DOUBLE-CHAMBER CONTAINER

Background of the Invention

Containers have been used for centuries to store and transport a wide variety of solid, liquid, and gaseous substances. Manufacturers have developed an assortment of container designs using different materials and shapes to meet the diverse needs of consumers and industries. While double-chamber containers already exist on the market, they often fall short in satisfying specific customer requirements.

The present invention addresses the limitations of current double-chamber container designs. Existing products typically feature two distinct compartments that are rigidly fixed together, limiting the flexibility and usability for certain applications. Additionally, the mechanisms for separately accessing and dispensing the contents of each chamber can be cumbersome or inefficient.

The double-chamber container designed by the inventors overcomes these shortcomings through several key innovations. Firstly, the two chambers are configured in a novel way that allows for independent access and controlled release of the stored components. This enables a wide range of potential uses beyond just the food industry, such as in the pharmaceutical, cosmetic, and cleaning product sectors, where maintaining separation of ingredients is crucial.

Furthermore, I have carefully selected materials and manufacturing techniques to optimize the container's durability, safety, and ergonomic features. The modular design also permits customization to accommodate different volume capacities and specialized functions as needed by the end-user.

By addressing the limitations of existing double-chamber containers, this invention opens up new opportunities for product development and market growth. The ability to seamlessly integrate two complementary substances into a single, convenient package has the potential to foster synergies between related companies and facilitate the introduction of innovative two-component products.

Abstract

The present invention relates to a novel double-chamber container design that enables the simultaneous storage and independent dispensing of two separate substances or products.

The key feature of this invention is the incorporation of two distinct chambers within a unified container structure. This configuration allows for the containment of two products or components that must be kept segregated until the point of use, yet can be easily accessed and utilized together.

The double-chamber container is constructed using a variety of food-grade materials, such as plastics, metals, papers, and composites. The chambers are separated by a divider that hermetically isolates the contents of each side. Specialized closures, sealing mechanisms, and dispensing features can be customized based on the specific application and user requirements.

This versatile container design has numerous applications across industries, including food and beverage, personal care, pharmaceuticals, and industrial products. It facilitates the development of innovative two-component formulations and enhances consumer convenience by enabling the combined use of complementary substances in a single, integrated package.

Through its modular construction and adaptable features, the double-chamber container offers manufacturers and brand owners a competitive edge by streamlining product development, logistics, and the delivery of enhanced user experiences.

Claims

1. A double-chamber container comprising:

   a. A cylindrical container body divided into two hermetically separated chambers;

   b. At least one additional container positioned within one of the chambers;

   c. A dual sealing lid configured to simultaneously seal and structurally reinforce the two chambers.

2. The double-chamber container of claim 1, wherein the two chambers are capable of independently storing two different substances without mixing prior to use.

3. The double-chamber container of claim 1, wherein the dual sealing lid comprises:

   a. An inner sealing ring that seals the additional container within the second chamber;

   b. An outer sealing ring that seals the lips of the first chamber.

4. The double-chamber container of claim 1, wherein the container body and additional components are made from food-grade materials selected from the group consisting of laminated paper, cardboard, aluminum, metal, plastic, and Styrofoam.

5. The double-chamber container of claim 1, wherein the position of the divider between the two chambers is adjustable to accommodate different volume requirements for each chamber.

6. The double-chamber container of claim 1, wherein the additional container within the second chamber can comprise multiple barriers to store several different components separately.

7. The double-chamber container of claim 1, wherein the sealing components for the chambers can be customized with perforations or other features to facilitate the storage and dispensing of specific products, such as spices.

8. The double-chamber container of claim 1, wherein the container is reusable after the first use, but cannot be hermetically resealed without the specialized sealing components (3 and 6).

Fig. 1 represents an orthographic view of front side of the double chamber container, which is cylindrical shape with lids on both sides. The logo, product name, any text or image that would closely define the product inside the container can be printed or embossed on the envelop and in picture it is shown as “logo type”.

The back, left and right sides are not shown in reproductions because their views would be the same as the front view shown in Fig.1.

Fig. 1.1 is an orthographic view of the bottom of the double chamber container where you can see the dual sealing lid which is shown and explained in more details in Fig. 4, 4.1, 4.2, 4.3, 4.4, 4.5 and Fig.2 Component 7. and container sealing lid, which is shown and explained in more details in Fig. 2, Component 6, Fig.3.1, Fig.6, 6.1, 6.2, 6.3, Fig 7, 7.1, 7.2, 7.3.

Fig. 1.2 is an orthographic view of top side of the double chamber container with the container top lid - shown and explained in more details in Fig.2 Component 2, Fig. 3.1, Fig 9. 9.1, 9.2, 9.3, 9.4 and also chamber sealing lid – shown and explained in more details in Fig.2 Component 3, Fig.6, 6.1, 6.2, 6.3, Fig.7, 7.1, 7.2, 7.3.

Fig. 1.3 is a perspective view of a top front side of the double chamber container which is cylindrical shape with lids on both sides. The logo, product name or any text or image according to the wishes of the manufacturer, which would closely define the product inside the container, can be printed or embossed on the envelop and in picture it is shown as "logo type". Also, you can see the container top lid (Fig.2 Component 2, Fig. 3.1, Fig. 9, 9.1, 9.2, 9.3, 9.4) and chamber sealing lid (Fig.2 Component 3, Fig.6, 6.1, 6.2, 6.3, Fig.7, 7.1, 7.2, 7.3).

Fig. 1.4 is a perspective view of the bottom front side of the double chamber container which is cylindrical in shape with lids on both sides. The logo, product name or any text or image according to the wishes of the manufacturer, which would closely define the product inside the container, can be printed or embossed on the envelop and in the picture it is shown as "logo type". You can also see the dual sealing lid which is shown and explained in more details in Fig. 4, 4.1, 4.2, 4.3, 4.4, 4.5 and Fig.2 Component 7 and container sealing lid, which is shown and explained in more detail in Fig. 2 Component 6, Fig. 3.1, Fig.6, 6.1, 6.2, 6.3, Fig 7, 7.1, 7.2, 7.3.

Fig. 2 shows the vertical cross-section and composition of container where the cylinder of the container is divided into two chambers by component 4 – container divider.

Component 1 shows the cylinder envelope made of food grade materials such as laminated paper, cardboard, aluminium, metal, plastic (PETE, HDPE ,V, LDPE, PP, PS), Styrofoam, etc. by folding, moulding, 3d printing, extruding or using some other manufacturing technology. The displayed cylinder is in a horizontal cross-section of the circle, which can be made in the horizontal cross-section as shown in Fig.5, where it follows that all other components are shown following the horizontal cross-section of the cylinder, except for the component 5 which is determined by the volume of the chamber and must be followed by the inner sealing ring - component 7 as shown in Fig.4 as mark 4.a, also component 7 with its outer sealing ring that is shown in Fig.4 as mark 4.b must always follow the horizontal section of the container. The volume of component 1 can be adjusted depending on the needs by modifying the height, the diameter and by adjusting the volume of the chamber by moving it in the vertical of the component 4. Also, container with similar characteristics as component 5 can be added in chamber 2.a. Likewise, it is shown and described in more details in Fig. 8, 8.1, 8.2, 8.3, 8.4.

Component 2 - container top lid is used as a solid interior protection of the chamber 2.a and also to structurally strength the entire container. It always follows the shape of the horizontal cross-section of

component 1 and of the outer lips of chamber 2.a. It can be made of food grade materials as metal, aluminium, paper, Styrofoam, plastic (PETE, HDPE, V, LDPE, PP, PS), etc. The name of company, product name, logo, etc. can be printed or embossed on the inside and outside of the lid. Likewise, it is shown and described in more details in Fig. 9, 9.1, 9.2, 9.3, 9.4.

Component 3 is a thin closure of the chamber 2.a which is peelable, made of laminated paper, laminated aluminium foil, aluminium foil, paper, Styrofoam, food grade plastic (PETE, HDPE, V, LDPE, PP, PS) , etc. Its purpose is to hermetically seal and preserve the product contained in the chamber 2.a by gluing it to the rim of the chamber 2.a. It must follow the shape of the horizontal cross-section of the component 1 and also of the lips od chamber 2.a. The name of company, product name and logo can be embossed and printed on the outer side of component 3. Likewise, it is shown and described in more details in Fig. 6, 6.1, 6.2, 6.3 as well as the variations in Fig.7, 7.1, 7.2, 7.3.

Component 4 shows a container divider in the form of a disc serving as a barrier between the chamber 2.a and the chamber 2.b. This component hermetically isolates the chamber 2.a and the chamber 2.b by placing it to the desired position in the component 1. The vertical position of component 4 is determined by the groove on which component 4 is seated as shown in Fig. 3 as mark B. The groove of component 4 is made by bending inward the shell of the component 1, by extracting from the mould and also by using some other manufacturing technology. It must follow the horizontal cross-section of the shape of component 1. It can be made of food grade materials such as aluminium, paper, Styrofoam, plastic (PETE, HDPE, V, LDPE, PP, PS), etc. Component 4 is essentially a disc that is made by bending around the edges by pressing or it can be made by moulding and also by 3d printing. Likewise, it can be printed and embossed on the outside and inside. If there is a need, due to the weight of the component 5, something like additional sealing ring (variations shown and explained in Fig.14, 14.1, 14.2, 14.3, 14.4, 14.5) can be added to component 4 which serves to firm the position of the component 5 and it can be located on the side of the component 4 facing the chamber 2.b. Likewise, small containers that serves to store conditioners such as silica gel, etc. can be moulded, glued and 3d printed on the both sides of the component 4 and their purpose is to improve the micro climate (humidity, pressure, temperature, odour) in chambers 2.a and 2.b. Likewise, it is shown and described in more details in Fig. 11, 11.1, 11.2, 11.3, 11.4 as well as its variations in Fig. 12, 12.1, 12.2, 12.3, 12.4, 12.5, Fig. 13, 13.1, 13.2, 13.3, 13.4, 13.5, Fig.14, 14.1, 14.2, 14.3, 14.4, 14.5. Small containers for storage of conditioners which are placed on component 4 are closed with the cover shown and explained in more details in Fig. 15, 15.1, 15.2, 15.3, 15.4, 15.5 and they consist of 2 elements - the conditioner sealing ring shown and explained in more details in Fig.12.5, 13.5, 14.5, 15.4 and 15.5 as mark 1, and a breathable membrane shown and explained in more details in Fig. 12.5, 13.5, 14.5, 15.4 and 15.5 as mark 2. Container sealing ring and breathable membrane can be thermally coupled or glued together. Container sealing ring can be made of food grade materials such as aluminium, paper, plastic (PETE, HDPE, V, LDPE ,PP, PS), etc. and other food grade compounds. Container sealing ring is positioned on the rim of the conditioner container shown in Fig.13.5 as mark A. Breathable membrane is a porous membrane positioned on the inner rim container sealing ring and for the purpose of separating the substance-conditioner in the conditioner chamber located on the component 4 from the product located in the chamber 2.a or 2.b or both, depends on variation. It is breathable and it can emit air in one or both directions, depending on the type and role of the conditioner. The membrane can be made of any food grade material such as metal, paper, fiber and other synthetic compounds whose pore diameter must be that large to ensures the physical separation of the content of the conditioner containers from the contents of the chamber 2.a and 2.b and to ensure air movement or fluid if necessary. Details are shown in Fig. 13.5, 15, 15.1, 15.3, 15.4, 15.5.

