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(54) TWO-PIECE TWIST-OFF LID FOR GLASS STORAGE JARS

(57) A two-piece twist-off lid for glass storage jars comprises of two separate parts: a covering disk and a threaded ring. The edge of the covering disk is curled upward to form a circular curl and is bent outward to form an annular channel for placing a seal and for seating the covering disc on the edge of the jar neck. The covering disk is made of elastic tinplate having a thickness of 0.08-0.16 mm and Rockwell hardness of 58-64. The cylindrical threaded ring is made of a plastic material and comprises retaining thread members for locking the ring on the jar neck. Said thread elements are embodied in the form of blade-like protrusions arranged at an angle along the circumference on the inner surface of the ring. The upper part of the threaded ring extends radially inward to form a retainer for the edge of the covering disk, wherein said retainer geometrically conforms to the curl of the covering disk. The design features of the proposed two-piece twist-off lid for glass storage jars provide a high degree of hermetic sealing, while the operating characteristics are consistent with the conditions of multiple use of the threaded ring as a component of the lid, and allow for the replacement of the covering disk.

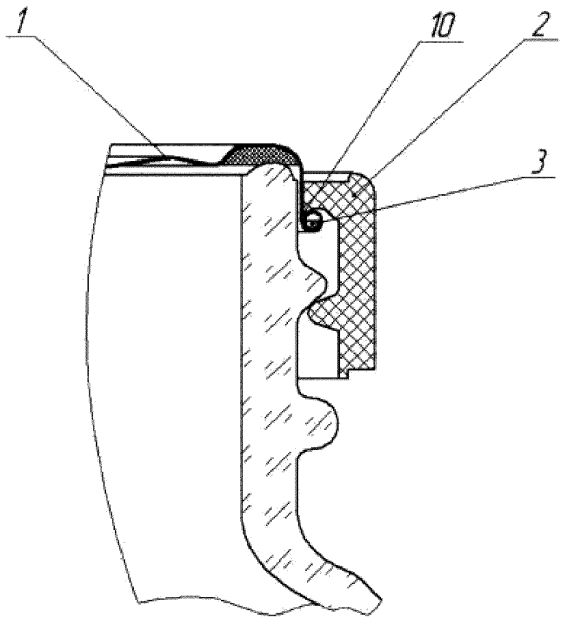

Fig. 3

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Description

Field of the Invention

[0001] The invention relates to the canned-foods industry, and specifically, to screw-type lids made of thin sheet metal and intended for hermetic sealing of glass storage jars having twist-off neck tops.

Background of the Invention

[0002] A lid for sealing glass storage jars having a twist-off neck top is known, comprising a disk-shaped covering part provided with an annular channel for placing a sealing ring in the place of contact between the lid and the edge of the jar neck, as well as a cylindrical side part provided with retaining members for locking the lid on the jar neck (GOST 25749-2005 - Metal screw-type lids. Specifications). A solid body of the known lid is made of soft (Rockwell hardness 51-54) tinplate having a thickness of 0.18, 0.20, or 0.22 mm. The cylindrical side part of such lid is smooth on the outside and contains the retaining members for locking the lid on the jar neck in the form of a rolled lower edge with spiral protrusions. The torque values required to open such lids range from 1.6 to 1.9 N□m for lids measuring 27 mm in diameter and increase to 5.9-6.4 N□m for lids measuring 110 mm in diameter. Opening jars closed with such lids requires excessive force and the use of extra tools. To ease the opening, consumers would sometimes bend the spiral protrusions on the lower edge of the side surface of the lid, e.g., with a knife. Applying such force may result in an injury, and may also affect the integrity and geometry of the edge of the lid, which prevents it from being reused. In addition, the known twist-off lid requires a protective varnish coating, since the use of can-sealing machines (industrial of household) subjects the lid, and specifically, the areas of the cylindrical side part thereof and the edge with spiral protrusions (lugs), to excessive mechanical stresses. Even in case of the coating with several layers of high-quality protective varnishes or enamels, it is not possible to eliminate the occurrence of mechanical damage and deformation of the lid within these areas under exposure to high temperature and aggressive media (e.g., marinade), which subsequently leads to the appearance of rust on the lid and prevents reusing thereof.

