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(54) **DEVICE FOR AUTOMATICALLY OPENING A CONTAINER PROVIDED WITH A SEALING ELEMENT**

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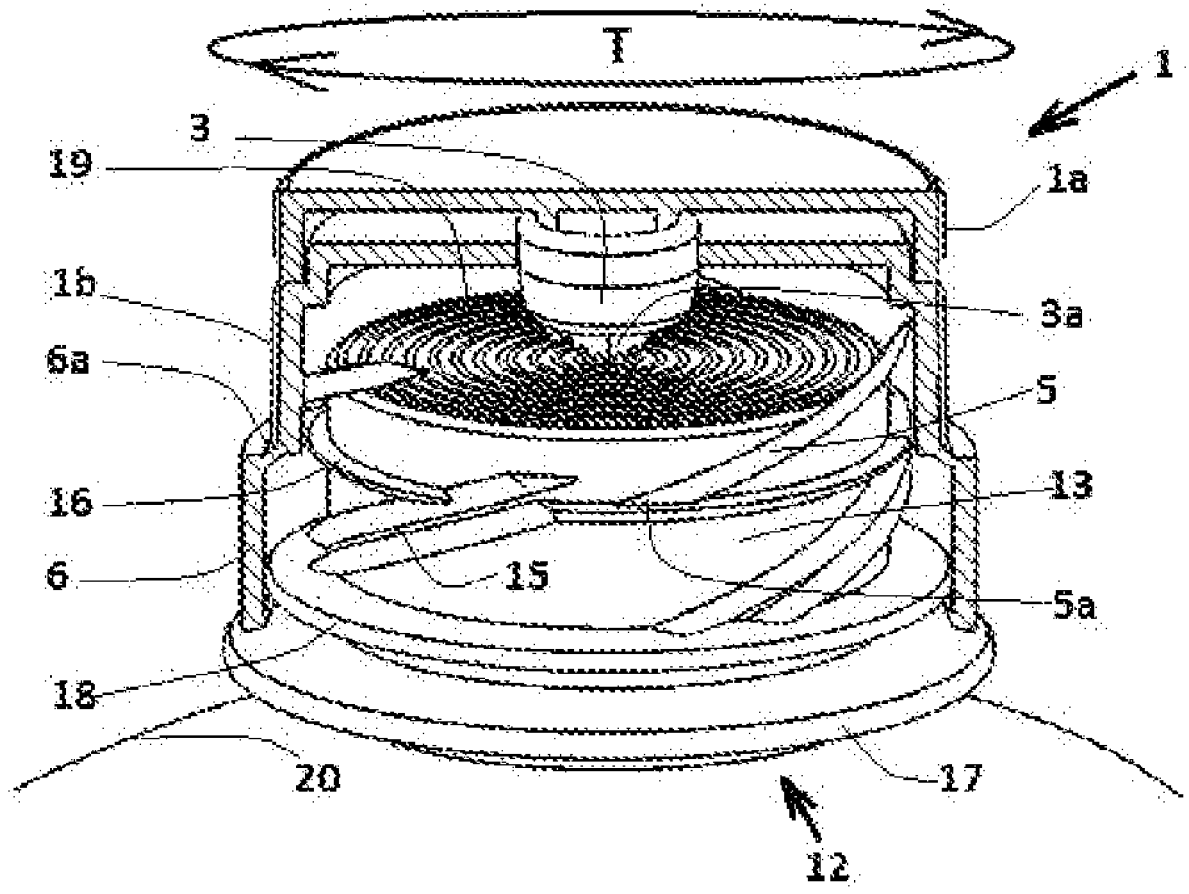
(57) **ABSTRACT**

The present invention refers to an automatic opening device for a container provided with a spout having a rim with a sealing element firmly attached thereto, said automatic opening device for a container being provided with means that obviate the need to unscrew the cap of the container and next remove the sealing element from the rim of the spout in order to enable pouring of the product stored in the container.



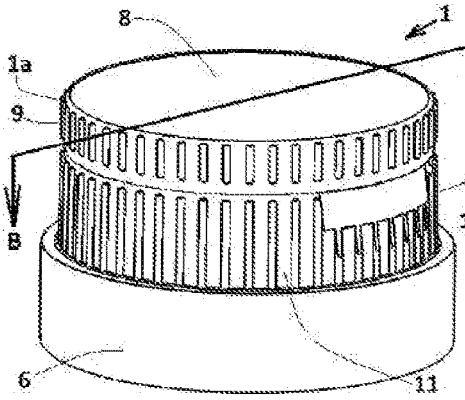


Fig. 1A

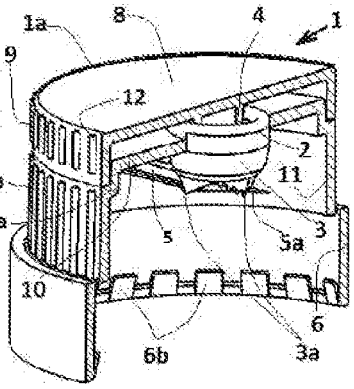


Fig. 1B

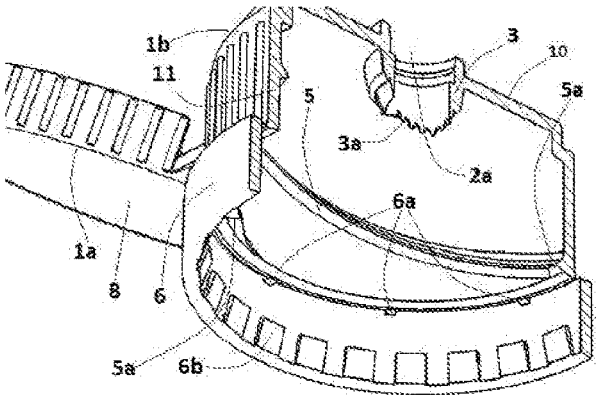


Fig. 1C

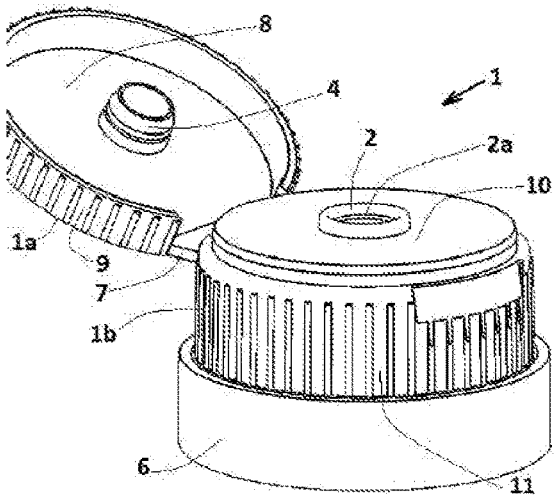


Fig. 2

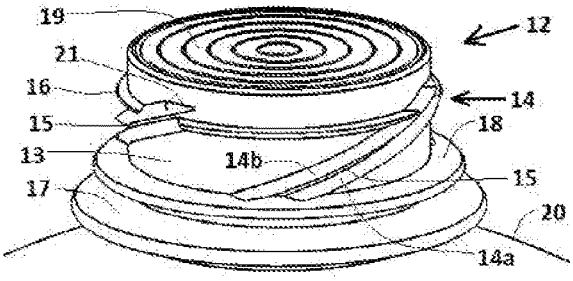


Fig. 3

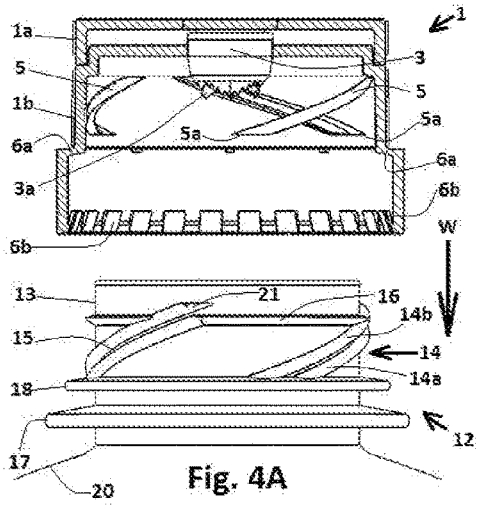


Fig. 4A

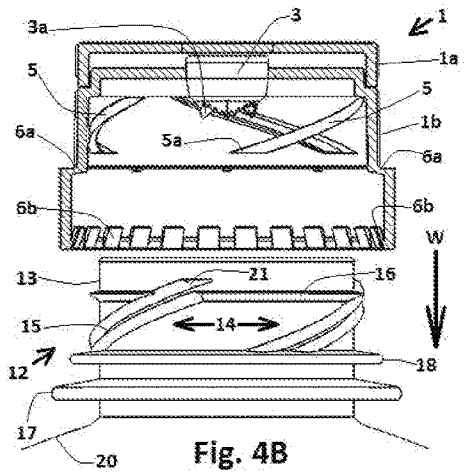


Fig. 4B

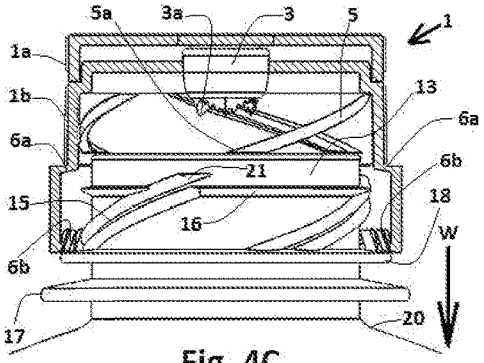


Fig. 4C

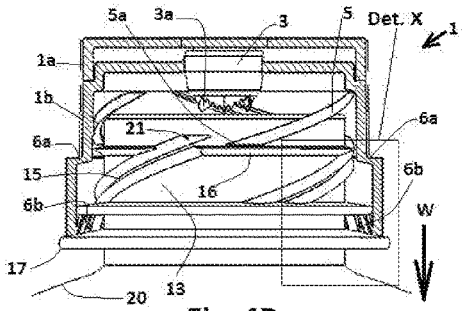
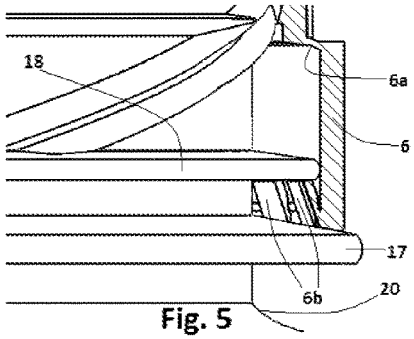


