridge portion 4 which is preferably located in a radial plane relative to the central longitudinal axis. A slit-like outlet opening 5 is formed in the ridge portion 4. In the present embodiment, the slit-like outlet opening 5 extends unidirectionally along one transverse main axis of the slit closure valve, although, if so desired, provision may be made for the slit-like outlet opening to be aligned in some other direction. Moreover, the slit-like outlet opening 5 could be made multidirectional by extending it e.g. along both transverse main axes of the slit closure valve.

Fig. 1 shows the slit-like outlet opening 5 in its closed position which is adopted in the rest position of the slit closure valve due to the inherent resilient properties of the material from which the slit closure valve is made. The preferred materials are rubber-like resilient materials such as elastomers,

silicon materials or natural or synthetic rubbers and the like. In the case of elastomers, thermoplastic elastomers are preferred because of the ease with which they can be handled in an injection moulding process.

It can be appreciated from Fig. 2, that the thickness of the side wall portions 3, 3' tapers from the ridge portion 4 towards the joint section 7 and creates a sealing lip-type structure near the joint section 7.

In accordance with the invention, a respective slit-like passage opening is formed in the side wall portions 3, 3' at diametrically opposed positions of the ridge portion 4 as is indicated by the references 8, 8' in Fig. 1. Each passage opening 8, 8' is aligned unidirectionally peripherally of the membrane member 2 and is a slit which is held in its closed position in the rest position of the slit closure valve due to the inherent resilient properties of the flexible material from which the side wall portions 3, 3' are made. It should be understood that the number and arrangement of the slit-like passage openings 8, 8' is not restricted to the previously described embodiment depicted in Fig. 1. Rather, provision may be made for less or more than two slit-like passage openings 8, 8', and furthermore, the angular spacing between adjacent slit-like passage openings could be something other than diametrical.

The slit closure valve constructed as previously described functions as follows. When the valve is mounted on a (not shown) container in fluid tight manner by e.g. pressing it into an opening in the container such as to seal it, each one of the slit-like openings 5 and 8 are in their closed positions and retain these positions for as long as there are no external forces exerted on the slit closure valve. If, whilst in this starting position, a squeezing force is applied to the container such as to compress the container walls to a certain extent, then the positive pressure occurring in the interior of the container exerts a force on the membrane member 2 which results in the slit-like outlet opening 5 being spread apart. The contents of the container can then be expelled externally through the slit-like outlet opening 5 for as long as the positive pressure is effective. As soon as the squeezing force on the container has been removed and the interior of the container has thus returned to its pressure-less state, the slit-like outlet opening 5 returns to its closed position due to the resilient restorative properties of the flexible material and the interior of the container is thereby hermetically sealed from the exterior.

When the interior of the container is in its unpressurized state or is subject to a low positive pressure, the contents of the container cannot escape outwardly through the slit-like passage openings 8, 8' since, in these circumstances, the passage openings 8, 8' remain closed due to the fact that the sealing lip type end sections of the side wall portions 3, 3' are pressed in sealed manner against the adjacent peripheral surface 6 of the base member 1. The peak-roofed configuration of the membrane member 2 assists this process of closing the passage openings 8, 8', and also that of releasing the slit-like outlet opening 5, by virtue of the side wall portions 3, 3' being rotated outwardly about their points of connection 7 to the base member 1 in the presence of positive pressure.

In the course of the restoration of the compressed container after the external squeezing force has been removed, a partial vacuum occurs in the interior of the container which would prevent complete restoration if pressure equalisation with the outer atmosphere could not occur. The slit-like passage openings 8, 8' effect this pressure equalisation process by virtue of the tendency of the side wall portions 3, 3' of the membrane member 2 to be drawn inwardly away from the peripheral surface 6 of the base member 1 under low pressure conditions. Air can thereby flow into the interior of the container from its surroundings until the pressure has been equalised. As soon as this state has been adopted once more, the passage openings 8, 8' are reclosed due to the inherent resilient properties of the flexible material from which the side wall portions 3, 3' are made.

Although, if so desired, each of the openings 5, 8 could be formed in an additional operational step following the basic formation of the slit closure valve, it is preferred that these openings be formed concurrently with the formation of the slit closure valve. This can be achieved, as the product is being removed from the mould, by moving cutting elements into the material at appropriate parts of an injection moulding tool corresponding to the locations of the openings 5, 8 so as to make cuts therein, these cutting elements then being simultaneously used for performing an ejection operation upon further advancement thereof. Furthermore, a dimensioning of the slit closure valve and a choice of materials is preferably such that the holding force for the outlet opening 5 will be of sufficient strength as to prevent it from being moved into its open position by virtue of a pressure exerted by the head of the contents of the container, thereby such an opening action only occurring when an external force is exerted on the container such as to create a positive pressure in the interior of the container which is greater than the pressure exerted by the head. A container provided with this slit closure valve could therefore be overturned without spilling the contents of the container. Finally, the membrane member need not be in the form of a peaked roof. Rather, some other suitable dome-shaped configuration could be adopted subject to that this would enable the

membrane member to be connected to the base member such that the angle α is maintained at less than 90° at least in the vicinity of the passage openings.