[0003] Another screw-type lid intended for hermetically sealing a jar neck similar to the twist-off type is known, which consists of two separate parts, wherein the first part of such lid is made of a sheet metal and represents a covering disc, the edge of which is curled up to form a round curl and bent outward to form an annular channel for placing a seal and for seating said covering disc on the edge of the jar neck; and the second part of the lid is made of a plastic material and represents a cylindrical threaded ring, the inner surface of which is provided with the retaining members for locking the lid on the jar neck (US2003141271 A1, B 65 D 41/34, publ. 07/31/2003). However, said ring has an inwardly bent upper edge, and hermetic sealing of the jar is achieved as a result of applying a retaining contact force specifically from this bent edge of the ring toward the section of the covering disk located directly on the edge of the neck. In this case, the curl along the edge of the covering disk only serves as a safe design feature thereof. The tightness of the jar seal as a result of using such mechanism depends on the continuous compressive force transmitted from the plastic ring through the bent edge to the metal covering disk. Ensuring the required duration of such force is quite difficult. Producing a ring of such design requires the use of high-quality plastic with special characteristics. In any case, the inwardly bent upper edge of the ring is subjected to excessive stress during the process of creating and maintaining a hermetic seal of the jar, which leads to the formation of microcracks and subsequent fracturing during reuse of the ring as part of the mechanical "closing-opening" cycles. Next, the retaining members intended for locking the lid on the jar neck are made in the form of a continuous spiral thread. It is impractical to use such thread on a glass jar having a standard twist-off neck with separate spiral protrusions provided on the outer surface thereof to guide the twisting movement of the lid. These disadvantages limit the value of applying the known technical solution to the manufacturing of lids for glass jars with twist-off necks, which would be feasible to recommend for reusing during home-canning process.

Disclosure of the Invention

[0004] The objective of the invention is to create a two-piece twist-off lid for glass storage jars, the design features of which allow achieving a high degree of hermetic seal, while the operating characteristics are consistent with the conditions of multiple use of the threaded ring as the component of said lid with the possibility of replacing the covering disc.

[0005] This objective is achieved as follows. The proposed two-piece twist-off lid for glass storage jars comprises two separate parts, wherein the first part of the lid is made of a sheet metal and represents a covering disc, the edge of which is curled up to form a round curl and bent outward to form an annular channel for placing a seal and for seating said covering disk on the edge of the jar neck, and the second part of the lid is made of a plastic material and represents a cylindrical threaded ring, the inner surface of which is provided with retaining thread members for locking thereof on the jar neck. In this case, according to the invention, the upper part of the threaded ring extends radially inward to form a retainer of the edge of the covering disc, which geometrically conforms to the curl of the covering disc. Such design features ensure that the covering disc is pressed against the edge of the jar neck due to a contact force transmitted from the threaded ring, as it is screwed onto the jar neck, specifically to the round curl of the covering disc, which compresses elastically and creates an addi-

tional contact force between the two pieces of the lid. In this case, the hermetic seal of the jar lasts longer, while the loads onto the individual structural elements of the ring are reduced, which allows preserving the integrity thereof over an extended period of time.

[0006] The retaining thread members located on the inner surface of the threaded ring of a two-piece lid according to the invention are made in the form of blade-like protrusions arranged at an angle along the circumference. In terms of the angle, length, and 6-piece quantity, such blade-like protrusions are geometrically consistent with the design of the outer surface of a standard twist-off neck of glass jars, which are typically used as glass containers during canned food manufacturing.