Fig. 4D



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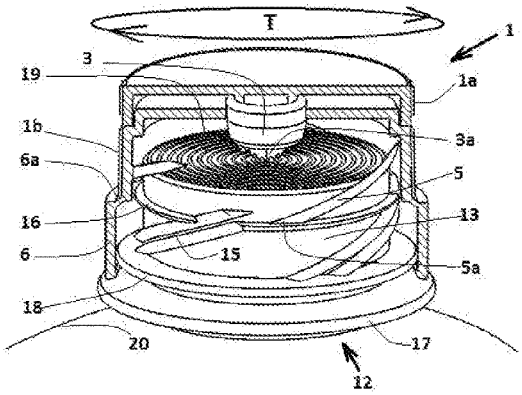
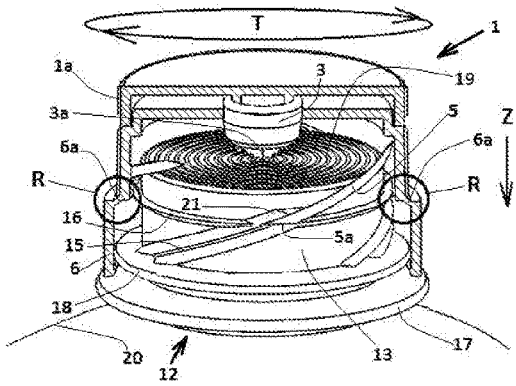


Fig. 6A



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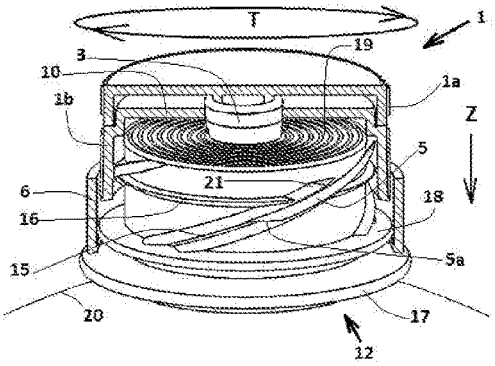

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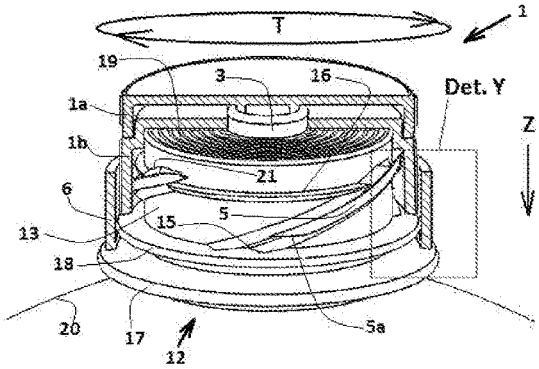

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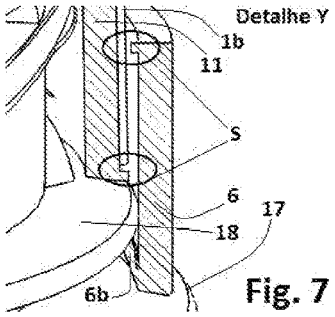

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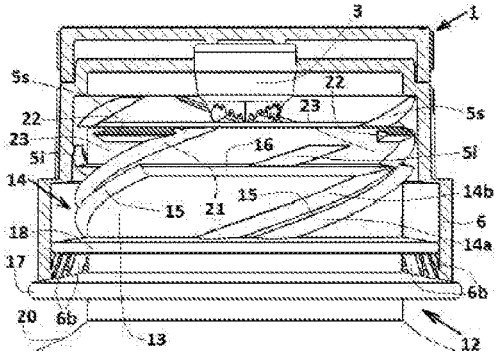
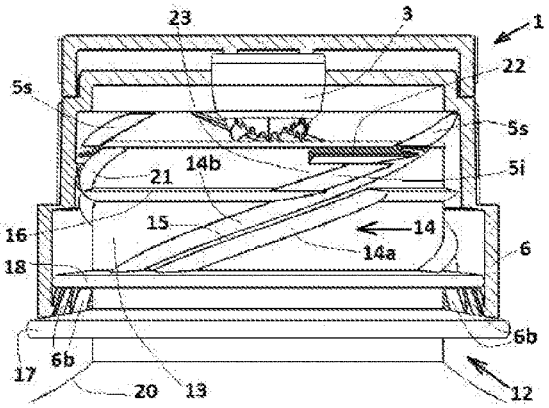


Fig. 8A



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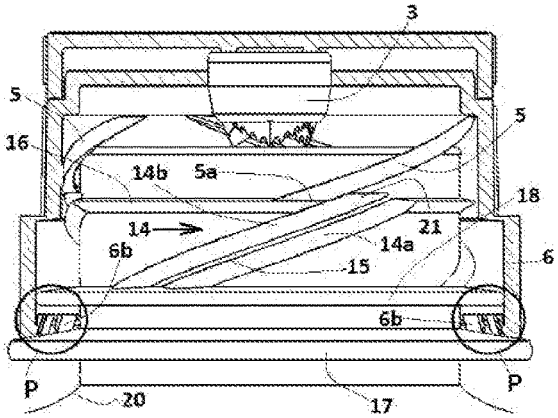

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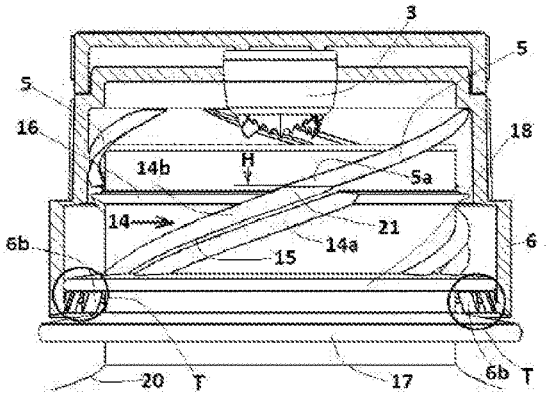

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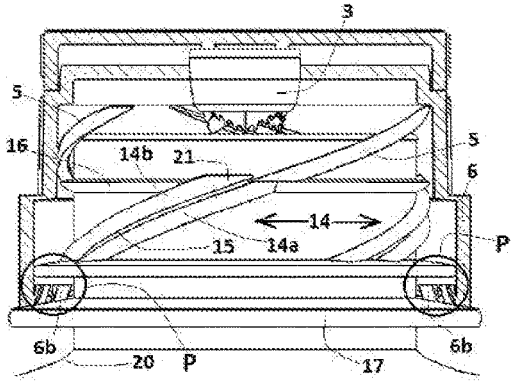

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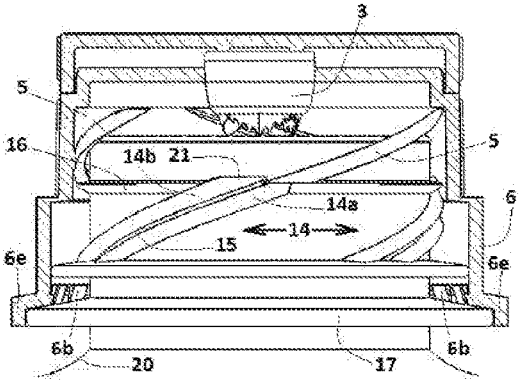
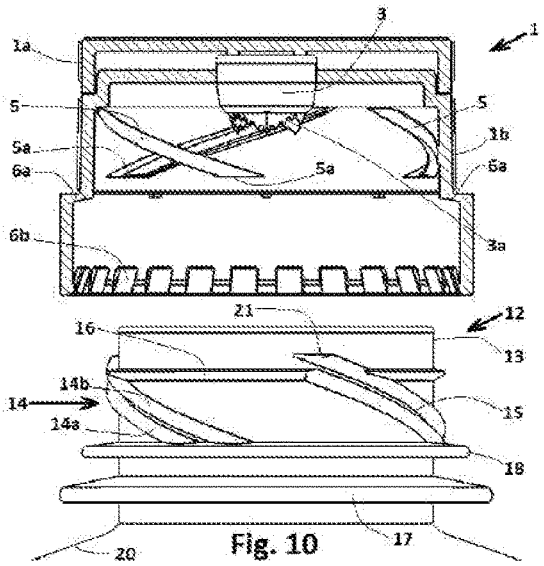


Fig. 9D



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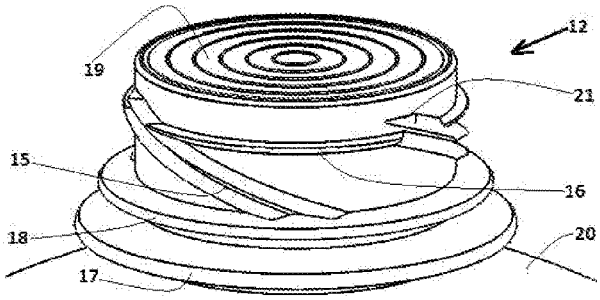

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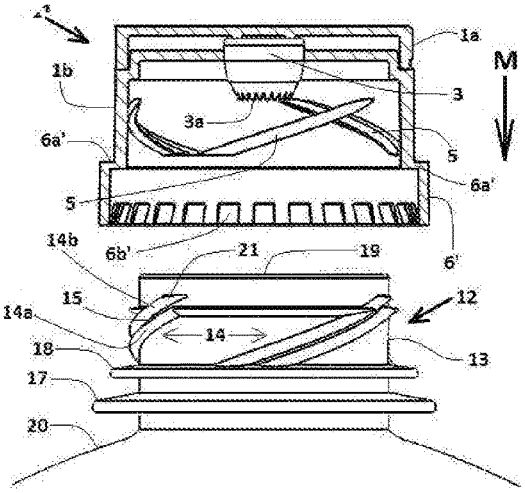
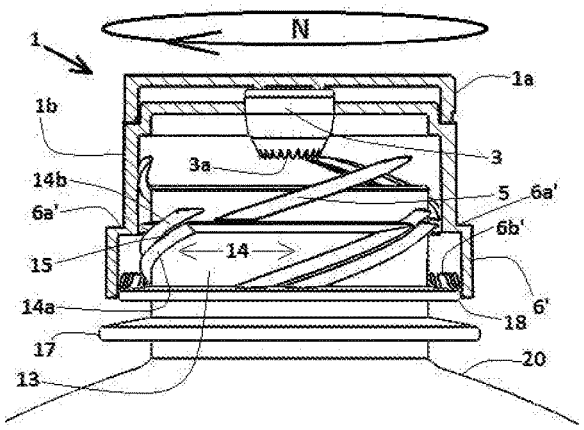