Component 5 is a second container cylindrical shape, located in the chamber 2.b, adjustable volume and shape which is conditioned by the volume and shape of the chamber 2.b and also by the shape of the inner sealing ring shown and explained in more details in Fig.4 as mark 4.a. Its purpose is to

preserve separate components of the product such as sauces, dips, cheeses, salads, etc. Component 5 can be made of food grade materials such as aluminium, plastic (PETE, HDPE, V, LDPE, PP, PS), paper, Styrofoam, etc. and it surface can be printed and embossed. Likewise, this component can be composed of multiple barriers so several different components can be stored. It is shown and described in more details in Fig.10, 10.1, 10.2, 10.3, 10.4.

Component 6 - container sealing lid is a thin closure of second container ie. component 5. It can be made of food grade materials such as aluminium, paper, plastic (PETE, HDPE,V, LDPE, PP, PS), Styrofoam, etc. and it is peelable. Its purpose is to hermetically seal and preserve the product contained in the container 2 ie. component 5 by gluing it to the rim of the component 5. It must follow the form of horizontal cross-section of the component 5 and also of the component 5 outer rim. Likewise, it surface can be printed and embossed. It is shown and described in more details in Fig. 6, 6.1, 6.2, 6.3 as well as the variations in Fig.7, 7.1, 7.2, 7.3.

Component 7 – dual sealing lid, consists of two sealing rings – the inner ring is applied to the outer edges of the rim of the second container ie. component 5 and the outer ring that enclose the lips of the component 1 of the chamber 2.b, as shown in Fig. 3, as mark C. Component 7 has 3 functions: solid interior protection of the container ie. component 5 as well as for positioning of another container inside the chamber 2.b. and also to structurally strengthen the entire container. The inner sealing ring (Fig. 4, as mark 4.a) always follows the rims of the component 5 and the outer ring (Fig. 4, as mark 4.b) always follows the shape of the lips of the chamber 2.b. It can be made of food grade materials such as aluminium, metal, paper, Styrofoam, plastic (PETE, HDPE, V, LDPE, PP, PS) etc. and also it surface can be printed and embossed. Likewise, it is shown and described in more details in Fig. 4, 4.1, 4.2, 4.3, 4.4, 4.5.

Fig. 3 shows the enlargement points, which are shown in more detail in Fig. 3.1

Fig. 3.1 the picture shows:

Picture A – shows an enlarged connection of components 1, 2 and 3 where you can see the way the how components are assembled. Component 3 is glued to the lips of component 1 - chamber 2.a which are physically protected by component 2 which is placed on the outer lips of component 1.

Picture B – shows the position of component 4 and its installation to component 1. Precisely, it shows the tongue - groove joint between the component 4 and component 1.

Picture C – shows an enlarged connection of components 1, 5, 6 and 7 where you can see the way how components are assembled, also shows the role of the dual sealing lid ie. component 7 Fig.2 as mentioned above.

Fig. 4

The pictures show more closely the appearance of the component 7 in Fig.2.

Picture D – enlarged cross-sectional view of the lid (component 7 in Fig. 2.)

Picture E – enlarged fragmentary cross-sectional view of sealing rings of component 7 in Fig.2 where 4.a is an inner sealing ring and 4.b is an outer sealing ring.

Fig. 4.1 represents perspective view of bottom front side of component 7 Fig.2.

Fig. 4.2 represents orthographic view of bottom side of dual sealing lid component 7 Fig.2

Fig. 4.3 represents an orthographic view of the front side of the dual sealing lid component 7 Fig.2, where the rear, left and right sides are not shown in the reproductions, as their representations would be the same as the front view shown in Fig.4.3.

Fig. 4.4 represents a perspective view of the top front side of the dual sealing lid (component 7 Fig.2).

Fig. 4.5 represents an orthographic view of the top side of the dual sealing lid (component 7 Fig.2).

Fig. 5

It presents some of the possible horizontal cross-sections of component 1 Fig.2 and all other dependent elements where the mark 5.1 (hatch cust 23 patern) represents the envelope of the container and the mark 5.2 (hatch ar-conc patern) represents other dependent components, except for components 2 and 7 Fig. 2 which are in horizontal cross-section larger than the circumference of the cylinder outer envelope.

Fig. 6 represents an orthographic view of the bottom side of the components 3 and 6 as shown and explained in more details in Fig.2

Fig. 6.1 represents an orthographic view of the upper side of the components 3 and 6 as shown and explained in more details in Fig.2

Fig. 6.2 represents a perspective view of the top front side of components 3 and 6 as shown and explained in more details in Fig.2.

Fig. 6.3 represents a perspective view of the bottom front side of the components 3 and 6, as shown and explained in more details in Fig.2.

The above figures show the components 3 and 6 shown and explained in Fig. 2, which visually and functionally have the same role, the only difference is in dimensions and the part of the double chamber container where it is placed. The front, rear, left and right sides of components 3 and 6 are not shown because their display would represent the line because of the thickness of the material from which they are made.

Fig. 7 represents an orthographic view of the top side of one of the possible variations of components 3 and 6 shown and explained in more details in Fig.2

Fig. 7.1 represents an orthographic view of the bottom side of one of the possible variations of components 3 and 6 as shown and explained in more details in Fig.2

Fig. 7.2 is a perspective view of a top front side of one of the possible variations of components 3 and 6 as shown and explained in more details in Fig.2

Fig. 7.3 represents a perspective view of the bottom front side of one of the possible variations of the components 3 and 6 as shown and explained in more details in Fig.2

The above figures show the possible variations of the components 3 and 6 shown and explained in Fig. 2, which visually and functionally have the same role and the only difference is in the dimensions and the part of the double chamber container where it is placed. The front, rear, left and right sides of

Components 3 and 6 are not shown because their orthographic representation would represent a line because of the thickness of the material from which they are made.

Fig. 8 represents a perspective view of the bottom front side of component 1 which is shown and explained in more details in Fig.2.

Fig. 8.1 represents an orthographic view of the bottom side of component 1, which is shown and explained in more details in Fig.2.

Fig. 8.2 represents an orthographic view of the top side of component 1 as shown and explained in Fig.2.

Fig. 8.3 represents an orthographic view of the front side of component 1 which is shown and explained in Fig.2.

Fig. 8.4 represents a perspective view of a top front side of component 1 which is shown and explained in Fig.2.

Left, right and back are not displayed because their display would be identical to Fig.8.3

Fig. 9 represents a perspective view of the bottom front side of component 2 which is shown and illustrated in Fig.2

Fig. 9.1 represents an orthographic view of the bottom side of component 2 as shown and explained in Fig.2

Fig. 9.2 represents an orthographic view of the front side of component 2 as shown and explained in Fig.2

Fig. 9.3 represents a perspective view of a top front side of component 2 which is shown and explained in Fig.2

Fig. 9.4 represents an orthographic view of the top side of component 2 as shown and explained in Fig.2

Fig. 9.5 represents a cross-sectional view of component 2 which is shown and explained in Fig.2

Orthographic views of the back, left and right sides are not shown for the reason that their orthographic view would be identical Fig.9.2

Fig. 10 represents a perspective view of the bottom front side of component 5 which is shown and explained in Fig.2

Fig. 10.1 represents an orthographic view of the bottom side of component 5 as shown and explained in Fig.2

Fig. 10.2 represents an orthographic view of the front side of component 5 as shown and explained in Fig.2

Fig. 10.3 represents a perspective view of a top front side of component 5 which is shown and explained in Fig.2

Fig. 10.4 represents an orthographic view of the top side of component 5 as shown and explained in Fig.2

Orthographic view of the last, left and right sides are not displayed because their orthographic view would be identical fig.10.2

Fig. 11 represents an orthographic view of the upper side of component 4 as shown and explained in Fig.2

Fig. 11.1 represents an orthographic view of the bottom side of component 4 which is shown and explained in Fig.2

Fig. 11.2 represents an orthographic view of the front side of component 4, which is shown and explained on Fig.2

Fig. 11.3 represents a perspective view of the bottom front side of component 4 which is shown and explained in Fig.2

Fig. 11.4 represents a perspective view of a top front side of component 4 which is shown and explained in Fig.2

Fig. 11.5 represents a cross-sectional view of component 4 which is shown and explained in Fig.2

Orthographic view of the last, left and right sides are not shown because their orthographic view would be identical to fig.11.2

Fig. 12 represents an orthographic view of the top side of one of the possible variations of component 4 which is explained in Fig. 2

Fig.12.1 represents an orthographic view of the bottom side of one of the possible variations of component 4 which is explained in Fig. 2

Fig.12.2 represents an orthographic view of the front side of one of the possible variations of component 4 which is explained in Fig. 2

Fig.12.3 represents a perspective view of the bottom front side of one of the possible variations of component 4 which is explained in Fig. 2

Fig. 12.4 represents a perspective view of a top front side of one of the possible variations of component 4 which is explained in Fig.2

Fig. 12.5 represents a front cross-sectional view of one of the possible variations of component 4, which is explained in Fig.2

Orthographic view of the last, left and right sides are not shown because their orthographic view would be identical as Fig. 12.2

Fig. 13 represents an orthographic view of the top side of one of the possible variations of component 4 which is explained in Fig. 2

Fig.13.1 represents an orthographic view of the bottom side of one of the possible variations of component 4 which explained in Fig.2

Fig.13.2 represents an orthographic view of the front side of one of the possible variations of component 4 which is explained in Fig.2

Fig. 13.3 represents a perspective view of a top front side of one of the possible variations of component 4 which is explained in Fig.2

Fig.13.4 represents a perspective view of the bottom front side of one of the possible variations of component 4 which is explained in Fig.2

Fig.13.5

Figure A - Represents an enlarged cross-section of the variations of component 4 showing the relationship between the component elements of the variations of component 4, where the mark 1 shows the lid of the chamber where conditioner is described in Fig.2 component 4, and the mark 2 is a breathable membrane which is described in more detail on Fig.2 component 4, Fig.14.5, 15.4, 15.5

Figure B - represents a cross sectional view of the variation of component 4 where the fill of the chamber shown in figure b in the form of a hatch gravel pattern can be seen.

Orthographic view of the last, left and right sides are not displayed because their orthographic view would be identical to a fig.13.2

Fig. 14 represents an orthographic view of the top side of one of the variations of component 4 which is explained in Fig.2

Fig.14.1 represents an orthographic view of the bottom side of one of the variation of component 4 which is explained in Fig.2

Fig.14.2 represents an orthographic view of the front side of one of the variations of component 4 which is explained in Fig. 2

Fig.14.3 represents a perspective view of a top front side of one of the variations of component 4 which is explained in Fig.2

Fig.14.4 represents a perspective view of the bottom front side of one of the variations of component 4 which is explained in Fig.2

Fig.14.5 represents a front cross-sectional view of one of the variations of component 4 which is explained in Fig.2 Marks 1 and 2 are more closely explained in Fig.2 component 4 and Fig 13.5, Fig.15.4 and 15.5

Orthographic view of the last, left and right sides are not shown for the reason that their orthographic view would be identical to Fig.14.2

Fig. 15 represents an orthographic view of the top side of the condenser chamber cover as described in Fig.2

Fig. 15.1 represents an orthographic view of the bottom side of the enclosure chamber cover as described in Fig.2 component 4

Fig. 15.2 represents an orthographic view of the front side of the enclosure chamber compartment as described in Fig.2 component 4

Fig. 15.3 represents a perspective view of the top front side of the condenser chamber cover as described in Fig. 2

Fig. 15.4 represents a perspective view of the bottom front side of the condenser chamber cover as described in Fig. 2, where the mark 1 and 2 are described in more detail on fig.2 component 4.