[0007] In the proposed two-piece twist-off lid according to the invention, the covering disc is made of elastic tinplate having a thickness of 0.08-0.16 mm and Rockwell hardness of 58-64. By using such thin and hard tinplate, it becomes possible to achieve the required technical effect. To ensure the marketable appearance of the covering disc made of such tinplate, it will be sufficient to use just 1-2 layers of protective varnish. Tinplate with such characteristics was selected experimentally from the variety of commercially available grades. When using tinplate grades with Rockwell hardness of 50-56, e.g., T52 or T57 (according to EN 10203/91), which is frequently chosen for manufacturing the known lids, the described effect will be either absent or unstable, since the elasticity of the described curl on such product will be insufficient to retain the threaded ring during long-term storage of the canned products. The use of tinplate grades with Rockwell hardness of 64 or higher, e.g., DR-680 (according to EN 10203/91), is possible, but impractical, since such tinplate is made using a dual rolling technology and is very expensive. The use of tinplate grades with Rockwell hardness of 58-64, e.g., T-61, T-65 or DR-550 (according to EN 10203/91), and thickness varying from 0.08 to 0.16 mm, is feasible according to the invention, and makes it possible to obtain a functional member of a modern two-piece twist-off lid.

[0008] In addition, in the proposed two-piece twist-off lid according to the invention, the threaded ring is made of heat-resistant polycarbonate plastic. The choice of this specific type of plastic, which is non-toxic, resistant to mechanical damage, operates within the temperatures range from -100oC to +145°C, and has a melting point of up to 250°C, satisfies the rational requirements for organizing the food-canning process at home or commercially. The threaded ring according to the invention has a much better ability to withstand the exposure to aggressive media in the process of using autoclaves compared to the conventional twist-off lids. When sealing glass jars using commercial can-sealing machines, the possibility of mechanical damage of the ring is generally eliminated. In addition, heat-resistant polycarbonate plastic is well suited for displaying on the outer surface of the threaded ring high-quality raised elements (graphic or verbal) of various functionality: decorative, informative, advertising, social, etc. Such feature opens up additional application possibilities for the proposed new lid, while accounting for today's marketing needs.

[0009] The outer surface of the threaded ring according to the invention can be provided with stiffening members in the form of vertical ribs connected from the top by an annular stiffening member. When embodied in such a way, the threaded ring (as a component of the two-piece twist-off lid intended for multiple use) exhibits enhanced mechanical strength and extended service life. Any raised decorative elements applied to the outer surface of the threaded ring in accordance with marketing objectives can also function as stiffeners.

[0010] The invention is illustrated by the following drawings.

Brief Description of the Drawings

[0011]

Figure 1 shows a vertical cross-section of the assembled two-piece twist-off lid for glass storage jars.

Figure 2 shows a vertical cross-section of the threaded ring of the two-piece twist-off lid for glass storage jars.

Figure 3 shows view A of the vertical cross-section of the assembled two-piece twist-off lid for glass storage jars in the position "jar closed, ring tight-ened."

Figure 4 shows view A of the vertical cross-section of the assembled two-piece twist-off lid for glass storage jars in the position "jar closed, ring untight-ened."

Figure 5 shows view A of the vertical cross-section of the assembled two-piece twist-off lid for glass storage jars in the position "jar open, ring untight-ened."

Figure 6 shows a vertical section of the embodiment of the threaded ring of the two-piece twist-off lid for glass storage jars with the stiffening members.

Figure 7 shows view B of the vertical section of the embodiment of the threaded ring of the two-piece twist-off lid for glass storage jars with the stiffening members.

Preferred Embodiments of the Invention

[0012] As shown in Fig. 1, a two-piece twist-off lid for glass storage jars consists of a covering disc (1) and a threaded ring (2). Covering disc (1) comprises an edge in the form of a round curl (3), which is bent outward to form an annular channel (4) for placing a seal (5) and for making a contact with the edge of a glass jar neck (6) provided with spiral protrusions (7).