Fig. 12A



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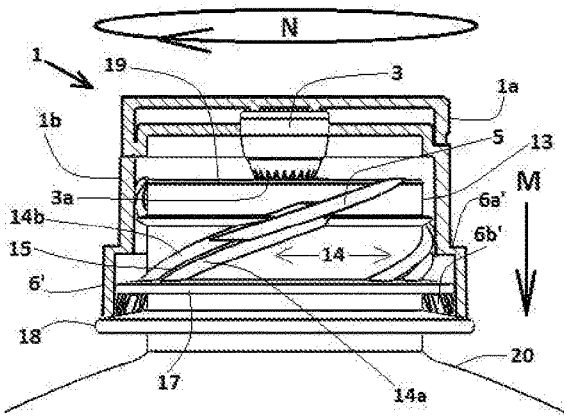

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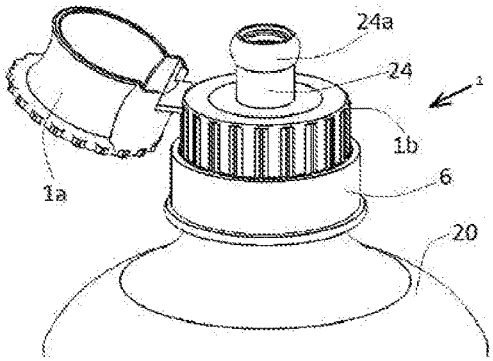

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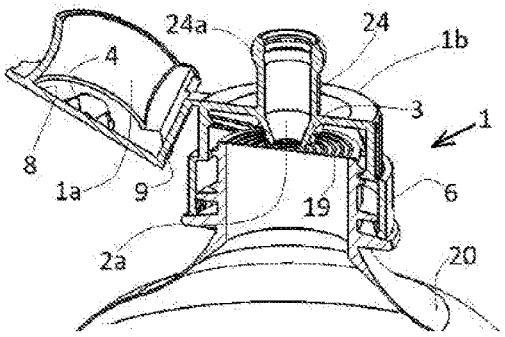

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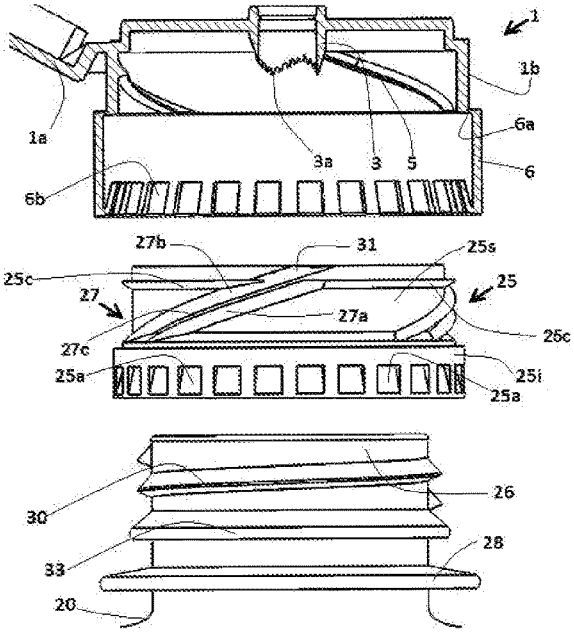

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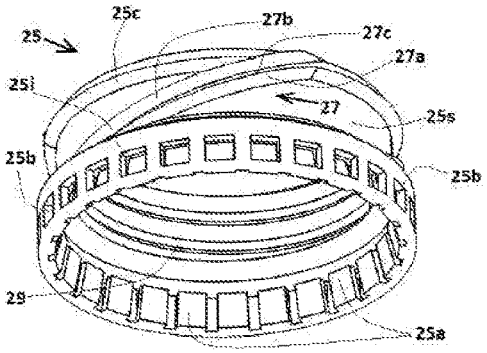

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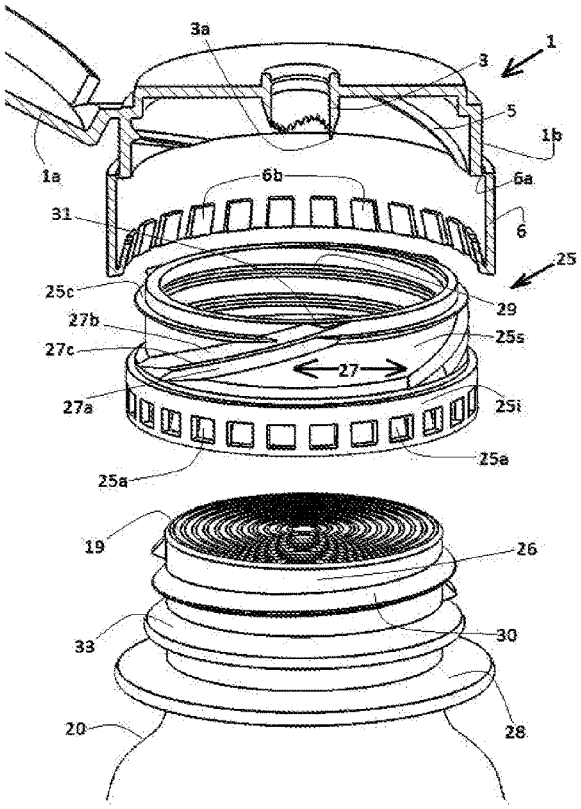


Fig. 14B

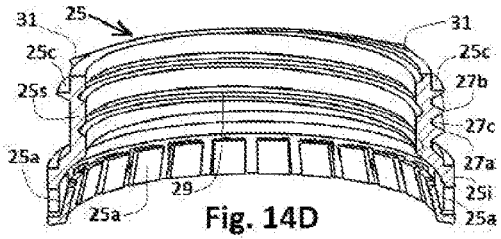


Fig. 14D

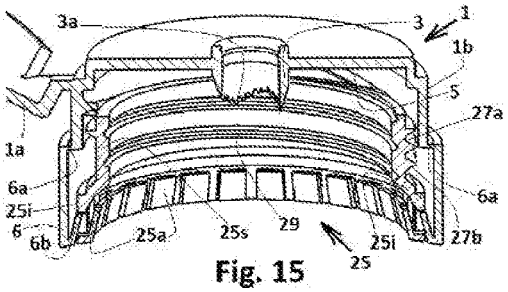


Fig. 15

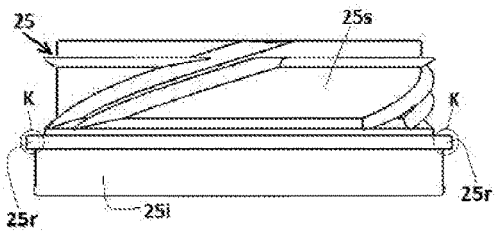


Fig. 16

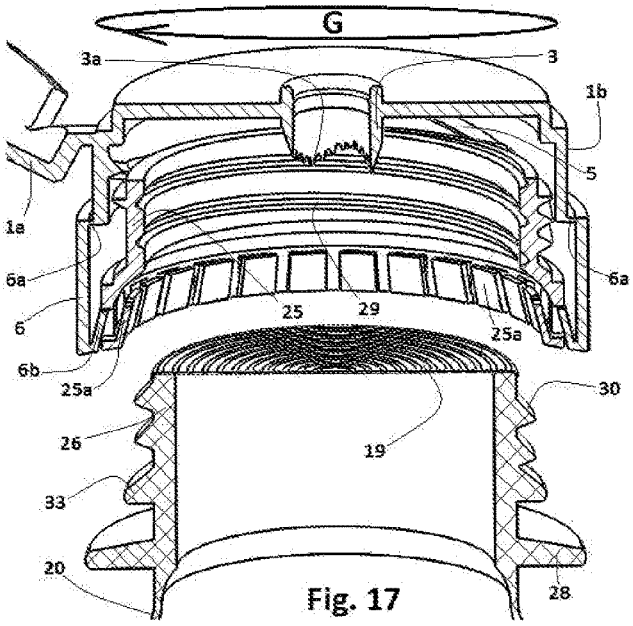


Fig. 17

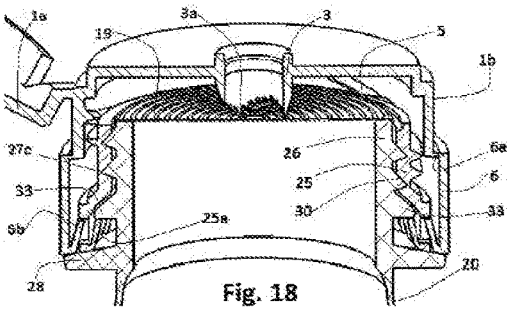


Fig. 18

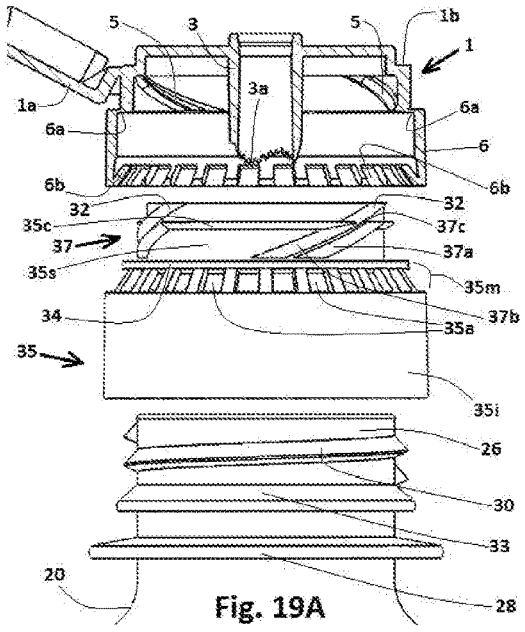


Fig. 19A

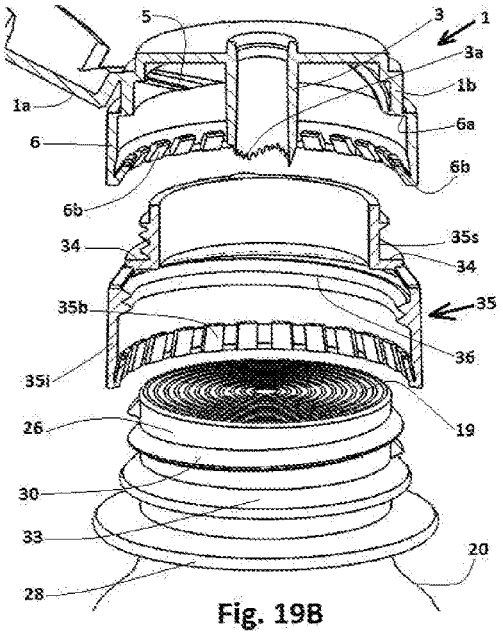
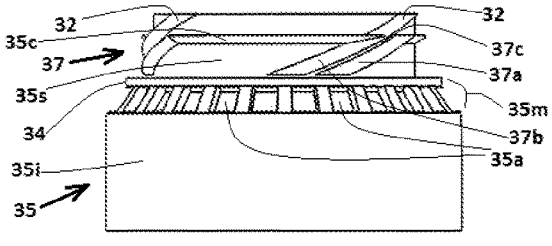