Fig. 15.5 represents a cross-sectional view of the cover of the conditioner chamber and the enlarged ratio of the breathable membrane and the lid of the chamber under the mark A, where the labels 1 and 2 are more fully described in Fig.2

Orthographic view of the last, left and right sides are not shown for the reason that their orthographic view would be identical to that of fig.15.2

The hatch lines in the cross-sectional drawings that shown portions of dual chamber container and his components are for the purpose of illustrating environment only and do not form part of the claimed design.

The ornamental design for a dual chamber container substantially as shown and described.

Front side orthographic

FIG. 1

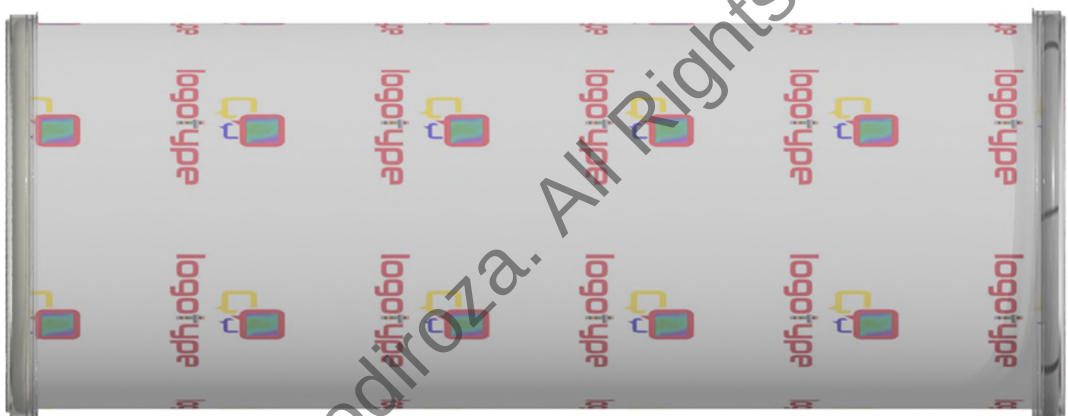


FIG. 1.1

Bottom side orthographic

FIG. 1.2 Top side orthographic

FIG. 1.3

Top front side perspective

FIG. 1.4

Bottom front side perspective