Claims

1. A slit closure valve for container openings or the like, including a membrane member of flexible material having an at least unidirectionally aligned slit-like outlet opening, and a base member peripherally surrounding the membrane member, said base member being connected to the membrane member, said outlet opening being held in a closed position by the resilient properties of the material and adapted to be moved into an open position against the resilient bias force of the material by a predetermined differential positive pressure exerted on one side of the membrane member, characterized in that a peripheral wall portion (6) of the base member (1) and an adjacent wall portion (3) of the membrane member (2) include therebetween an acute angle α of less than 90° , and that at least one further, substantially peripherally aligned slit-like passage opening (8) held in a closed position by the resilient properties of the material is provided in the membrane wall portion near the base member, said passage opening being adapted to be moved into a releasing position by a differential negative pressure exerted on the membrane member from the side subjected to said predetermined differential positive pressure.
2. The slit closure valve according to claim 1, characterized in that the membrane member (2) has a substantially peak-roofed configuration including a ridge portion (4) having said outlet opening (5).
3. The slit closure valve according to claim 1, characterized in that the membrane wall portion (3) near the slit-like passage opening (8) is in the form of a sealing lip.
4. The slit closure valve according to claim 1, 2 or 3, characterized in that a pair of slit-like passage openings (8) is provided at diametrically opposed positions of the membrane member (2).
5. The slit closure valve according to anyone of the preceding claim, characterized in that it is a one-piece moulded part.
6. The slit closure valve according to anyone of the preceding claims, characterized in that the membrane member (2) is at least partially accommodated in the base member (1).

7. The slit closure valve according to anyone of the preceding claims, characterized in that the or each passage opening (8) and the outlet opening (5) are substantially parallel to the central longitudinal axis of the slit closure valve.