Fig. 19B



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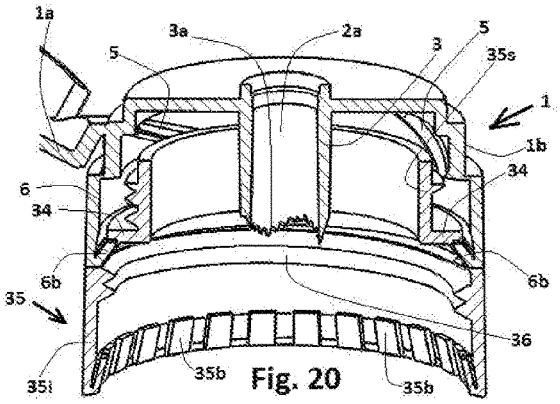
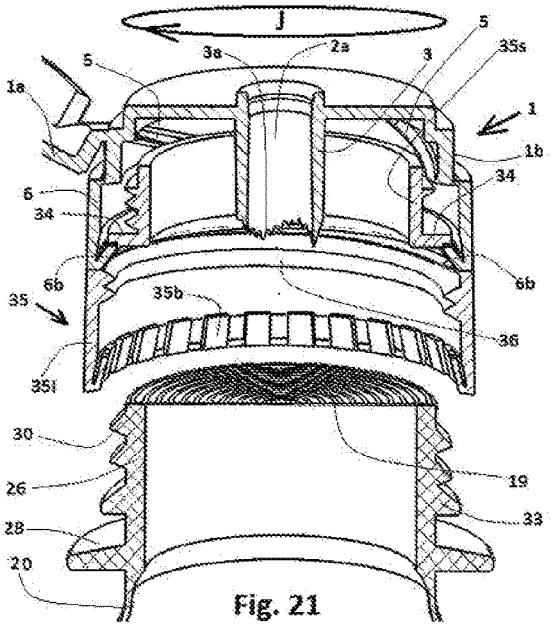


Fig. 20



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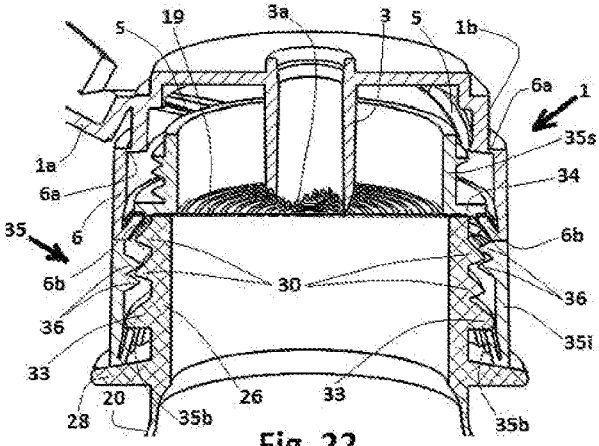

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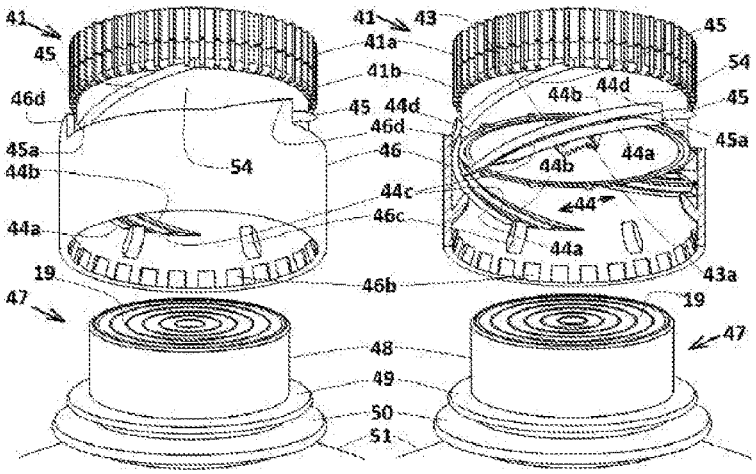
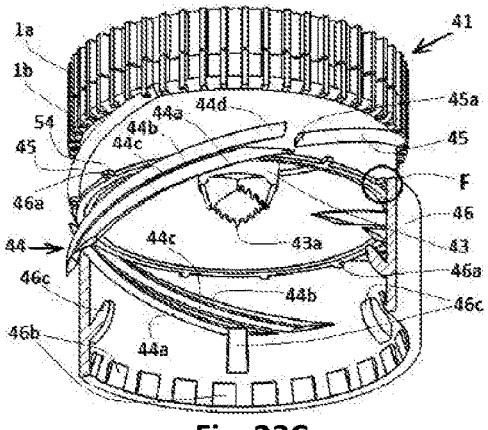


Fig. 23A

Fig. 23B



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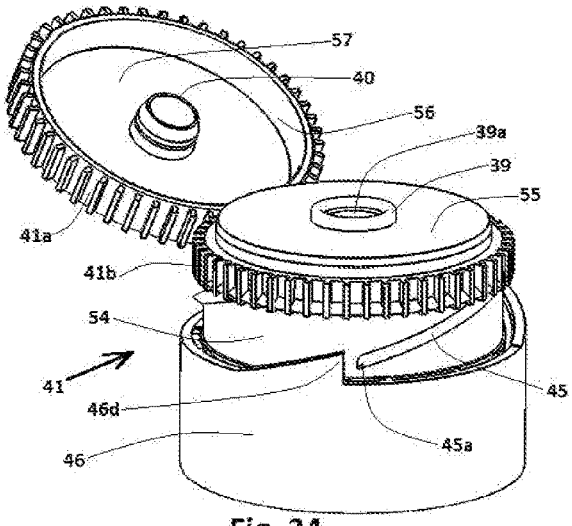

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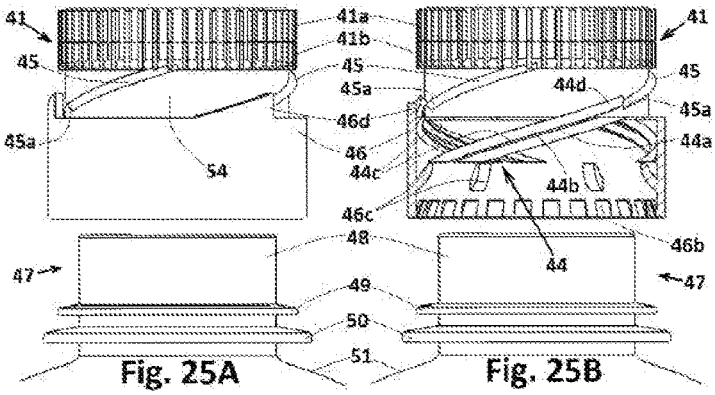


Fig. 25A Fig. 25B

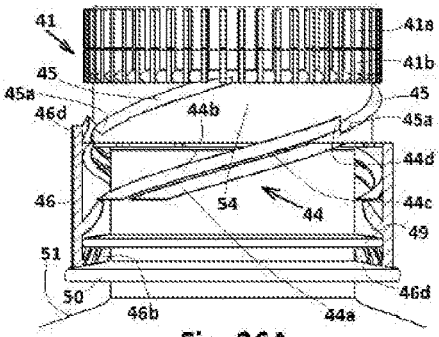


Fig. 26A

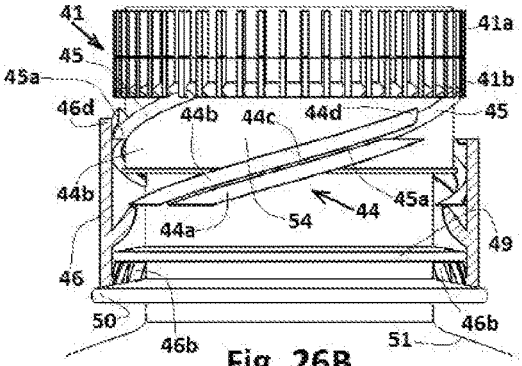
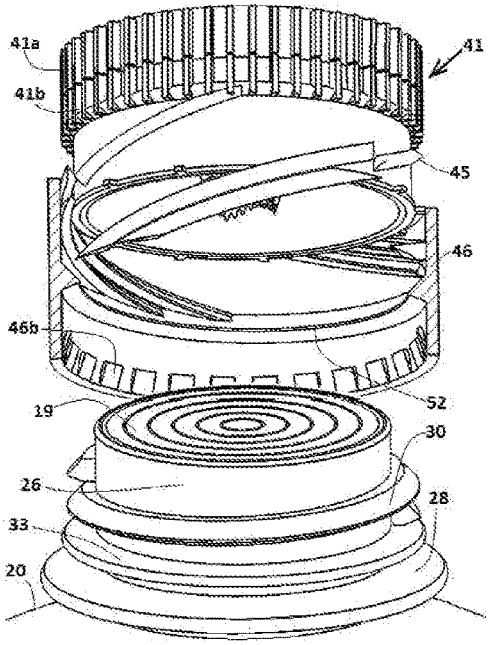


Fig. 26B



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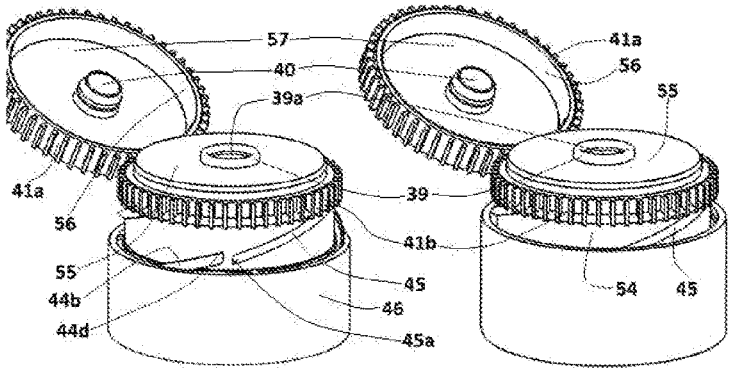