[0013] As shown in Fig. 2, the inner surface of threaded ring (2) is provided with blade-like thread protrusions (8),

which are arranged at an angle along the circumference to form a retaining system for locking the threaded ring (2) on the glass jar neck (6). The total number of protrusions (8) is six, which is consistent with the typical number of spiral protrusions on the neck of a conventional glass jar. The lead angle of thread protrusions (8) of the threaded ring (2) corresponds to the lead angle of spiral protrusions (7) on the glass jar neck (6) and constitutes 7.66°. An upper part (9) of the threaded ring (2) is extended radially inward to form a retainer (10) locking the edge of the covering disk.

[0014] As shown in Fig. 3, retainer (10) of the threaded ring (2) geometrically conforms to the round curl (3) of the covering disk (1).

[0015] Sealing of a glass jar with the proposed two-piece lid according to the invention is performed as follows.

[0016] Covering disk (1) is placed on top of the glass jar neck (6) so that annular channel (4) with seal (5) placed therewithin comes into contact with the edge of neck (6). Threaded ring (2) is placed on the glass jar neck (6) over the covering disk (1), while retainer (10) is located above the round curl (3) of the covering disk (1), and thread protrusions (8) are positioned above the spiral protrusions (7) on the glass jar neck (6). Next, threaded ring (2) is rotated clockwise, which forces thread protrusions (8) to come under the spiral protrusions (7) on the glass jar neck (6); threaded ring (2) is lowered, and retainer (10) comes into contact with the round curl (3) of the covering disk (1) due to their conformance in terms of the shape. Furthermore, threaded ring (2) presses the covering disk (1) against the upper edge of the glass jar neck (6) via seal (5), thus resulting in reliable hermetic sealing of the jar. Curl (3) compresses elastically upon coming into contact with retainer (10) and creates an additional contact force between the two parts of the lid - covering disk (1) and threaded ring (2), which increases the shelf life of hermetically sealed jar.

[0017] The removal of the two-piece lid from the glass jar is performed as follows.

[0018] Since the vacuum created inside the glass jar specifically presses the covering disk (1) against the edge of the glass jar neck (6) to create a reliable seal, this force is not directed toward the threaded ring (2). Therefore, threaded ring (2) can be rotated counterclockwise without any excessive force and without the use of additional tools. Furthermore, as shown in Fig. 4, thread protrusions (8) wedge in between the spiral protrusions (7) on the glass jar neck (6) and round curl (3) of the covering disc (1); threaded ring (2) lifts up and retainer (10) comes out of contact with the round curl (3) of the covering disc (1) .

[0019] As shown in Fig. 5, further rotation of threaded ring (2) counterclockwise causes the force, created by thread protrusions (8) and directed between spiral protrusions (7) on the glass jar neck (6) and round curl (3) of the covering disc (1), to break the seal and then easily and uniformly, without an deformation, lift the covering disk (1) above the edge of the glass jar neck (6).

[0020] Next, threaded ring (2) is removed together with the covering disk (1), which is held by thread protrusions (8). In this case, a direct contact between the ring and the contents of the glass jar, as well as contamination thereof, are eliminated.

[0021] To reseal the same jar while its contents is being used, the same covering disc and threaded ring can be used, however, it is recommended to replace the covering disc each time before closing such jar. This is an economical option to ensure a longer storage of the contents of unsealed glass jars, since the bottom (inner) surface of the covering disc will always be clean.

[0022] In the future, when using the two-piece twist-off lid system consisting of a covering disc and a threaded ring during home-canning, the threaded ring can be used repeatedly, while replaceable covering discs should only be used once. The ring can withstand up to 10,000 closing-opening cycles. The covering discs should advisably be procured in sufficient quantities, both with and without the ring.

[0023] As shown in Fig. 6, threaded ring (2) according to the invention can be reinforced by using the stiffening members arranged on its outer surface (11). As shown in Fig. 7, the stiffening members on the outer surface (11) of the threaded ring (2) according to the invention are made in the form of vertical ribs (12) connected from the top by an annular stiffening member (13). Such ring, reinforced by the stiffening members, can withstand up to 30,000 "closing-opening" cycles.