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FIG.1

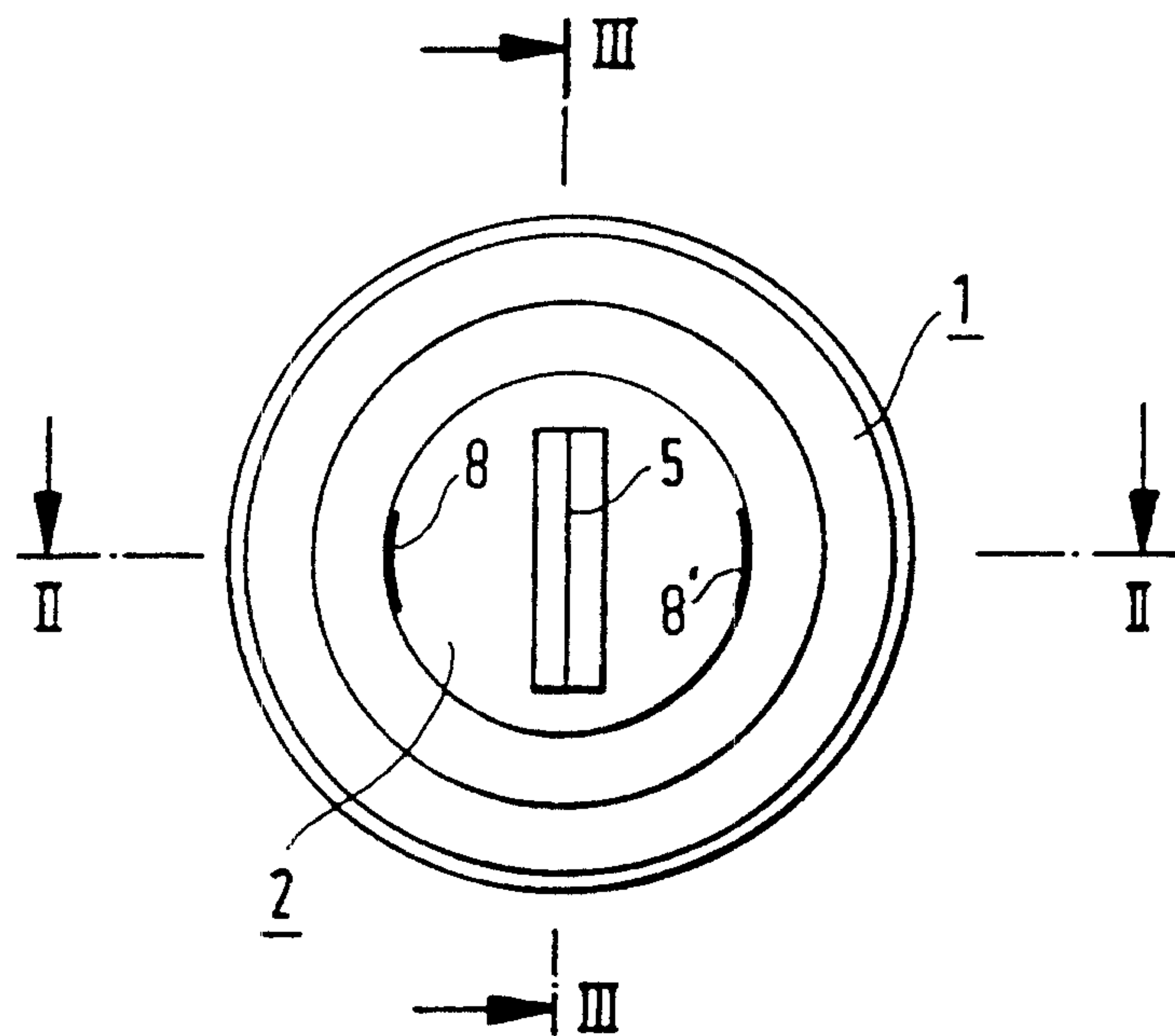


FIG.2

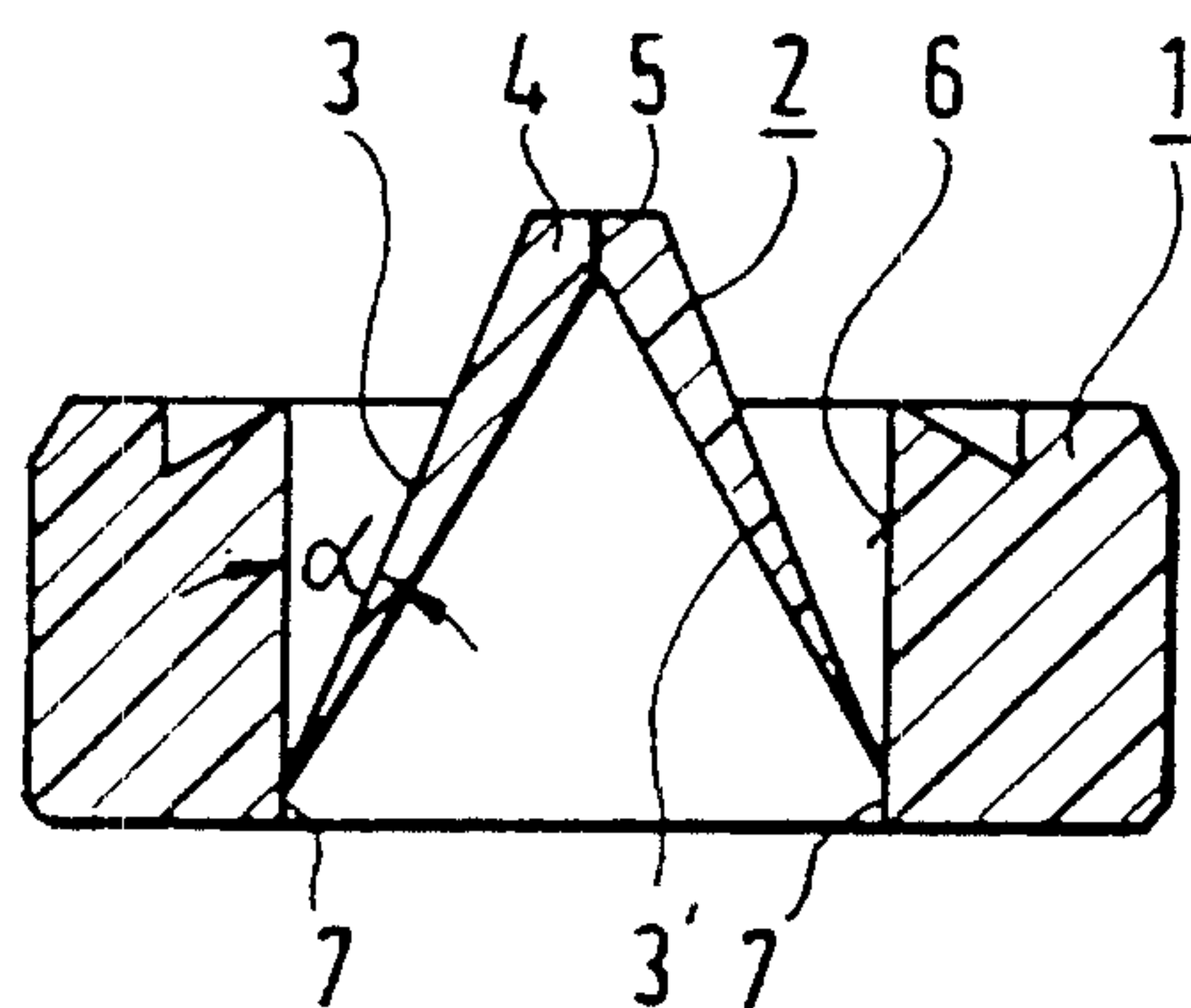


FIG.3