Fig. 28A Fig. 28B

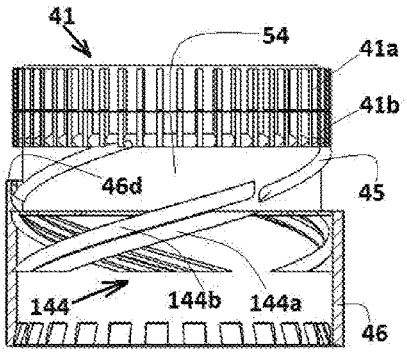

Fig. 29A

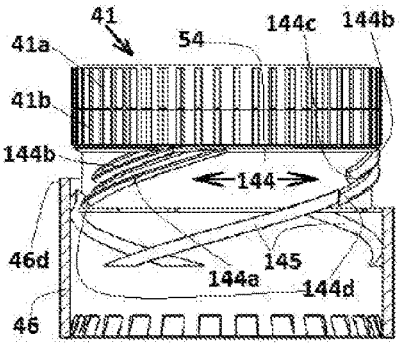

Fig. 29B

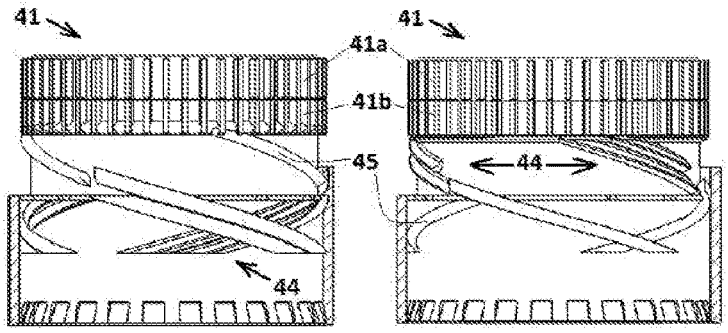

Fig. 30A Fig. 30B

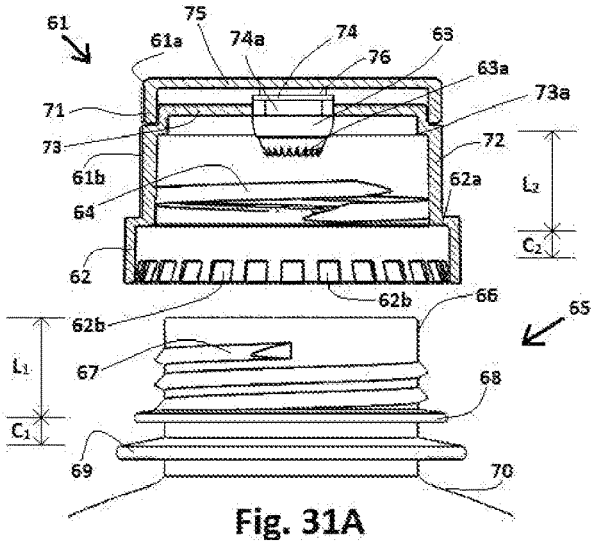

Fig. 31A

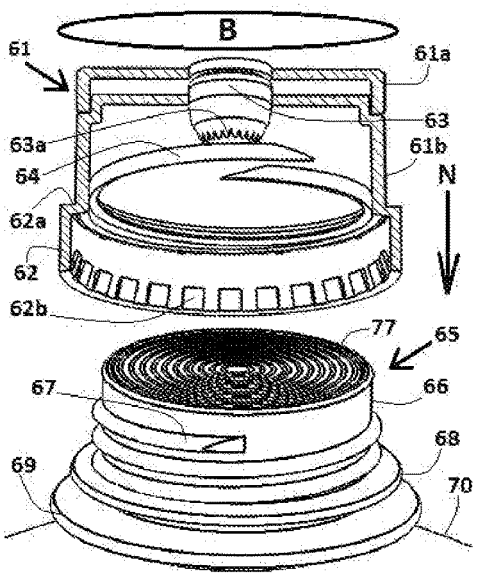

Fig. 31B

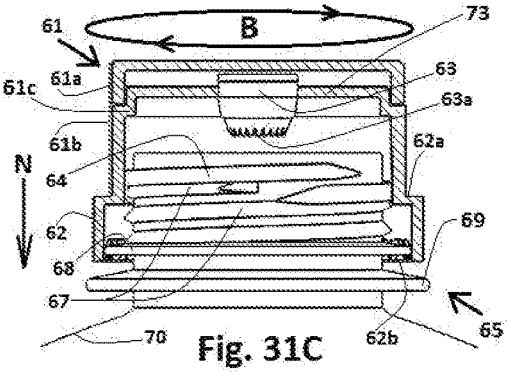

Fig. 31C

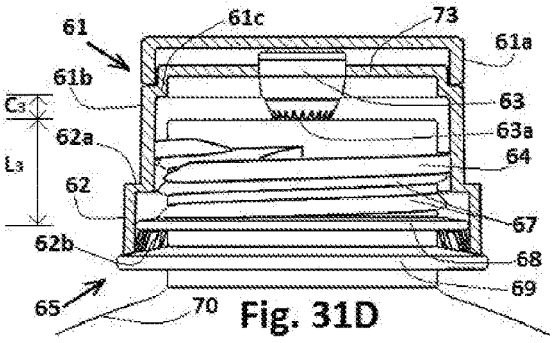

Fig. 31D

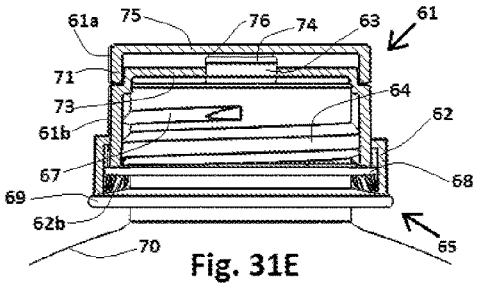

Fig. 31E

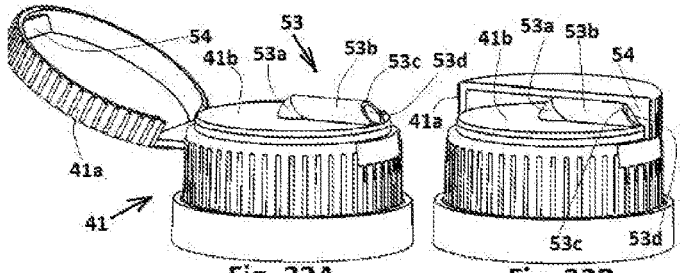

Fig. 32A Fig. 32B

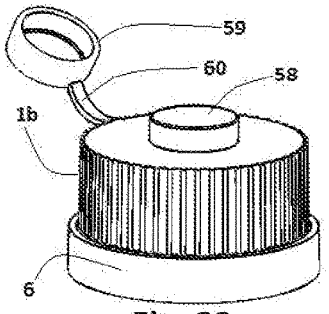

Fig. 33

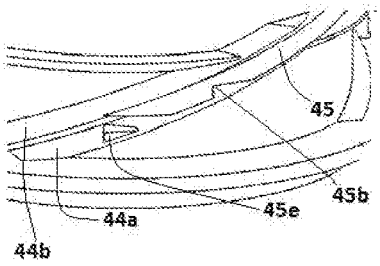

Fig. 34A

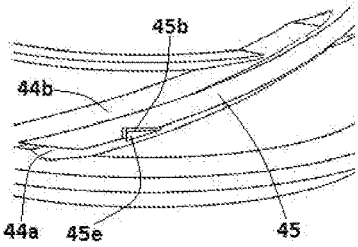

Fig. 34B

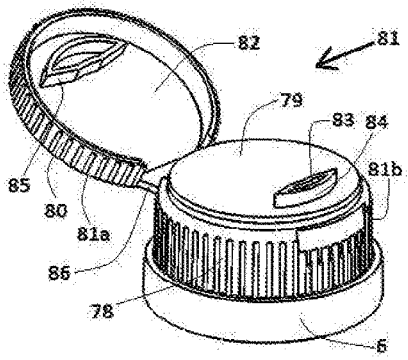

Fig. 35

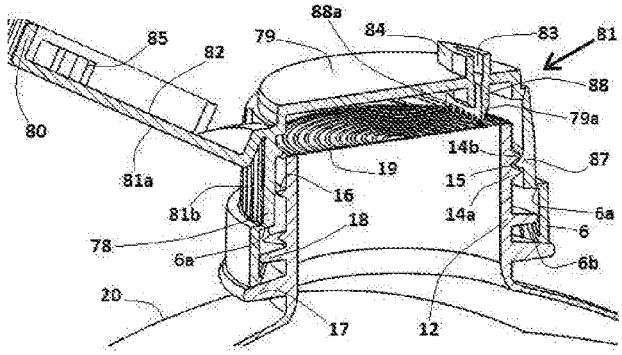

Fig. 36

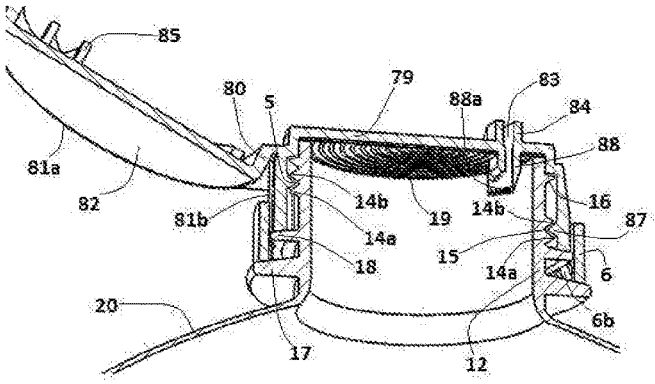

Fig. 37

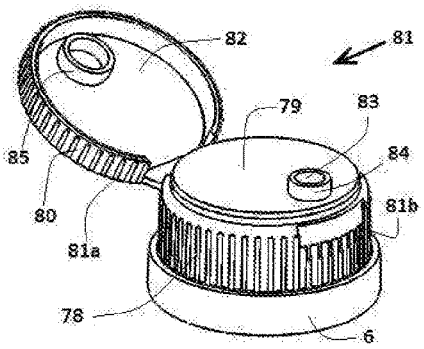

Fig. 38

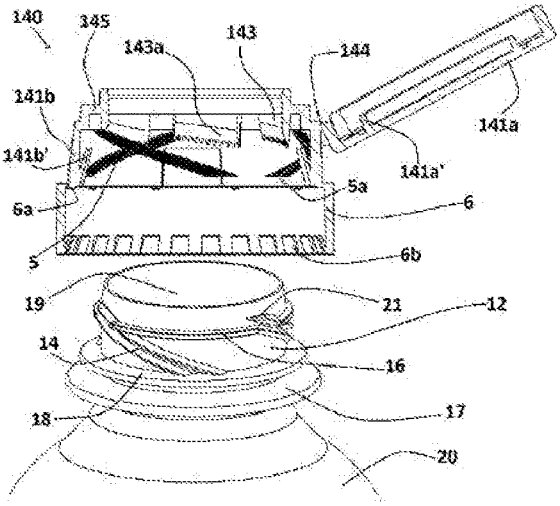

Fig. 39

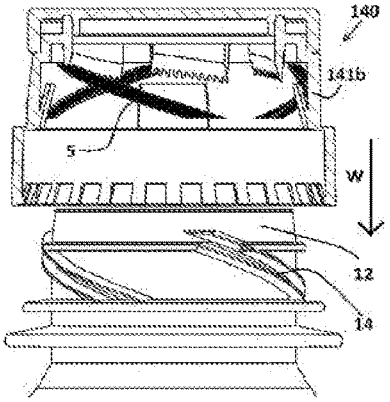

Fig. 40

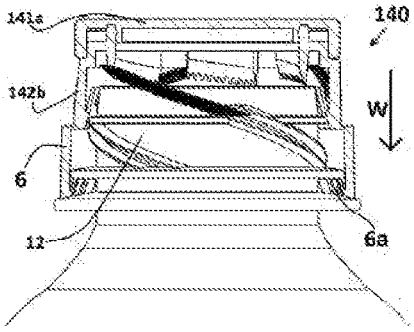

Fig. 41

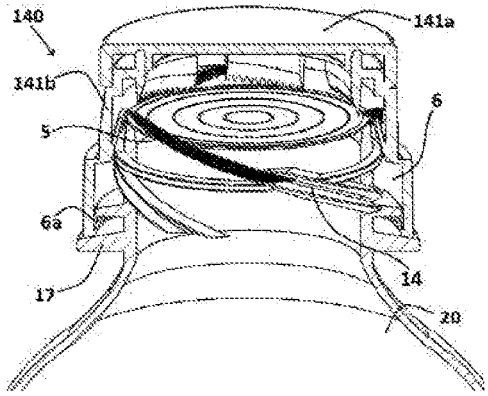

Fig. 42

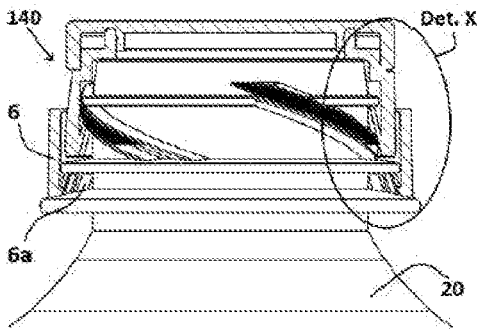

Fig. 43

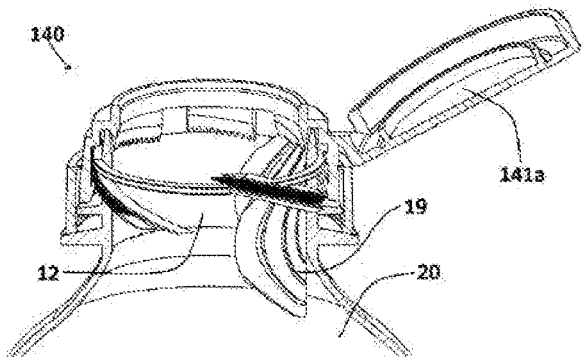

Fig. 44

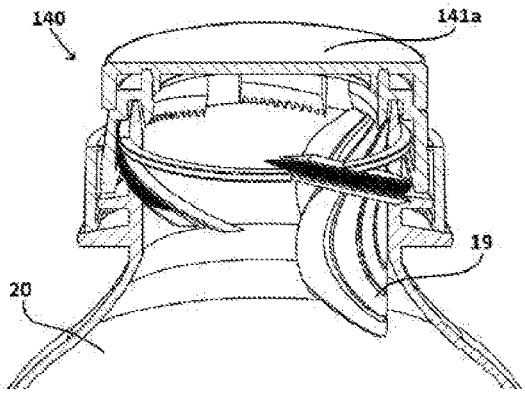

Fig. 45

DEVICE FOR AUTOMATICALLY OPENING A CONTAINER PROVIDED WITH A SEALING ELEMENT

FIELD OF THE INVENTION

[0001] The present invention relates to an automatic opening device for containers that has a spout provided with a sealing element firmly attached to its rim, said automatic opening device for containers being provided with means that eliminates the need to remove the cap of the container and performs multiple operations to remove the sealing element from the edge of the spout to release the ministering of the stored product.

RELATED ART

[0002] It is well known the use of sealing elements in containers designed to store products such as condiments for food, soups, liquid or paste products, medicines, cosmetics and other products. Normally the sealing element is firmly attached to the rim of the opening through which the product can be removed from the container, for example at the rim of a pouring spout.

[0003] Usually, a closing element is provided in the pouring spout, usually a cap, which is often provided with an internal screw thread which engages to an external screw thread provided in the pouring spout. The cap will only operate to seal the container after a user removes the sealing element from the rim of the spout.

[0004] Several types of sealing elements are known to adhere to the rim of the spouts of these containers, the characteristics of which vary according to the type of product contained in the container. Usually the sealing elements comprise a multilayer material, which can comprise plastic materials, paper, aluminum films, etc. U.S. Pat. Nos. 6,277,478, 6,461,714, 7,648,764 and 8,080,118 disclose some types of sealing elements.

[0005] There are several reasons to seal the container by means of sealing elements applied to the rim of the spout, for example, the need to provide barriers against light, odors, scents, humidity, oxygen, etc., which can jeopardise the quality and the integrity of the product stored in the container. For this reason, the sealing elements can usually be made in layers of different materials, each of them meeting specific needs.

[0006] The sealing elements can also serve to extend the shelf life of the products stored in the containers, since the sale to the final user can take place long after the date of manufacture, in some cases in periods longer than one year after manufacture.

[0007] The sealing elements also serve as an indication to the user that the contents of the container have not been tampered with. If the sealing element shows any sign of tampering when opening the cap, it will signal to the user that the container has been tampered with and the product may have suffered some type of contamination and therefore should not be used.

[0008] For this reason, containers caps with spouts with sealing elements in the rim are often not provided with tamper evidence devices, since the sealing element itself serves this purpose. In this case, when purchasing the product, users have just to remove the caps from the containers to check if the sealing element is intact.

[0009] In such situations, users may inadvertently damage the sealing element, which would make the product contained in the container unsuitable for sale. To avoid this possibility, it is common for the sealing elements to be manufactured with layers of thicker materials than would be necessary to serve as a barrier element, aiming to increase its resistance. However, this greatly increases manufacturing costs.

[0010] Whatever is the reason for providing thicker sealing elements, this option usually creates difficulties for users, causing them difficulties to remove the sealing element when it is necessary to open the container for the first time to pour product contained therein.