[0024] The proposed two-piece twist-off lid for glass storage jars according to the invention can be used by consumers for home-canning, as well as by the canned foods industry for canning various types of food products by any of the known methods, such as pasteurization, sterilization, and conventional packaging of bulk foods (vacuum packing). Furthermore, there is no need to revamp the sealing units (can-sealing machines) of the conventionally equipped industrial plant processing lines.

[0025] In case of purchasing factory-made canned food in a jar sealed with the proposed two-piece lid according to the invention, consumers will have the opportunity to reuse not only the jar, but also the threaded ring of such lid: this would only require replacement of the old covering disc with a new one. Such covering discs will be readily available through distribution networks, however, the cost thereof will be significantly less compared to a conventional lid.

[0026] The proposed two-piece twist-off lid for glass storage jars according to the invention is characterized by design features which collectively provide a high degree of hermetic sealing, while allowing for a multiple use of the threaded ring with the possibility of replacing the covering disc.

Industrial applicability

[0027] Components of the two-piece twist-off lid for glass storage jars can be manufactured in accordance with their design features based on the conventional industrial equipment by using modern technologies for manufacturing products from thin sheet metal and plastic.

Claims

1. A two-piece twist-off lid for glass storage jars, consisting of two separate parts, wherein the first part of the lid is made of a sheet metal and represents a covering disc, the edge of which is curled up to form a round curl and bent outward to form an annular channel for placing a seal and for seating said covering disk on the edge of the jar neck, and the second part of the lid is made of a plastic material and represents a cylindrical threaded ring, the inner surface of which is provided with retaining thread members for locking thereof on the jar neck, **characterized in that** the upper part of the threaded ring extends radially inward to form a retainer of the edge of the covering disc, which geometrically conforms to the curl of the covering disc, while the retaining thread members are made in the form of blade-like protrusions arranged at an angle along the circumference; the covering disk is made of elastic tinplate having a thickness of 0.08-0.16 mm and Rockwell hardness of 58-64.

2. The two-piece twist-off lid for glass storage jars according to claim 1, **characterized in that** the threaded ring is made of heat-resistant polycarbonate plastic.

3. The two-piece twist-off lid for glass storage jars according to Claims 1 or 2, **characterized in that** the outer surface of the threaded ring is provided with the stiffening members in the form of vertical stiffening ribs connected from the top by an annular stiffening member.