FIG. 2

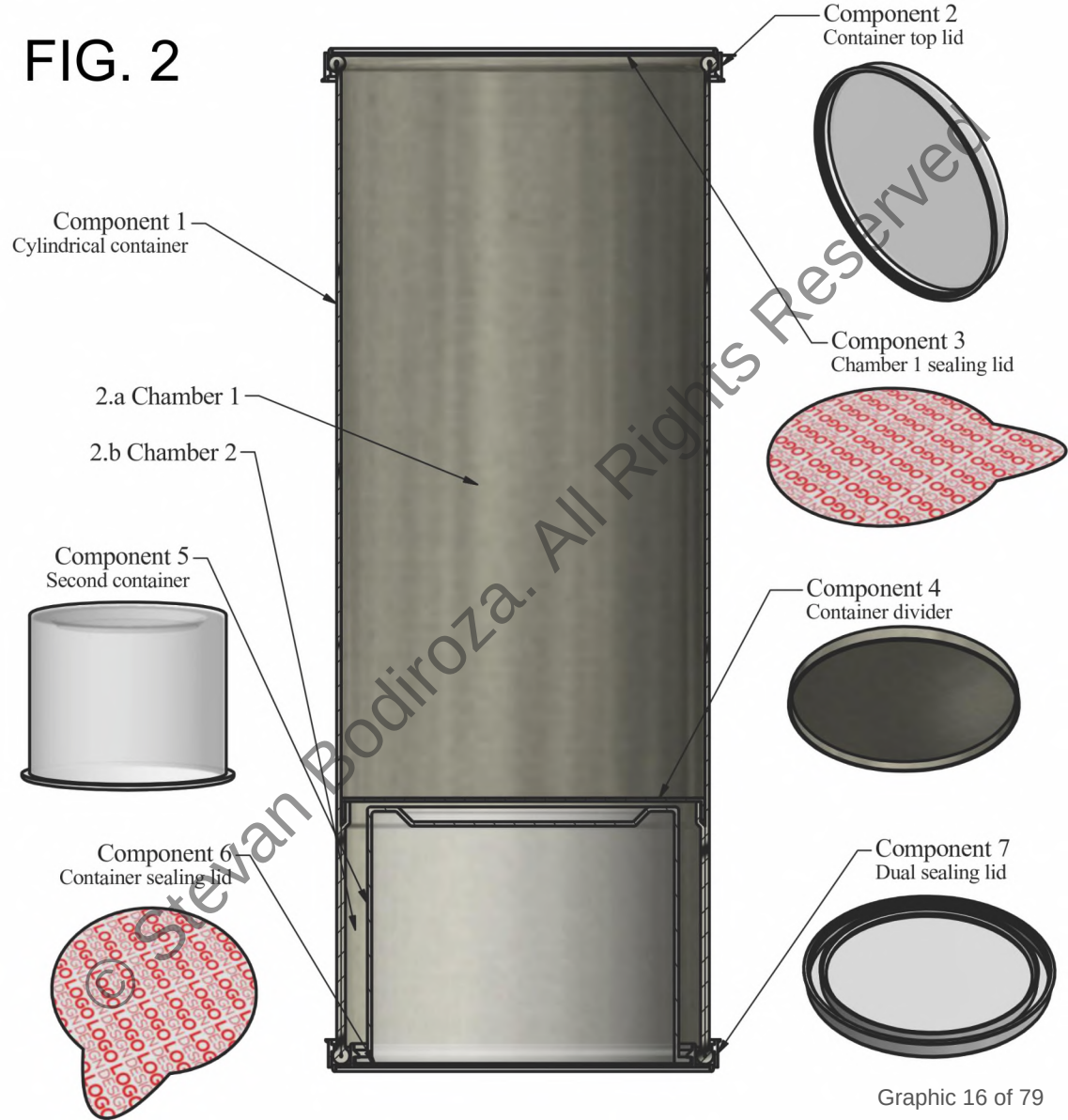


FIG. 3

FIG. 3.1

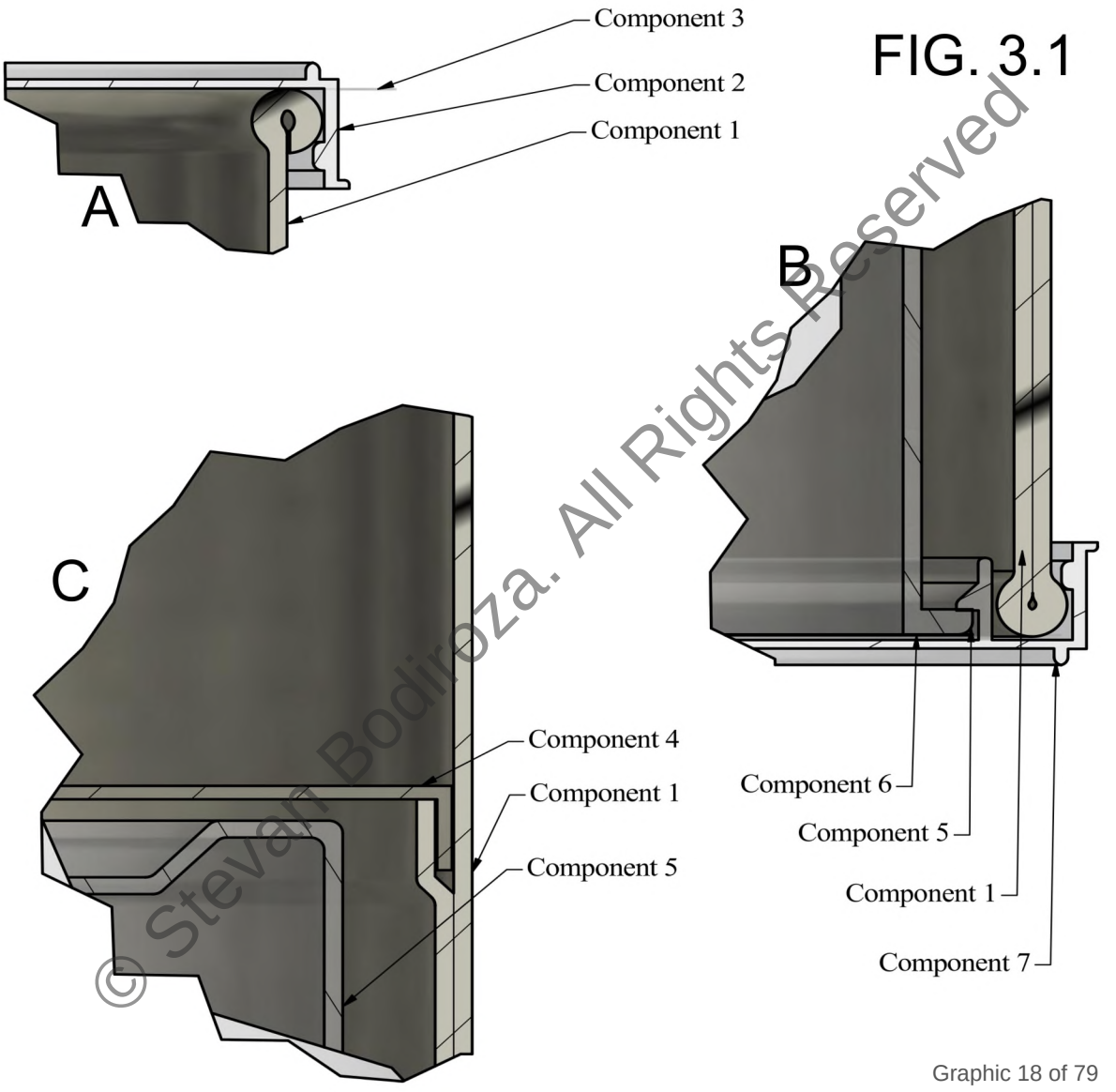


FIG.4

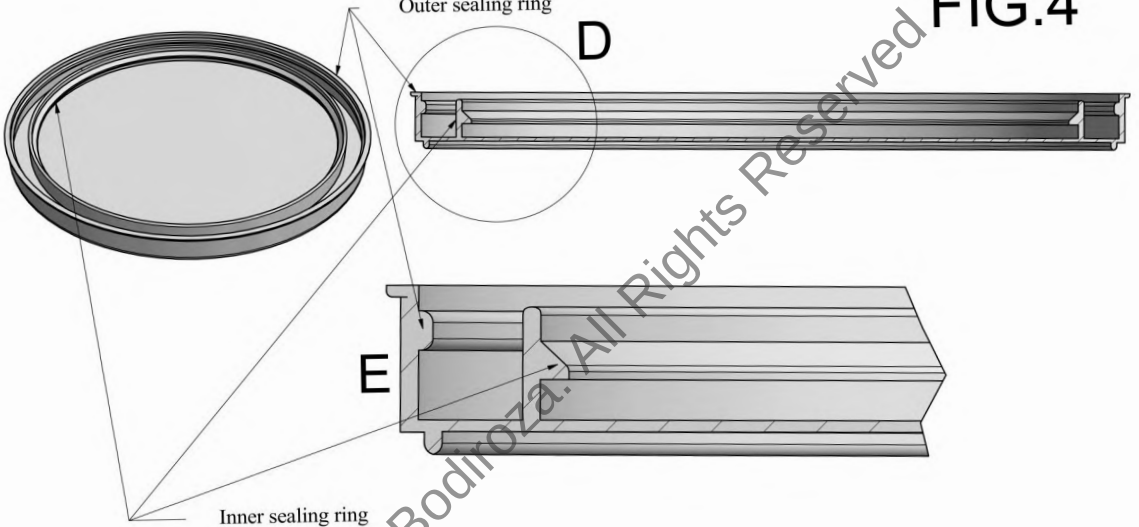


FIG. 4.1 Bottom front side perspective

FIG. 4.2 Bottom side Orthographic

FIG. 4.3 Front side orthographic

FIG. 4.4 Top front side perspective

FIG. 4.5 Top side orthographic

FIG. 5

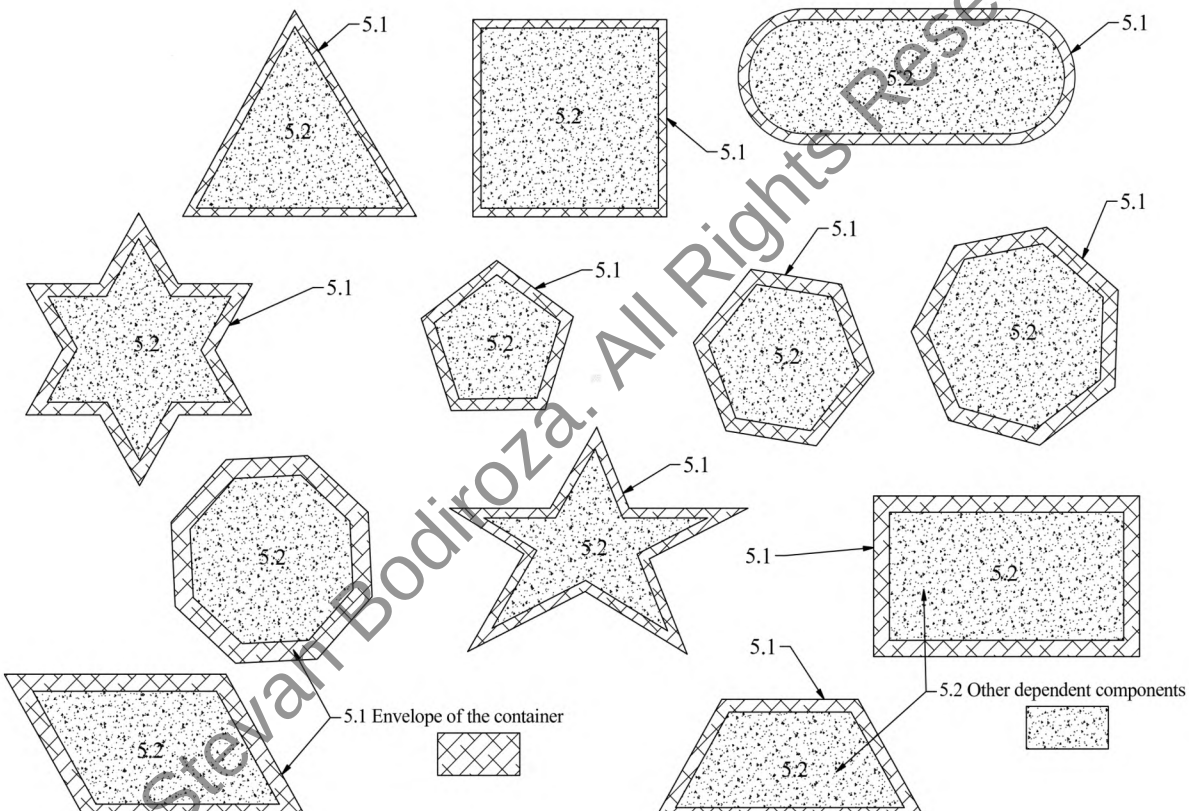


FIG. 6

Bottom side orthographic

FIG. 6.1 Top side orthographic

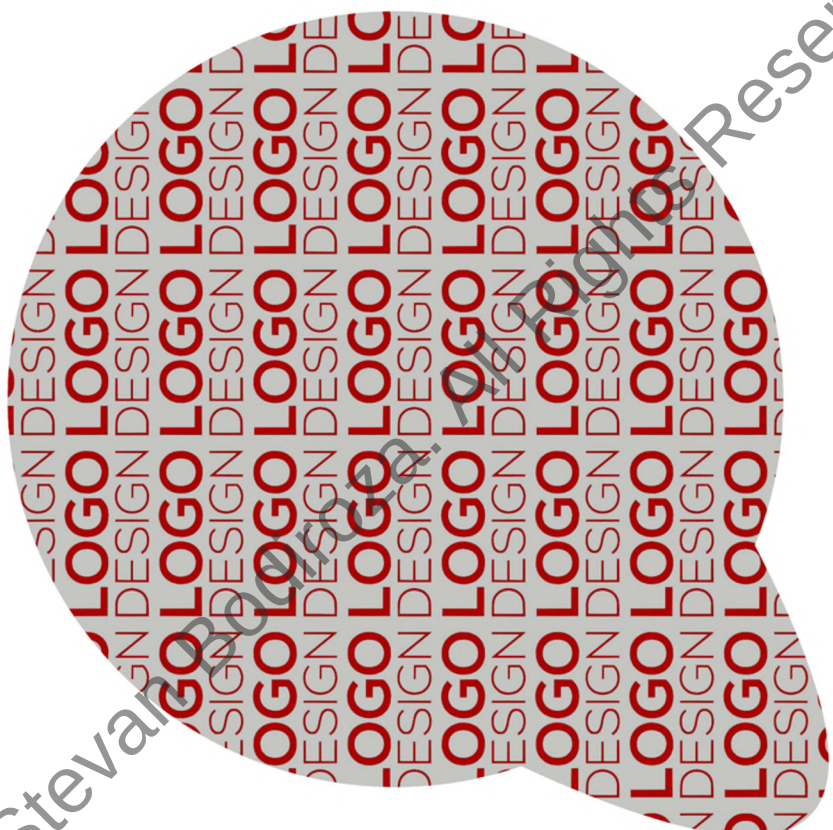


FIG. 6.2 Top front side perspective

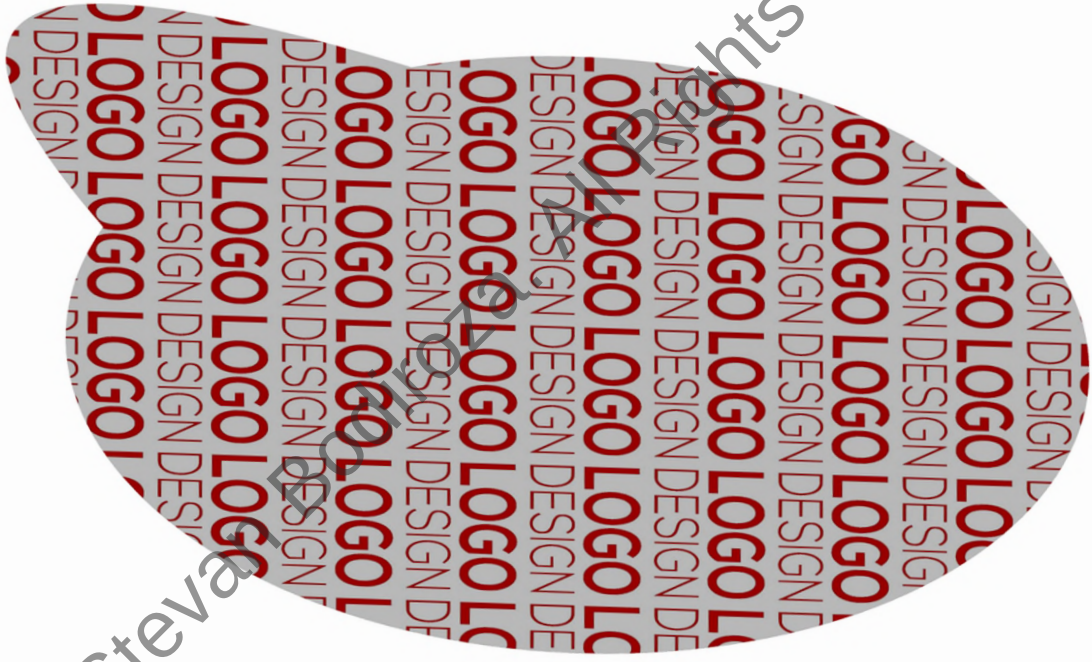


FIG. 6.3 Bottom front side perspective

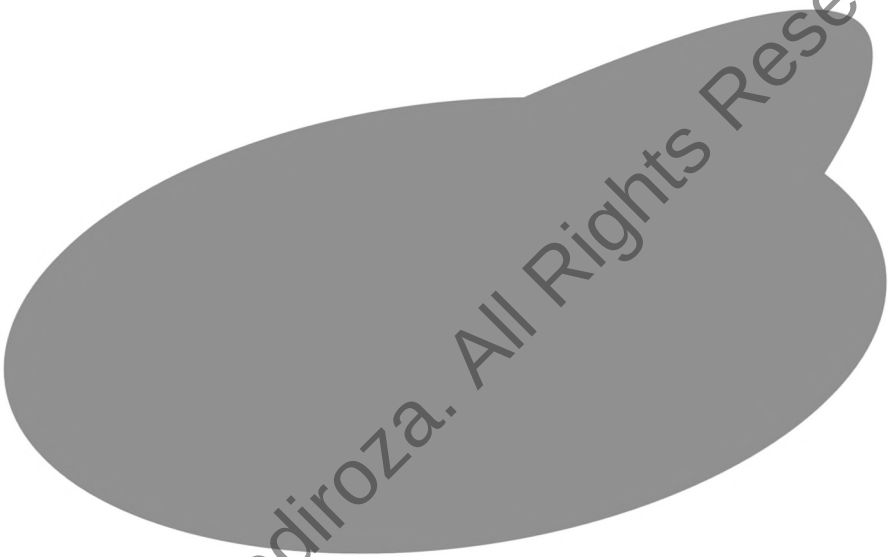


FIG. 7

Top side orthographic

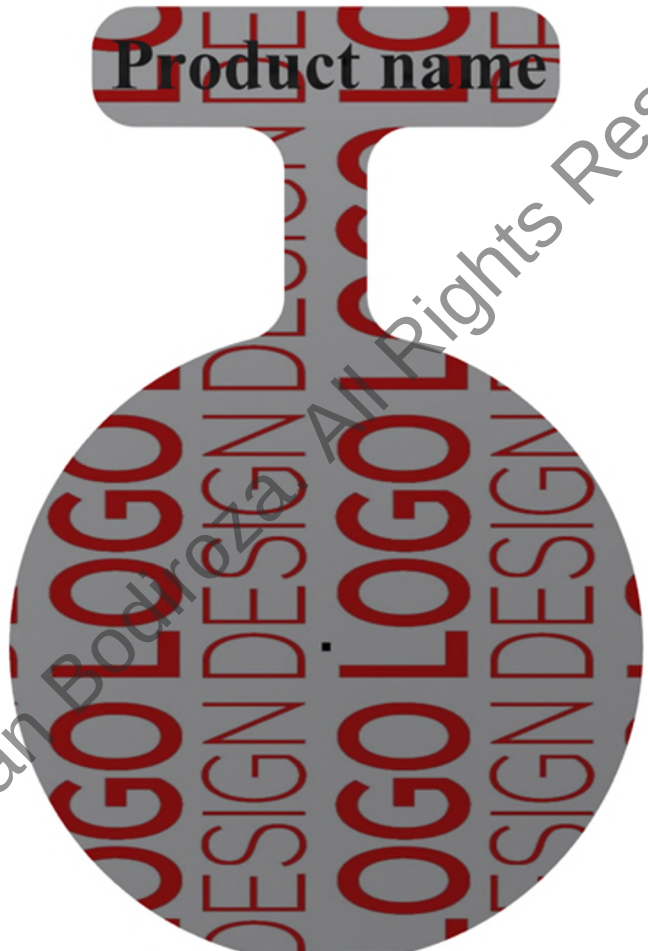


FIG. 7.1

Bottom side orthorgraphic

FIG. 7.2 Top front side perspective

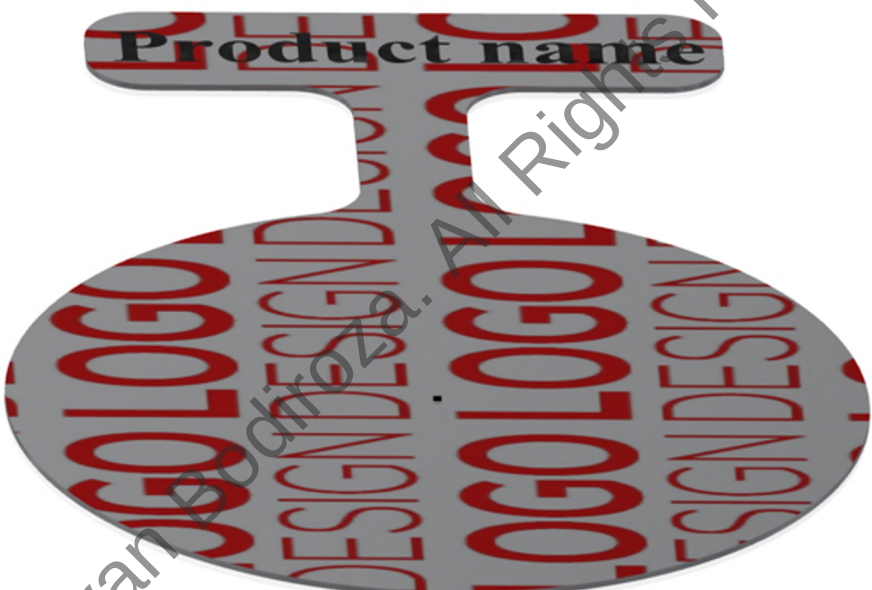
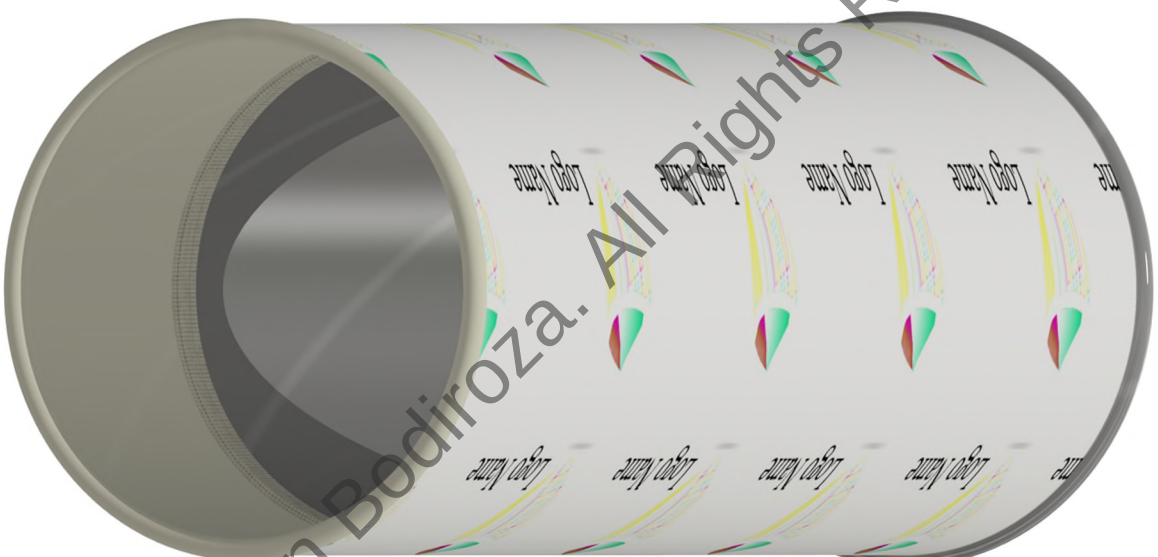