[0011] If the product is a condiment or a cream, for example, it is common for the cap to be provided with a pouring spout that makes it possible to pour the product without the need to disengage the cap from the spout. In these cases, after removing the sealing element, the cap must be re-engaged to the spout, to close the container and allow the product to be served normally through the pouring spout.

[0012] When it is necessary to remove the product stored in the container for the first time, it will be necessary to unscrew the cap from the spout and remove the sealing element attached to the rim of the spout. Then, the cap must be screwed back on to the spout to keep the container closed, in case all the product stored in the container has not been used.

[0013] In some cases, the sealing elements are provided with at least one side lug that extends downwards the rim of the spout, facing the outer portion of the spout. This side lug aims to facilitate the task of removing the sealing element, and for this aim the user must handle the side lug and make an upward movement. However, even with the provision of these side lugs, the task of removing the sealing element is still difficult, and frequently users are unable to release the sealing element because it is firmly adhered to the rim of the spout.

[0014] It is common that the sealing element tears during the attempt to release it from the rim of the spout, being them partially removed, thereby causing users to try to find a means to remove the rest of the sealing element still attached to the rim of the spout. This operation is not always easy to be performed, being even very difficult for users to handle the remaining parts of the sealing element still adhered to the rim of the spout, in order to remove them. Users often use a sharp instrument, such as the tip of a knife or scissors, to assist removal of said remaining parts of the sealing element, which can cause accidents as well as creating the possibility of product contamination.

[0015] It is not uncommon that users instead of trying to remove the sealing element as a whole, choose to simply cut it, usually with a sharp instrument, such as the tip of a knife or scissors. As one of the layers of the sealing element comprises a resilient plastic material, usually this may cause some resistance for users to be able to puncture the sealing element.

[0016] The difficulty to release the sealing element may be even greater if it is quite thick, notably in containers in that the cap is not provided with a tamper evidence element, wherein the sealing element also serves to hinder tampering with the container, as previously mentioned.

[0017] In the situations mentioned above, in which users use some sharp instrument to assist in the removal of the

sealing element, accidents may occur and cause injury to users, which is unfortunately not uncommon.

[0018] As can be seen from the foregoing, the need to provide a sealing element at the rim of the container spout, for the preservation of the product, usually causes difficulties for users. Besides being necessary the users perform a sequence of operations to open the container (unscrew the cap of the spout, remove the sealing element from the rim of the spout and then screw the cap back on the spout), the operation of releasing the sealing element from the rim of the spout can even cause accidents.

[0019] It is known the use of caps for container which also serve as sealing element for the containers. These caps are usually provided with a protruding element at the top, usually in the form of a cone trunk, which will later be used for pouring the product stored in the container.

[0020] Said protruding element has its upper end closed, and therefore it will be necessary for users to use a cutting instrument, a knife, for example, to cut the upper portion of the protruding element, thereby opening a pouring orifice for the product into the container. It is then highly possible that accidents occur during this operation, especially if performed by children or older people.

[0021] These caps can be provided in one piece or in two pieces joined by a pivoting element, one of the pieces being the part that is applied to the spout and the other serves as a closing element.

[0022] In view of the problems previously reported, it becomes evident the need to provide sealed containers in which it is possible for users to easily perform the operation of opening the container without causing accidents.

[0023] The present invention provides an automatic opening device for containers provided with sealing elements fixed to the rim of the pouring spout, thereby allowing the operation for tearing the sealing element to be made in a single operation, whereby eliminating the need for the user to perform multiple tasks in order to tear the sealing element to open the containers.