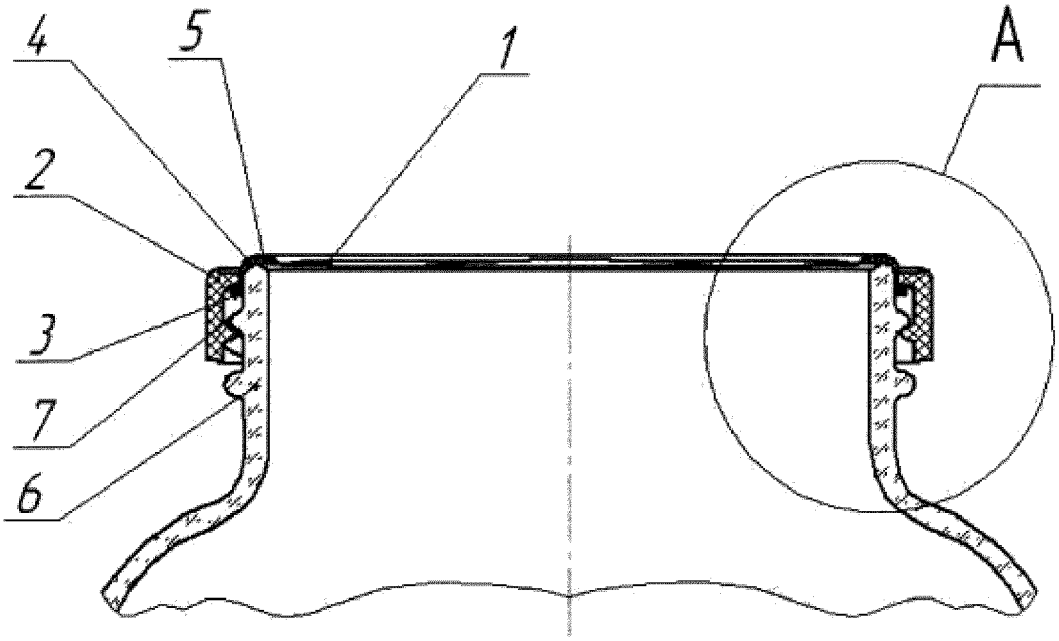

Fig. 1

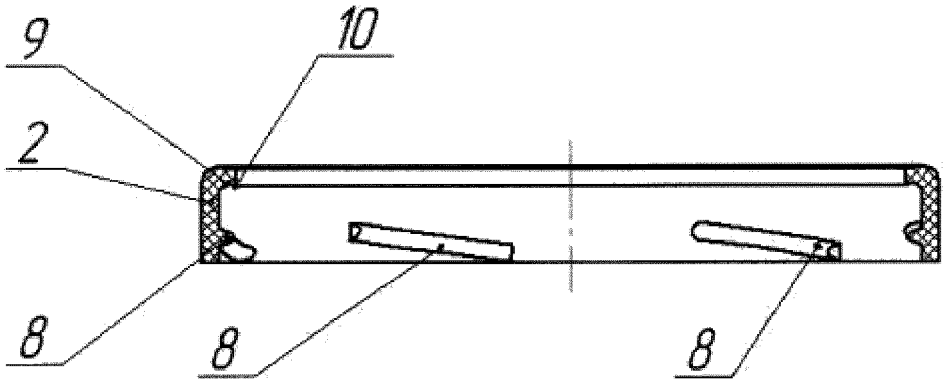

Fig. 2

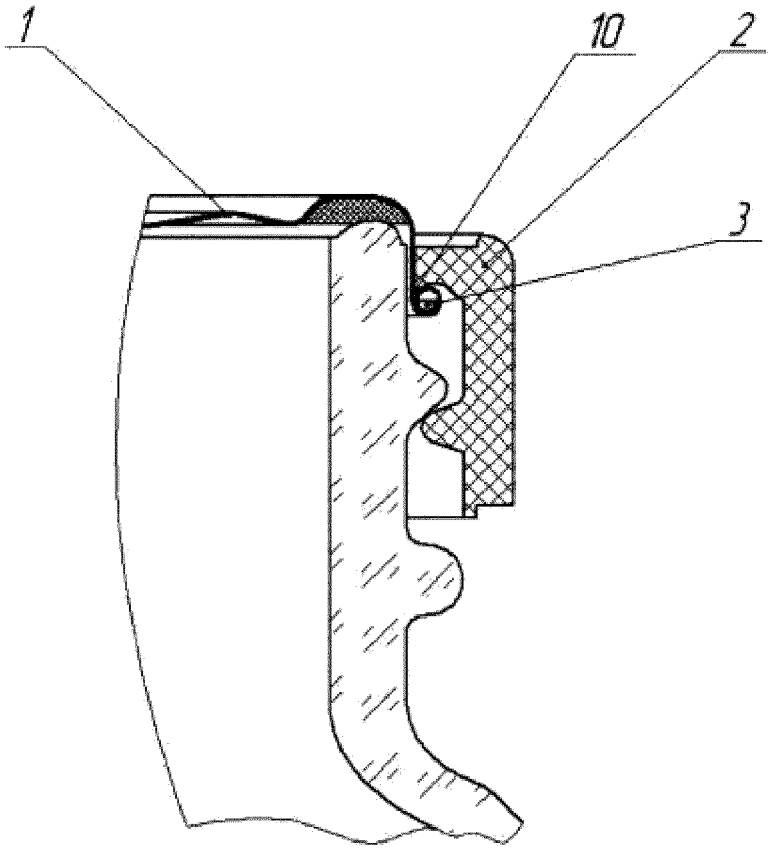

Fig. 3

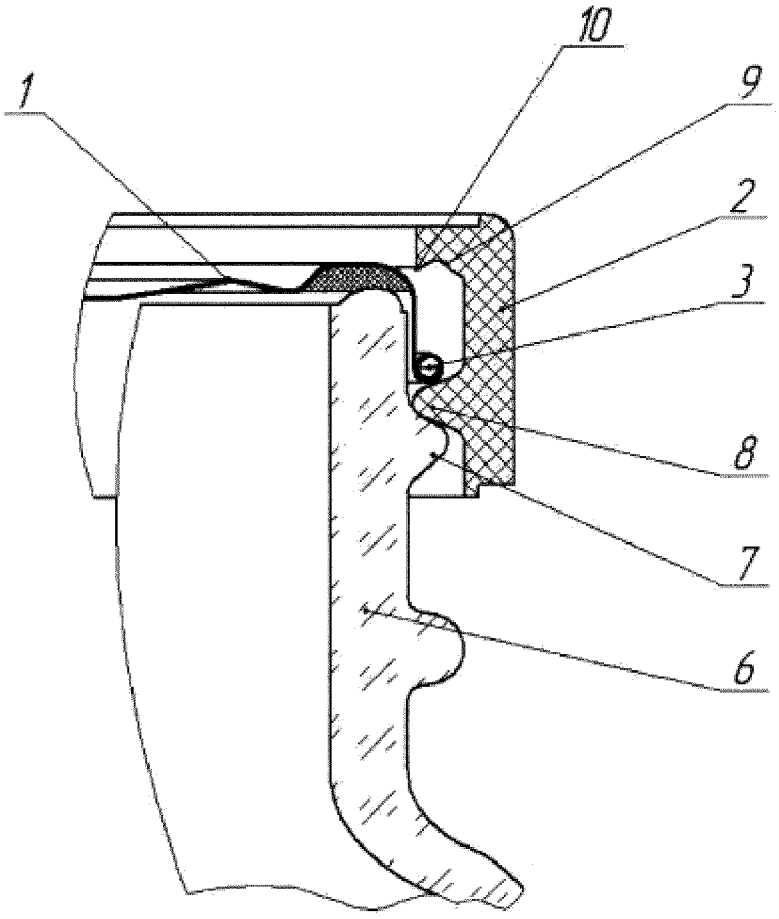

Fig. 4

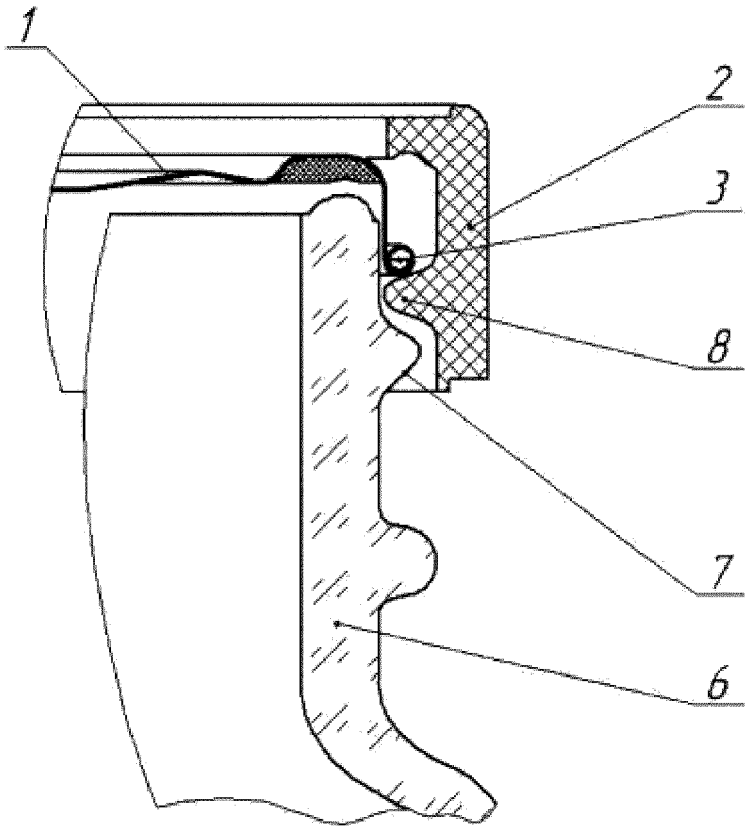

Fig. 5

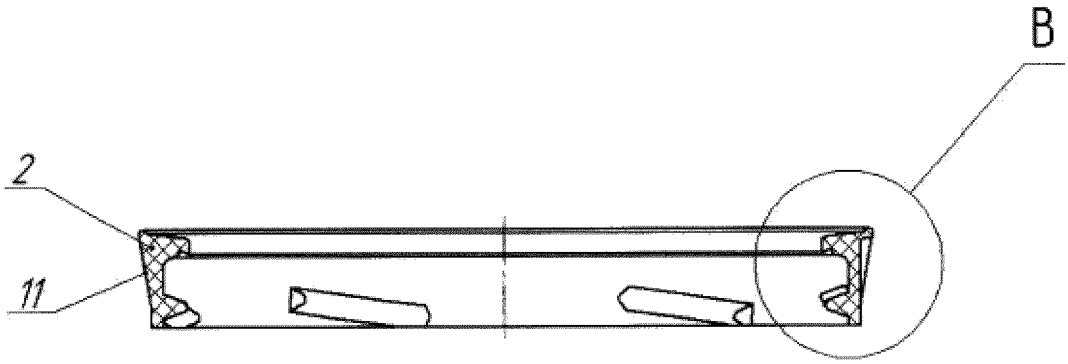

Fig. 6

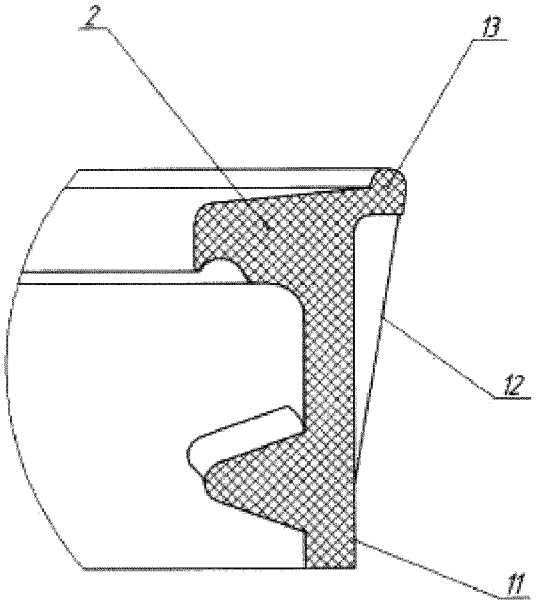

Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/UA 2018/000141

A. CLASSIFICATION OF SUBJECT MATTER
B65D 41/04; B65D 41/17; B65D 41/18; B65D 41/28; B65D 45/30; B65D 51/14; B65D 51/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
MPK: B65D41/04; B65D41/17; B65D41/18; B65D41/28; B65D45/30; B65D5 1/14; B65D51/18
SRC: B65D41/0492 B65D41/17 B65D41/18; B65D41/28; B65D45/30; B65D5 1/14; B65D5 1/18

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Espacenet, Google

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 2017341823 A1 (WORLD BOTTLING CAP LLC [US]) 30 November 2017 (30.11.2017) (par. [0014], [0019], [0024], [0025])	1-3

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/ UA Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2005)

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