FIG. 7.3 Bottom front side perspective

Bottom front side perspective

FIG. 8



Bottom side orthographic

FIG. 8.1

Top side orthographic

FIG. 8.2

Front side orthographic

FIG. 8.3

Top front side perspective

FIG. 8.4

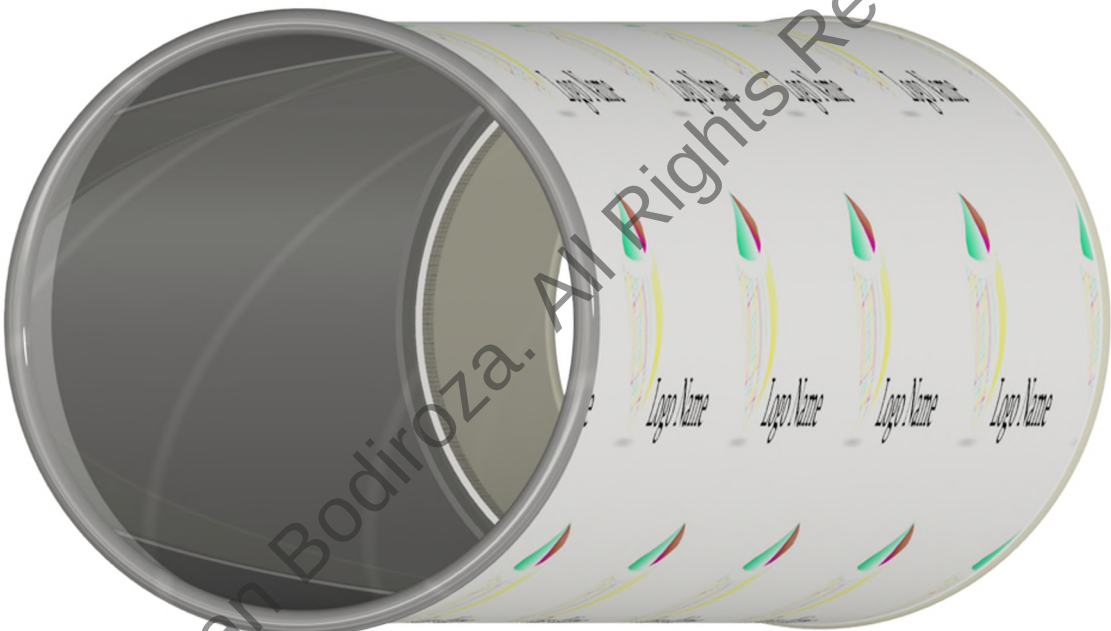


FIG. 9 Bottom front side perspective

FIG. 9.4 Top side orthographic

FIG. 9.1 Bottom side orthographic

FIG. 9.2

Front side orthographic

FIG. 9.3

Top front side perspective

FIG. 9.5 Front cross-sectional view

FIG. 10

Bottom front side perspective

FIG. 10.1 Bottom side orthographic

FIG. 10.2

Front side orthographic

Top front side perspective

FIG. 10.3

FIG. 10.4 Top side orthographic

FIG. 11 Top side orthographic

FIG. 11.1 Bottom side orthographic

FIG. 11.2 Front side orthographic