[0024] Furthermore, the present invention allows the sealing elements to be manufactured without the need to be thicker than necessary, thereby serving only as a barrier element. Consequently, it eliminates the need for the sealing elements to be more resistant to avoid accidental ruptures, as currently observed. These and other advantages will be immediately realised from the detailed description of the invention that will be made hereafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The invention will be better understood from the detailed description made hereafter with respect to the attached drawings, in which:

[0026] FIGS. **1**A, **1**B and **1**C respectively depict an upper perspective view, an upper perspective view in partial cut and a lower perspective view, in partial cut, of a first embodiment of the automatic opening device for containers according to the present invention;

[0027] FIG. **2** depicts an upper perspective view of the automatic opening device for containers shown in FIGS. **1**A, **1**B, **1**C, in a situation where the closing element of the device is in the open position;

[0028] FIG. **3** depicts an upper perspective view of a threaded spout provided in a container, with a sealing element being provided at the rim of the spout;

[0029] FIGS. **4**A, **4**B, **4**C and **4**D depict frontal views of the automatic opening device for containers depicted in FIGS. **1**A, **1**B, **1**C and **2**, in partial cut, showing a sequence for the application of the device in the spout depicted in FIG. **3**;

[0030] FIG. **5** depicts a front cutting view of a Detail X shown in FIG. **4**D;

[0031] FIGS. **6**A, **6**B, **6**C and **6**D depict upper perspective views of the automatic opening device for containers depicted in FIGS. **1**A, **1**B, **1**C and **2**, in partial cut, showing a sequence of operations for opening the container using the device for cutting the sealing element provided at the rim of the spout shown in FIG. **3**;

[0032] FIG. **7** depicts a front cutting view of the Detail Y depicted in FIG. **6**D;

[0033] FIGS. **8**A and **8**B depict front views of a first variation of the automatic opening device for containers shown in FIGS. **1**A, **1**B, **1**C and **2**;

[0034] FIGS. **9**A, **9**B, **9**C and **9**D depict front views of a second variation of the automatic opening device for containers shown in FIGS. **1**A, **1**B, **1**C and **2**;

[0035] FIGS. **10** and **11** depict, respectively, a front view of a third variation of the automatic opening device for containers shown in FIGS. **1**A, **1**B, **1**C and **2**, and an upper perspective view for a spout to which this variation of the automatic opening device for containers must be applied;

[0036] FIGS. **12**A, **12**B and **12**C depict front views in partial cut of a fourth variation of the automatic opening device for containers shown in FIGS. **1**A, **1**B, **1**C and **2**;

[0037] FIGS. **13**A and **13**B depicts respectively, an upper perspective view, and an upper cutting view of a fifth variation of the automatic opening device for containers;

[0038] FIGS. **14**A, **14**B, **14**C and **14**D depict, respectively, an exploded front view, an exploded upper perspective view in partial cut, a lower perspective view and an upper perspective view, showing a spout adapter device intended to serve as an interface for the application of an automatic opening device for containers in a spout of a container provided with an external screw thread different from the internal screw thread of the automatic opening device for containers;

[0039] FIG. **15** depicts an upper perspective view, in cut, in which the assembly of the automatic opening device for containers in the spout adapter device depicted in FIGS. **14**A, **14**B, **14**C and **14**D can be seen;

[0040] FIG. **16** depicts a front view of a variation of the spout adapter device of FIGS. **14**A, **14**B, **14**C and **14**D;

[0041] FIGS. **17** and **18** depict top perspective views, in cut, showing the assembly formed by the automatic opening device for containers applied to the spout adapter device before and after being applied to a container, respectively;

[0042] FIGS. **19**A, **19**B and **19**C depict, respectively, an exploded front view, in partial cut, and an upper perspective view, in partial cut, and a front view, in which an alternative embodiment of the spout adapter device is shown;

[0043] FIG. **20** shows an upper cutting perspective view of the spout adapter device of FIGS. **19**A and **19**B applied to the automatic opening device for containers;

[0044] FIGS. **21** and **22** show upper perspective views, in cut, of the assembly depicted in FIG. **20**, before and after the assembly is applied to a spout, respectively;

[0045] FIGS. **23**A, **23**B and **23**C depict, respectively, a perspective view, a partial cutting perspective view and a lower perspective view, in partial cut, of a further embodi-

ment of the invention according to the teachings of the present invention, showing an automatic opening device for containers to be applied to the spout of a container by means of a bayonet type connection;

[0046] FIG. **24** shows an upper perspective view of the automatic opening device for containers of FIGS. **23**A, **23**B and **23**C, in which the closing element is open;

[0047] FIGS. **25**A and **25**B depict a front view and a partial cutting front view showing the automatic opening device for containers of FIGS. **23**A, **23**B and **23**C in a position immediately prior to the beginning of its application to a spout;

[0048] FIG. **26**A depicts a front view of the automatic opening device for containers of FIGS. **23**A, **23**B and **23**C applied to the spout of a container, and FIG. **26**B depicts a front view of the automatic opening device for containers after a user has started the operation for opening the container;

[0049] FIG. **27** depicts an exploded perspective view of a variation of the automatic opening device for containers of FIGS. **23**A, **23**B and **23**C in which the lower portion of a guiding and locking device of the automatic opening device for containers is provided with an internal screw thread;

[0050] FIGS. **28**A and **28**B depict upper perspective views showing alternative embodiments for the guiding and locking device for the automatic opening device for containers of FIGS. **23**A, **23**B, **23**C and **27**;

[0051] FIGS. **29**A, **29**B, **30**A and **30**B depict partial cutting front views showing variations in the application of different types of screw threads to the guiding and locking device and to the automatic opening device for containers of FIGS. **23**A, **23**B, **23**C, **27**, **28**A and **28**B;

[0052] FIGS. **31**A and **31**B depict, respectively, a front partial cutting view and a front perspective cutting view, in which an additional embodiment of an automatic opening device for containers according to the teachings of the present invention is shown, in which said device is shown disconnected from a spout;

[0053] FIGS. **31**C and **31**D depict frontal partial views of the automatic opening device for containers shown in FIGS. **31**A and **31**B, showing different stages of application of the device in a spout;

[0054] FIG. **31**E depicts a front partial view of the automatic opening device for containers shown in FIGS. **31**A and **31**B after being activated to open a container;

[0055] FIGS. **32**A and **32**B depict respectively an upper perspective view and an upper partial cutting perspective view of an automatic opening device for containers whose base element is provided with a pouring device;

[0056] FIG. **33** depicts an automatic opening device for containers whose base element is provided with a protruding plugging element whose upper portion is sealed;

[0057] FIGS. **34**A and **34**B depict perspective views showing a rotational locking system of the external screw thread flanks of the automatic opening device for containers of the invention;

[0058] FIG. **35** shows an upper perspective view of a further embodiment of the automatic opening device for containers in a situation where the closing element of the device is in the open position;

[0059] FIG. **36** depicts an upper perspective cutting view of the automatic opening device for containers depicted in FIG. **35**, in a situation where the device is applied to a spout of a container and the closing element of the device is in the open position;

[0060] FIG. **37** depicts a lower perspective cutting view of the automatic opening device for containers depicted in FIG. **35**, in a situation where the device is applied to a spout of a container and the closing element of the device is in the open position;

[0061] FIG. **38** depicts an upper perspective view of a variation of the throughout orifice of the fourth embodiment of the automatic opening device for containers depicted in FIG. **35**, in a situation where the closing element of the device is in the open position;

[0062] FIG. **39** depicts a perspective view, in partial cut, of an additional embodiment of an automatic opening device for containers object of the present invention;

[0063] FIGS. **40** and **41** depict frontal views, in partial cut, showing phases of operation of the application of the automatic opening device for containers of FIG. **39** being applied to a container;

[0064] FIG. **42** depicts a perspective view, in partial cut, of the automatic opening device for containers of FIG. **39** at the end of its application to the container;

[0065] FIG. **43** depicts a front view, in partial section, of the automatic opening device for containers of FIG. **39**, in a situation where the device was activated by a user to tear the sealing element of the spout of the container; and

[0066] FIGS. **44** and **45** depict perspective views, in partial cut, in which the closing element of the device is in the open and closed positions, respectively.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0067] In the following specification regarding embodiments of the invention, similar components will always be mentioned and indicated in the Figures by the same indicative numerals. Terms like "upper", "lower", "vertical" and "horizontal" used in this description refer specifically to the position in which elements, parts, portions, regions, etc. are depicted in the Figures. FIGS. **1**A, **1**B, **1**C and **2** depict a first embodiment of the automatic opening device for containers **1** according to the present invention. As can be seen in the Figures, the automatic opening device for containers **1** comprises a closing element **1***a*, a base element **1***b* and a locking device **6**. The terms "container" and "packaging" may be used in this specification in a interchangeable manner.

[0068] In the embodiment depicted in these Figures, the closing element **1***a*, in the closed position, engages into the base element **1***b*, as depicted in FIG. **1**A, and both are connected to each other by means of a pivoting connection element **7**, as shown in more detail in FIG. **2**.

[0069] There are variations of this type of pivoting connection, which can be used interchangeably in conjunction with the present invention. In addition, any other type of connection means can be used to connect the closing element **1***a* to the base element **1***b*, and there may not even be any connection means between them, and the connection between these two parts could be made by pressure or screwing, for example.

[0070] The base element **1***b* comprises a first sidewall **11**, in the form of an elongated cylindrical body, and a top element **10**, circular in shape and whose edges are joined to the upper edge of the first sidewall **11**. A central protruding

ring **2** is provided in the upper central portion of the top element **10**, which encircles a throughout orifice **2***a*. The closing element **1***a* comprises a second sidewall **9** in the form of an elongated cylindrical body and an upper element **8**, circular in shape and whose edges are joined to the upper edge of the second sidewall **9**.

[0071] A protruding sealing element **4** is provided in the inner central portion of the upper element **8** of the closing element **1***a*. The sealing protruding element **4** is designed to house into the protruding ring **2** and to close the throughout orifice **2***a* of the base element **1***b* when the closing element **1***a* and the base element **1***b* are closed.

[0072] Preferably the automatic opening device for containers **1** is designed so that the second sidewall **9** of the closing element **1***a* and the first sidewall **11** of the base element **1***b* have substantially equal outside diameters when closed, as shown in FIG. **1**A. In order for this to occur, the top element **10** of the base element **1***b* must be provided with a recess in the region of its edge at which it connects to the first sidewall **11**, to form a engaging annular ring region **10***a*. Thus, when the closing element **1***a* is in the closed position, the lower region of the second sidewall **12** will fit into that engaging annular ring region **10***a*, as can be seen in FIG. **1**B.

[0073] This feature is only intended to facilitate the manipulation of the automatic opening device for containers **1** by users, but it is not essential for the functionality of the device. The embodiments of the closing element **1***a* and the base element **1***b* can be different from those depicted in the Figures, without, however, changing the functionality of these components for the adequate operation of the automatic opening device for containers **1**. The automatic opening device for containers **1** can even be provided without a closing element **1***a* as shown in the Figures, as the automatic opening device for containers **1** will operate normally even being not provided with this component, as will be seen hereafter.

[0074] An internal screw thread **5** is provided in the inner portion of the first sidewall **11** of the base element **1***b*. In the embodiment depicted in the Figures, the internal screw thread **5** comprises an internal orientation screw thread to the right of three entries, depicted in the Figure by means of three internal screw thread flanks **5**. The internal screw thread **5** may comprise a screw thread with any number of entries and consequently, and so the invention is not limited to the use of an internal screw thread **5** with three entries.

[0075] In the present description, a three entries screw thread was chosen only as an exemplary embodiment of the invention, although the use of a multiple entry screw thread is more suitable for the purposes of the invention, as will be seen hereafter. The internal screw thread **5** can be indistinctly oriented to the right, as shown in the Figures, or oriented to the left. Hereinafter the expressions "internal screw thread **5**" and "internal screw thread flanks **5**" will be used as a common reference for this internal screw thread.