FIG. 11.3 Bottom front side perspective

FIG. 11.4 Top front side perspective

FIG. 11.5 Front cross-sectional view

FIG. 12 Top side orthographic

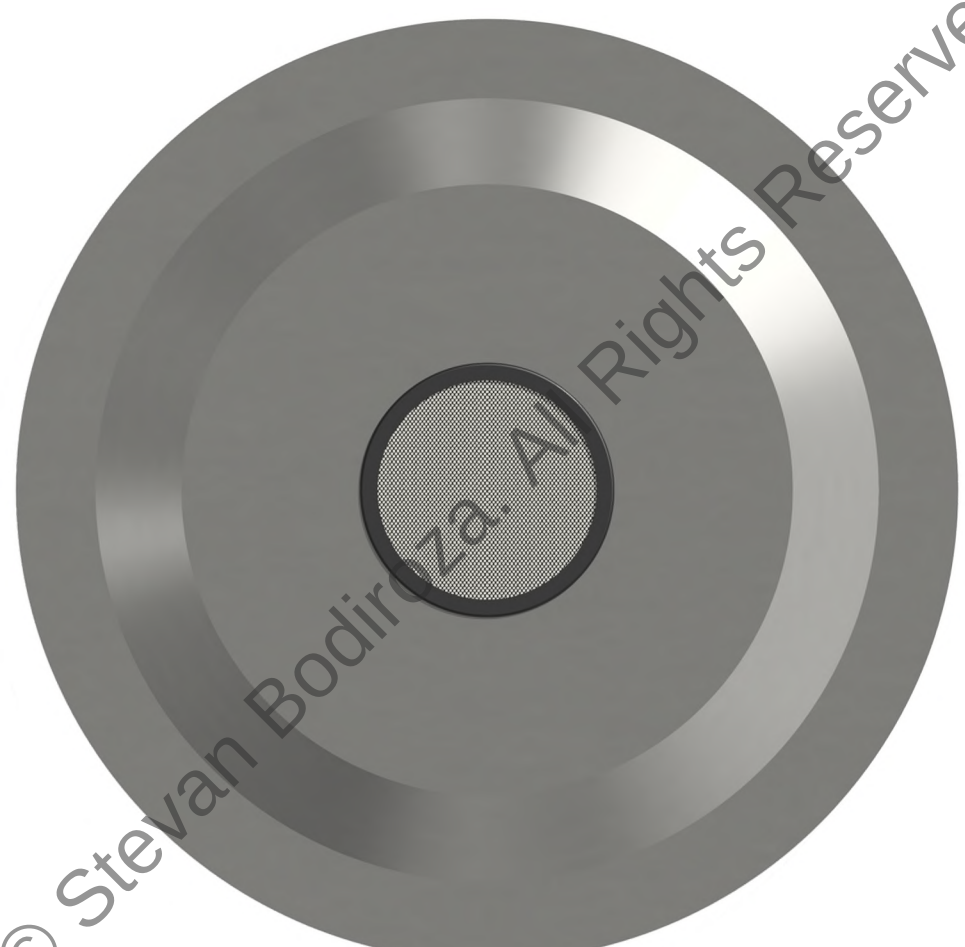


FIG. 12.1 Bottom side orthographic

FIG. 12.2 Front side orthographic

FIG. 12.3 Bottom front side perspective

FIG. 12.4 Top front side perspective

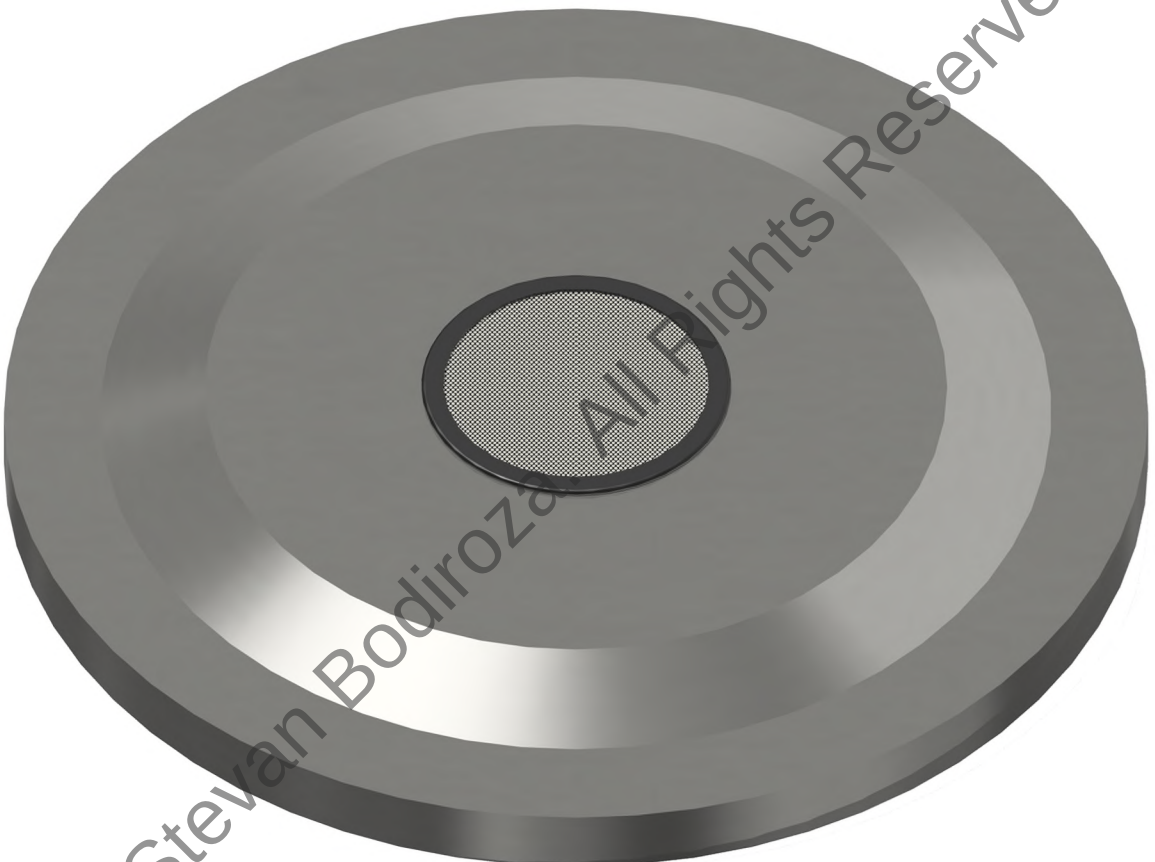


FIG. 12.5 Front cross-sectional view

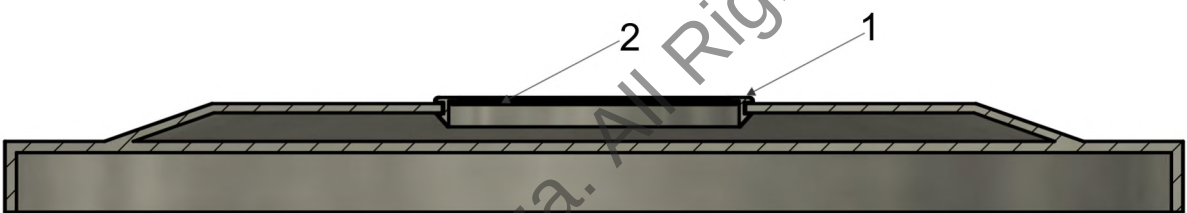


FIG. 13

Top side orthographic

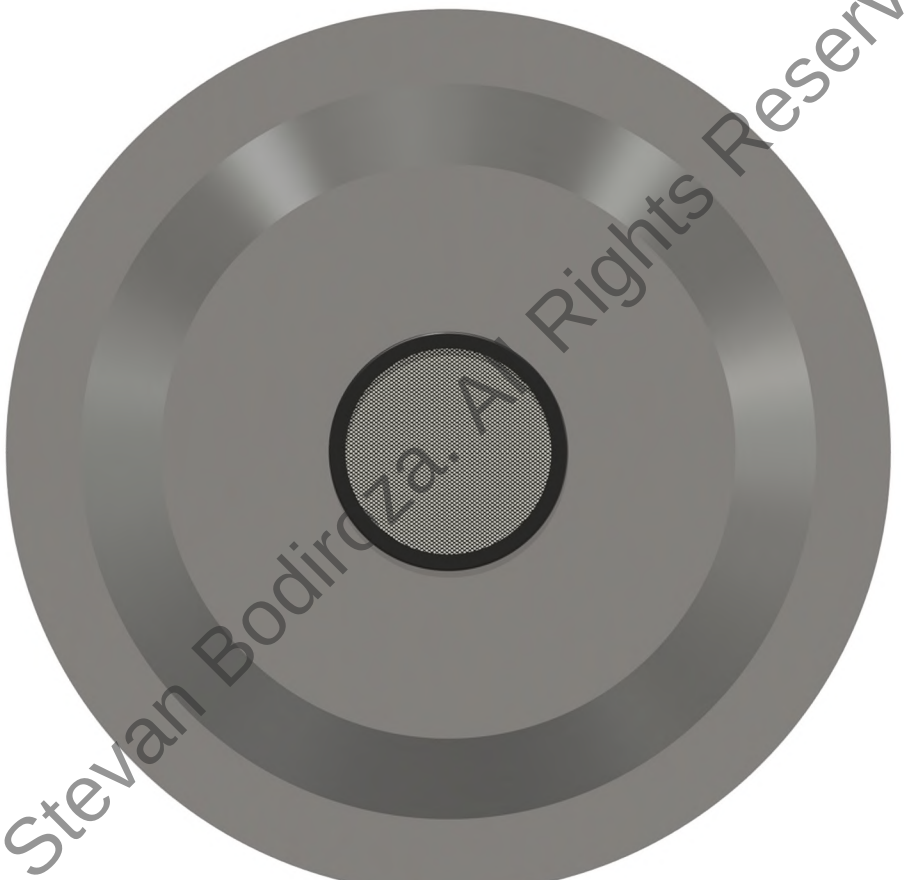


FIG. 13.1

Bottom side orthographic

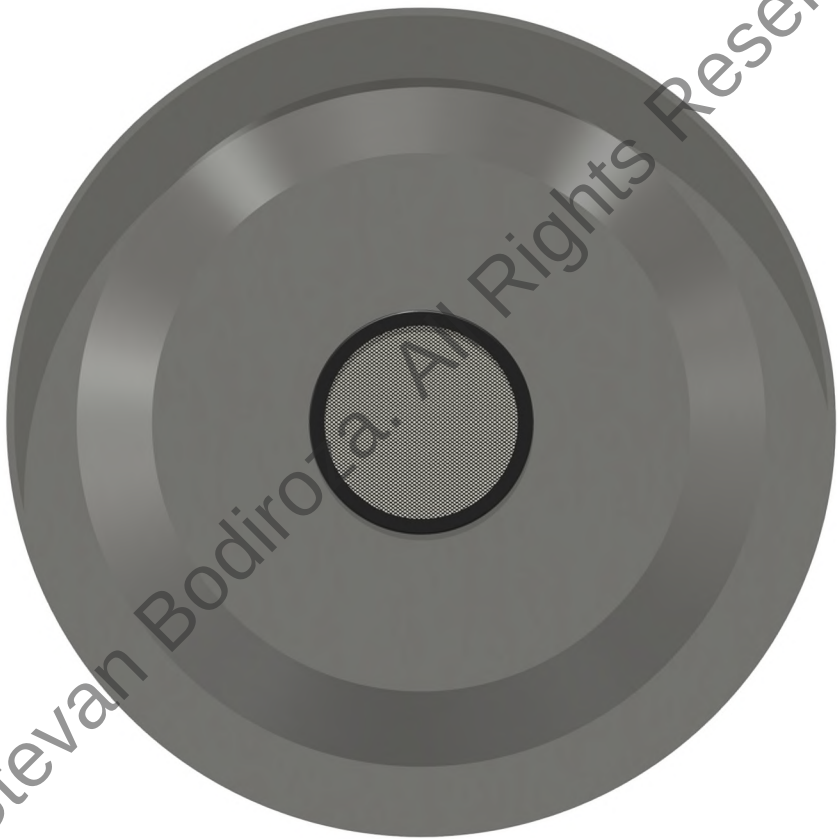


FIG. 13.2

Front side orthographic

FIG. 13.3 Top front side perspective

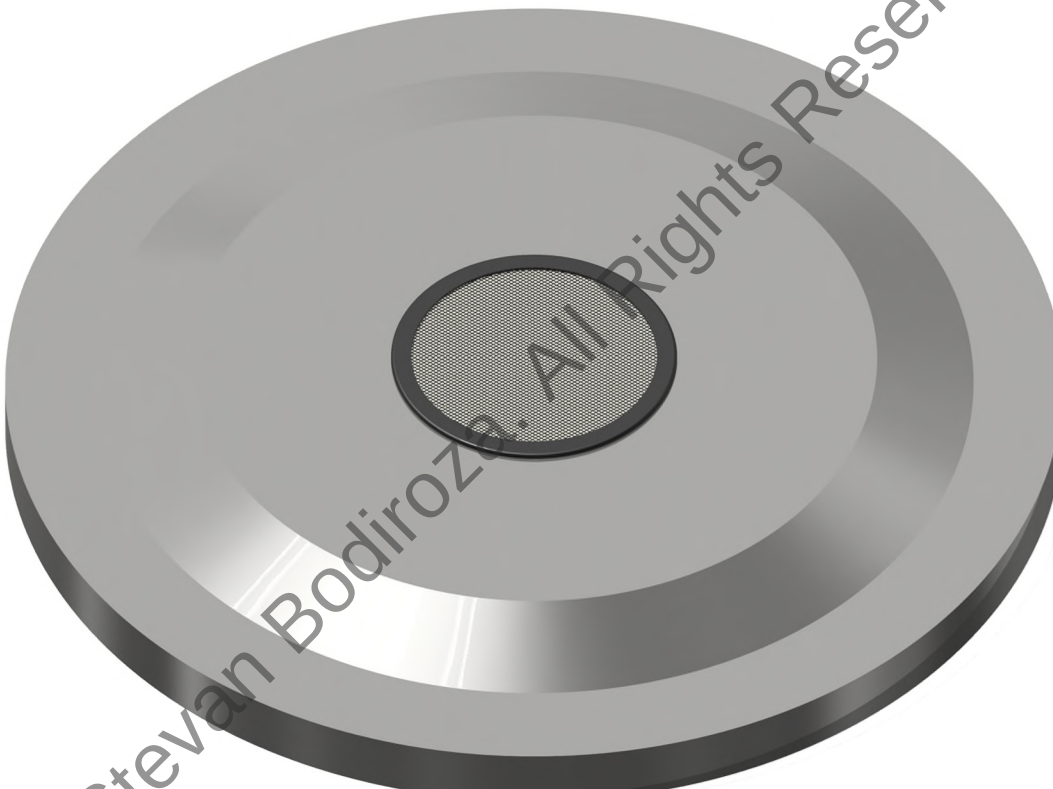
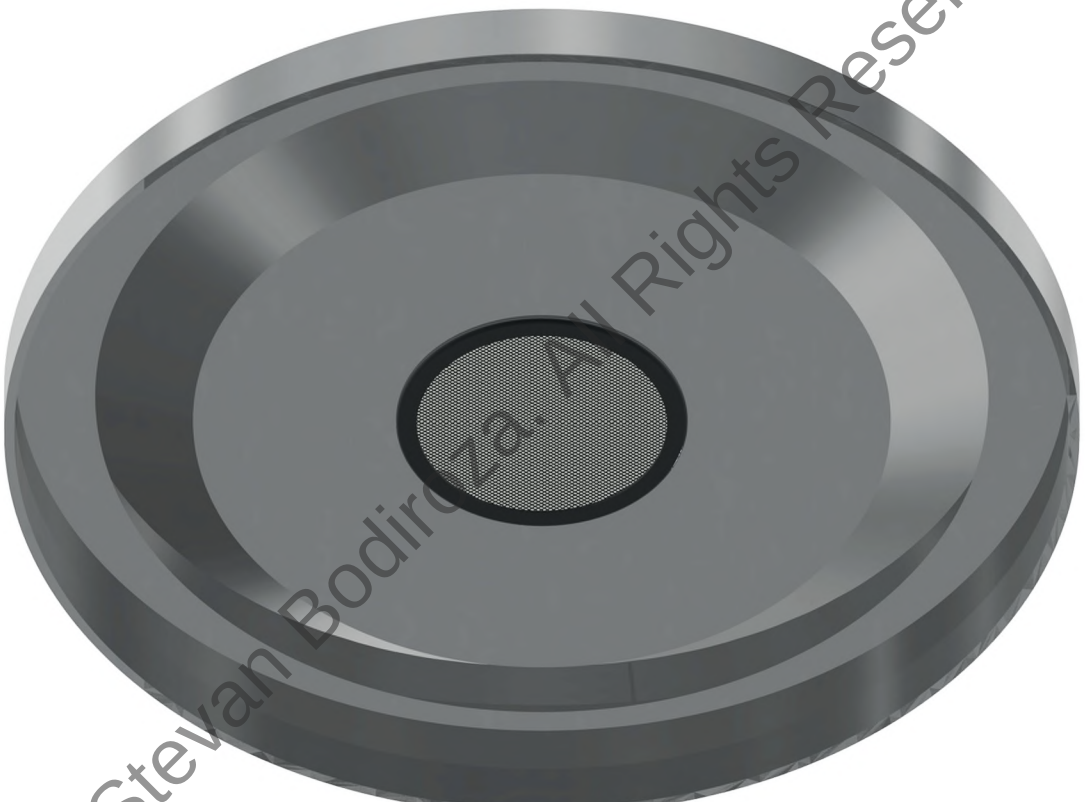


FIG. 13.4 Bottom front side pespective



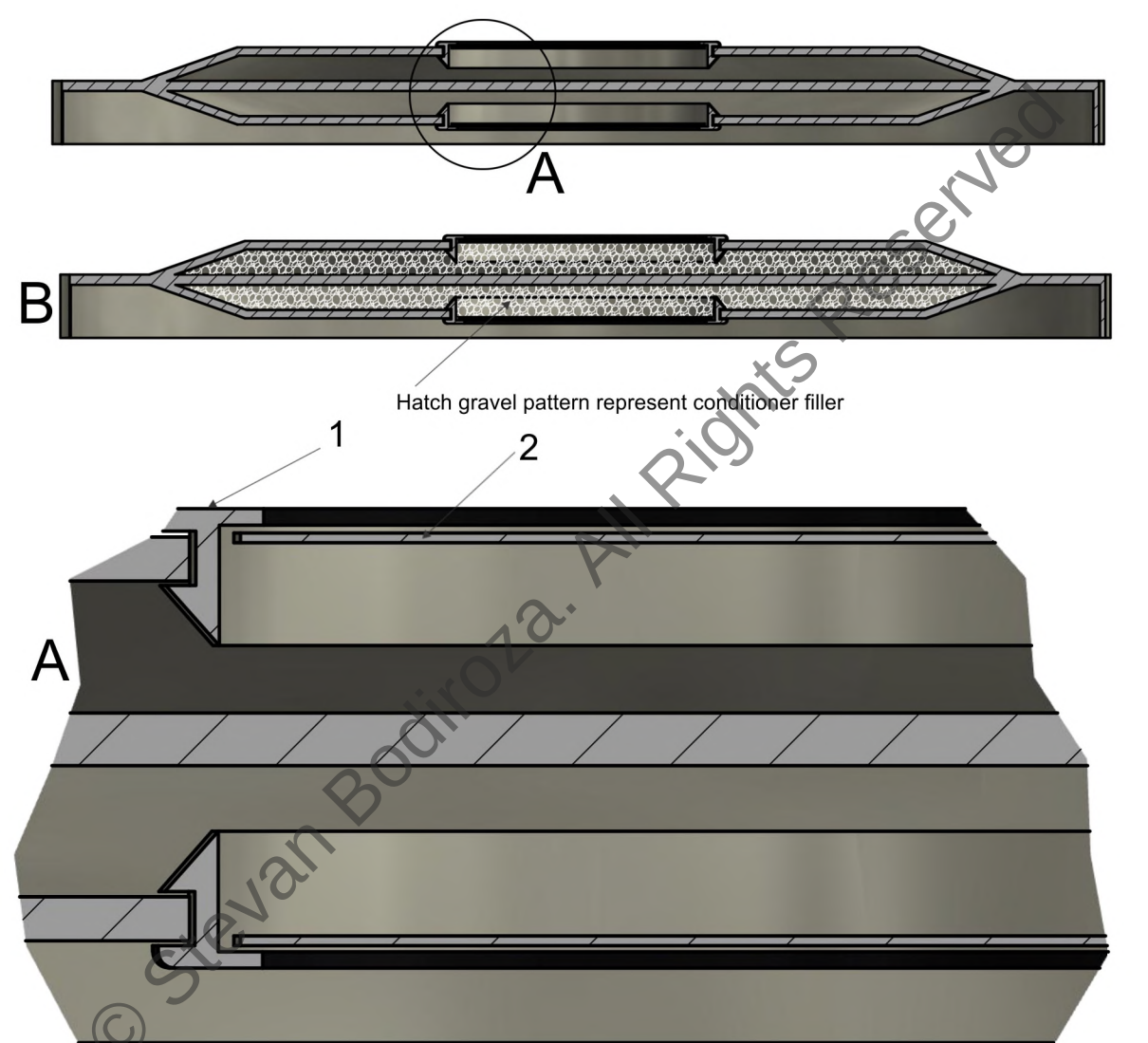


FIG.13.5

FIG. 14 Top side orthographic

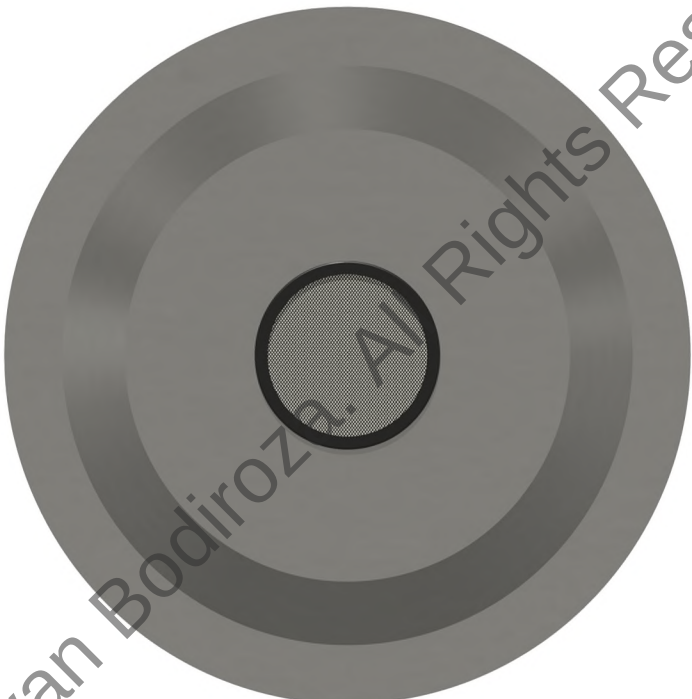


FIG. 14.1 Bottom side orthographic

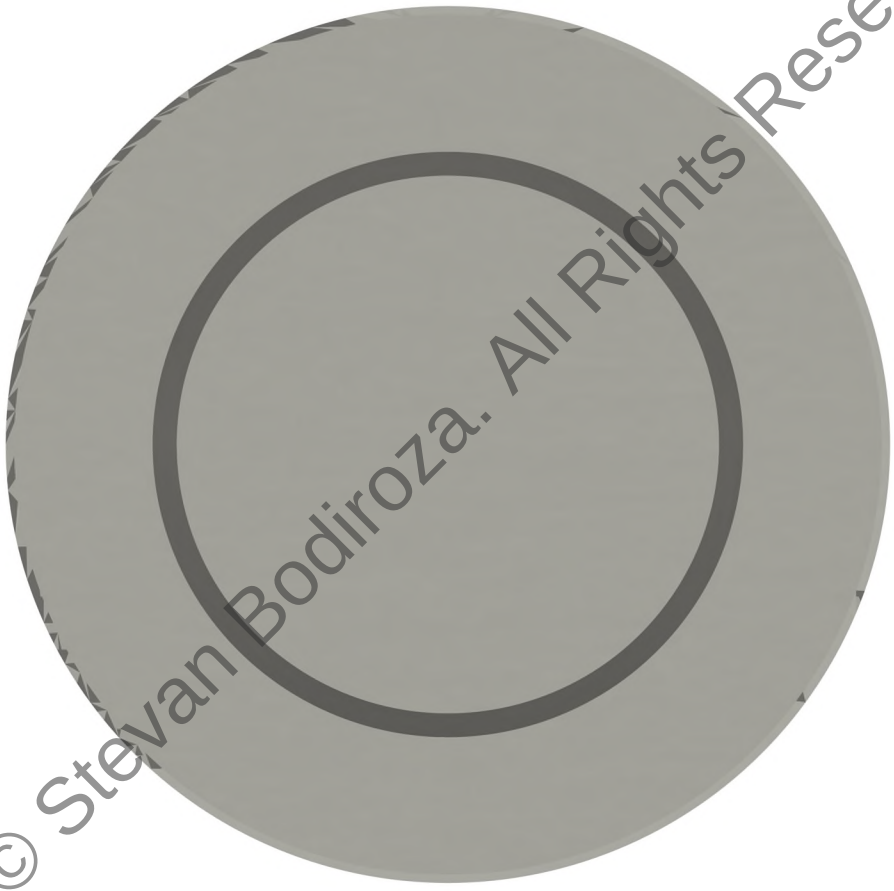


FIG. 14.2 Front side orthographic

FIG. 14.3 Top front side perspective

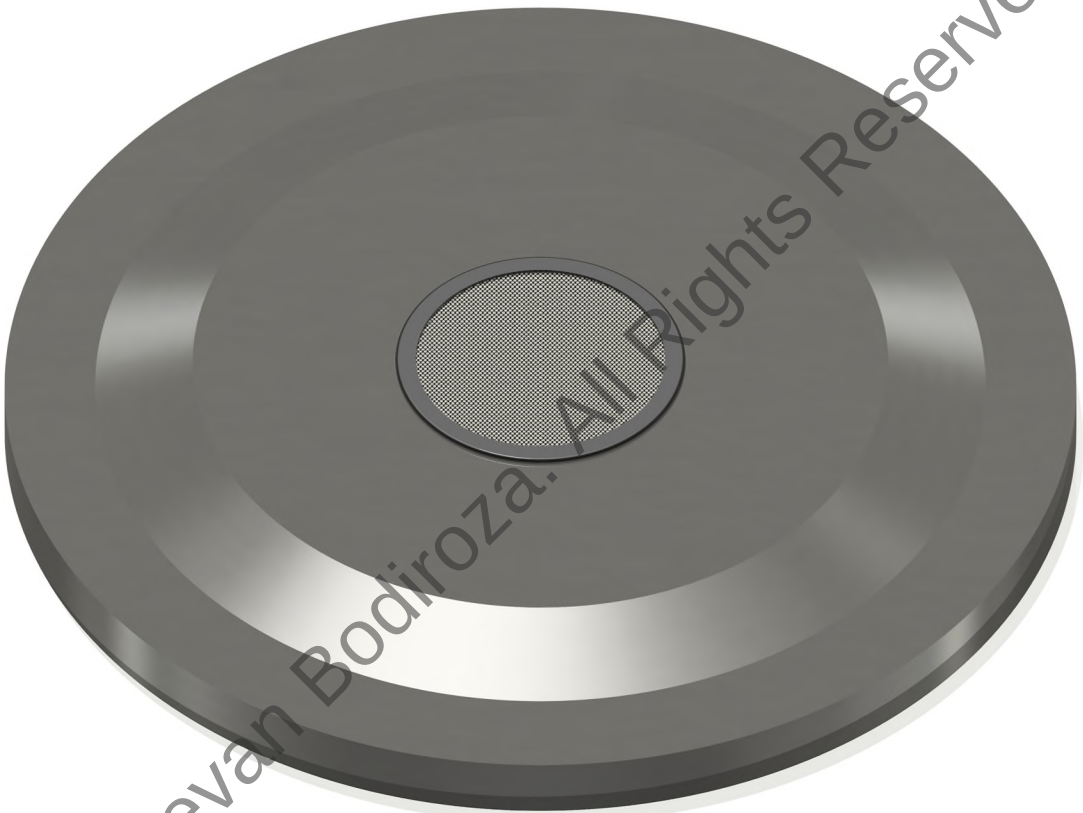


FIG. 14.4 Bottom front side perspective

FIG. 14.5 cross-sectional view

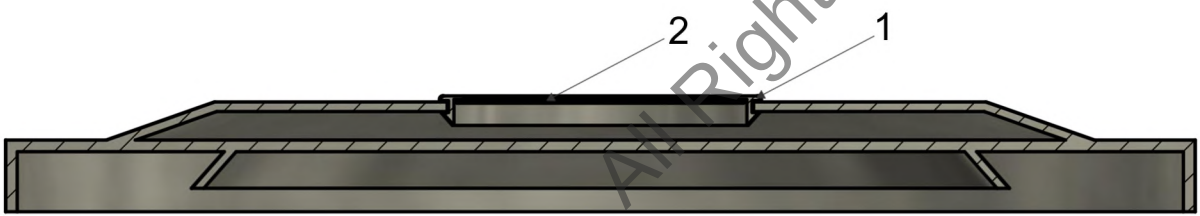


FIG. 15

Top side orthographic

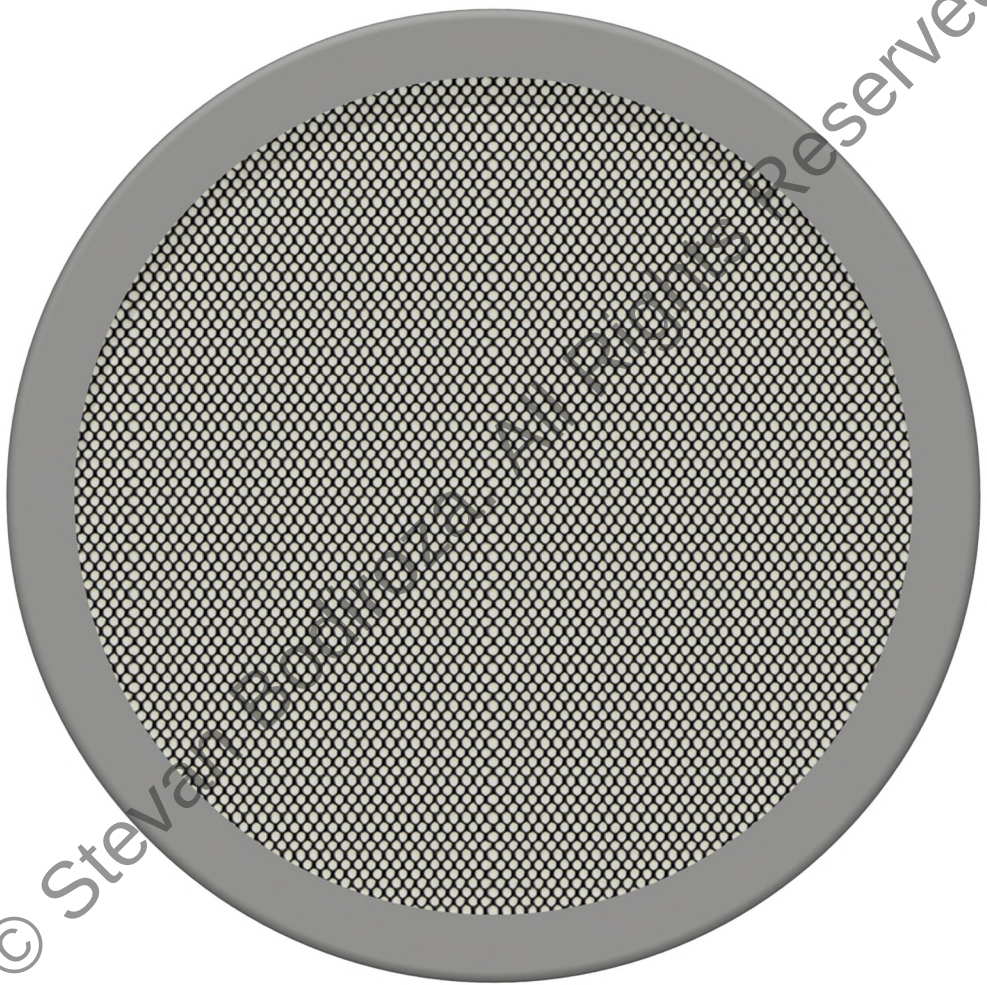


FIG. 15.1 Bottom side orthographic

FIG. 15.2 Front side orthographic

FIG. 15.3 Top front side perspective

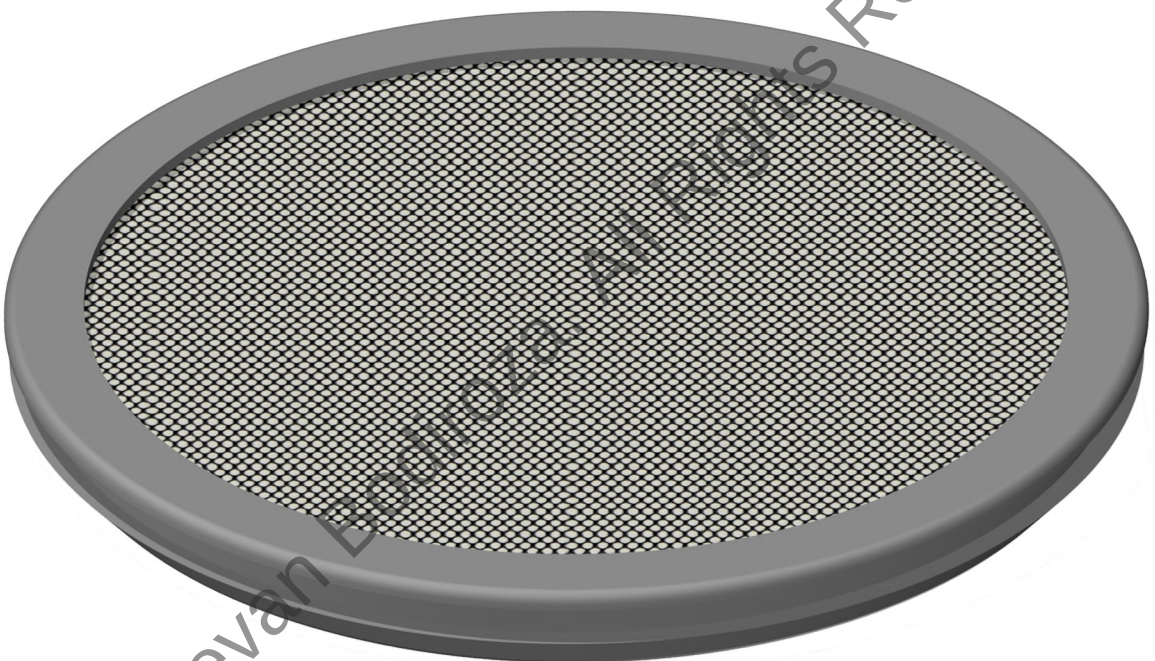


FIG. 15.4 Bottom front side perspective

FIG. 15.5 Cross-sectional view