[0076] A cutting device **3** is provided in the inner portion of the top element **10**, which comprises a hollow protruding body whose upper portion is connected to the lower portion of the top element **10**, in the region where the throughout orifice **2***a* is located, the latter being a continuation of the hollow portion of the cutting device **3**. The lower portion of the cutting device **3** is provided with a plurality of cutting elements **3***a*. In FIG. **1**B, this cutting device **3** does not appear in cut so as to enable it to be totally seen.

[0077] The locking device **6** comprises an elongated substantially cylindrical body provided at its upper edge with a plurality of upper rupture elements **6***a*, which are connected to the lower edge of the base element **1***b*, as can be seen in more detail in FIG. **1**C. A plurality of lower locking elements **6***b* is provided in the lower internal portion of the locking device **6**. The lower locking elements **6***b* comprise tabs distributed circularly and spaced apart, the lower portion of each lug being joined to the lower region of the locking device **6** and the body of each lug being tilted towards the geometric axis of the locking device **6**. The lower locking elements **6***b* are designed so that they can undergo small radial bends towards the inner wall of the locking device **6**.

[0078] Other embodiments of lower locking elements **6***b* can be used and, therefore, the invention is not limited to the embodiment depicted in FIGS. **1**B and **1**C. The function of the upper rupture elements **6***a* and the lower locking elements **6***b* will also be seen hereafter in the description that will be made of the operation of applying the automatic opening device for containers **1** to a spout.

[0079] FIG. **3** depicts a container **20** provided with a spout **12**, depicted in the Figure only by its upper part. The spout **12** comprises an elongated cylindrical body **13** provided with an external screw thread **14**, in the present case, a right hand screw thread with three entries, which comprises a lower flank **14***a* and an upper flank **14***b*, with a root **15** formed between these two flanks. It can be seen in FIG. **3** that the upper flank **14***b* of the external screw thread **14** has an upper end **21** which extends over the upper ring **16**, while the lower flank **14***a* has its upper end even with the lower portion of the upper ring **16**, to facilitate the screwing of the internal screw thread flanks **5** on the root **15**, as will be seen hereafter.

[0080] The choice of an external right oriented screw thread, with three entries, is exclusively due to the fact that this is the embodiment used in the internal screw thread flanks **5** of the base element **1***b*. The same above comments are valid here, in which the use of a right hand screw thread with three entries is only a possibility to carry out the invention, which evidently is not limited to the use of a screw thread of three entries, as well as the screw thread may be right or left hand oriented. Thus, the external screw thread **14** can be a screw thread with any number of entries, and its orientation can be indistinctly to the right, as shown in FIG. **3**, or to the left, as long as it is compatible with the screw thread used in the internal screw thread **5**.

[0081] A sealing element **19** is affixed to the rim of the spout **12**. The elongated cylindrical body **13** of the spout **12** is also provided in its outer portion with an upper ring **16**, an intermediate ring **18** and a lower ring **17**, located in the upper, intermediate and lower regions, respectively. The diameter of the upper ring **16** is smaller than the diameter of the intermediate ring **18**, and the diameter of the intermediate ring **18** is smaller than the diameter of the lower ring **17**, as can be seen in FIG. **3**.

[0082] FIGS. **4**A, **4**B, **4**C and **4**D show a sequence of a process for applying the automatic opening device for containers **1** to the spout **12** of the container **20** provided with a sealing element **19**. In order to facilitate the description of the steps of the process for applying the automatic opening device for containers **1** in the spout **12** the internal screw thread flanks **5** of the base element **1***b* located in the front portion of the device for the automatic opening device for containers **1** were not cut.

[0083] For the sake of simplification of the Figures, in the description of the process for the application of the automatic opening device for containers **1** to the spout **12** the tools used for this operation will not be represented, whichever are the tools used in this operation. The arrows W depicted in FIGS. **4**A, **4**B, **4**C and **4**D indicate the direction of the operation to apply the automatic opening device for containers in the spout **12** of the container **20**.

[0084] The application of the automatic opening device for containers **1** to the spout **12** is made by means of making the lower part of the automatic opening device for containers **1** to exert a downward longitudinal movement against the upper part of the spout **12**, as shown in the Figures. In this process a slight interference may occur between some component parts of the automatic opening device for containers **1** and component parts of the spout **12** at the time of assembly.

[0085] Consequently, the automatic opening device for containers **1** must be made of a relatively resilient material, a thermoplastic, for example, and so, elements of the automatic opening device for containers **1** located in regions where occur interference with elements of the spout **12** undergo temporary elastic deformations, thereby allowing the continuity of the process to apply the automatic opening device for containers **1** in the spout **12**.

[0086] An automatic opening device for containers **1** can be seen in FIG. **4**A, whose geometric axis is aligned with the geometric axis of the spout **12**, in a position to start the operation to apply the automatic opening device for containers **1** to the nozzle **12**. In FIG. **4**B the automatic opening device for containers **1** is depicted in a position immediately before the beginning of its engagement to the spout **12**. In FIG. **4**C the automatic opening device for containers **1** is almost completely engaged in the spout **12**. It is important to observe in this Figure that the lower regions of the lower locking elements **6***b* of the locking device **6** initiate contact with the upper face of the intermediate ring **18**.

[0087] With the continuity of the longitudinal downward movement of the automatic opening device for containers **1** in relation to the spout **12**, the lower locking elements **6***b* of the locking device **6** will be outwardly pressed by the edge of the intermediate ring **18**, and consequently will tend to incline outwardly towards the internal wall of the locking device **6**, which will allow the continuity of the downward longitudinal movement of the automatic opening device for containers **1**.

[0088] After the lower locking elements **6***b* of the locking device **6** move past the intermediate ring **18** they will return to the regular position, in that they are projected towards the geometric axis of the locking device **6**, as depicted in FIG. **4**D, and shown in more detail in FIG. **5**, which depicts a Detail X indicated in FIG. **4**D. As a result, the lower locking elements **6***b* will prevent longitudinal upward movements of the automatic opening device for containers **1**, which will then be kept in that position.

[0089] The downward longitudinal movement of the automatic opening device for containers **1** ceases when the lower edge of the locking device **6** touches the upper surface of the lower ring **17**, as shown in FIG. **4**D, whereby the process of applying the automatic opening device for containers **1** to the spout **12** is completed. Observe in FIG. **4**D that at the end of this downward longitudinal movement of the automatic opening device for containers **1**, the internal screw thread flanks **5** are in a position in which they can be screwed to the screw thread **14** of the spout **12**, as will be seen hereafter. The container **20** will then be ready for sale.

[0090] FIGS. **6**A, **6**B, **6**C and **6**D depict upper perspective views, in partial cut, showing a sequence of the process for opening the container **20** by means of the automatic opening device for containers **1**. In order to facilitate the description of the process, and likewise what occurred in the description of the process for applying the device to the spout **12** shown in FIGS. **4**A, **4**B, **4**C and **4**D, the internal screw thread flanks **5** of the base element **1***b* had not been cut in FIGS. **6**A, **6**B, **6**C and **6**D. The cutting device **3** also does not appear in cut, thereby making possible to see it in its entirety.

[0091] In FIG. **6**A the automatic opening device for containers **1** is depicted in the final position after being applied to container **20**, an operation carried out in a factory. In order to start the process to open the container **20** a user must apply a clockwise rotary movement to the upper portion of the automatic opening device for containers **1**, formed by the closing element **1***a* and the base element **1***b*, as indicated by the circle T in the Figures.

[0092] This clockwise rotary movement will cause the upper rupture elements **6***a* of the locking device **6** to rupture, as indicated by the circles R in FIG. **6**B, and consequently, the assembly formed by the closing element **1***a* and the base element **1***b* will begin to rotate clockwise. In the continuity of this clockwise rotary movement, the entry tips **5***a* of the internal screw thread flanks **5** will run along the upper face of the upper ring **16**, until they meet the upper end **21** of the upper flank **14***b* of the screw thread **14**, as can be seen in FIG. **6**B.

[0093] Next, with the continuity of the rotational movement, the entry tip **5***a* of each internal screw thread **5** will begin to enter the root **15** of the external screw thread **14**, as can be seen in FIG. **6**B. Following this rotary movement, the internal screw thread flanks **5** will displace along the roots **15** of the external screw thread **14**. This rotary movement will cause a downward axial displacement of the automatic opening device for containers **1**, as indicated by the arrows Z in FIGS. **6**B, **6**C and **6**D. The combination of the two movements, rotation and downward axial displacement, will cause the cutting elements **3***a* of the cutting device **3** to cut the sealing element **19** affixed to the upper edge of the spout **12**, as can be seen in FIG. **6**C.

[0094] The rotational movement of the automatic opening device for containers **1** in a clockwise direction will cease when the edge of the spout **12**, to which the sealing element **19** is attached, touches the lower region of the top element **10** of the base element **1***b*. This will cause a compression between the top element **10** of the base element **1***b* and the edge of the spout **12**, thereby contributing to cause a sealing in this area of compression, as can be seen in FIG. **6**D.

[0095] FIG. **7** depicts an upper rupture element **6***a* which was torn at the beginning of the rotary movement of the automatic opening device for containers **1**, part of the rupture element **6***a* being attached to the inner portion of the upper edge of the locking element **6**, as shown in the upper part of the drawing, and the remaining part keeping attached to the inner portion of the lower edge of the base element **1***b*, as shown in the lower part of FIG. **7**, indicated by the ellipses S.

[0096] At the end of the rotary movement of the automatic opening device for containers **1** in a clockwise direction, causing it to make a downward axial movement, the cutting elements **3***a* of the cutting device **3** had already made the

tearing of the sealing element **19**. Consequently, the product into the container **20** can be poured through the protruding hollow body of the cutting device **3** and the throughout orifice **2***a*, pivoting first the closing element **1***a* to enable the product stored in the container **20** to pass through the throughout orifice **2***a*.

[0097] Preferably both the outer face of the second sidewall **9** of the closing element **1***a* and the outer face of the first sidewall **11** of the base element **1***b* of the automatic opening device for containers **1** are provided with means that increase the friction coefficient thereof, consequently facilitating the handling of the automatic opening device for containers **1** by users.

[0098] The process of opening the container **20** described hereinbefore requires the users to turn clockwise the automatic opening device to open the container **1**. This may cause some confusion to the users, as clockwise is usually the direction of rotation for closing caps of containers, which mostly use threaded spouts with screw threads right hand oriented.

[0099] In order to prevent users from rotating the automatic opening device for containers **1** in the wrong direction, it is necessary to place instructions on the top face of the closing element **1***a* so that the initial rotation is made in a clockwise direction, in order to ensure the perfect functioning of the automatic opening device for containers **1**. For example, a circular arrow with the tip indicating the correct direction of rotation can be used to open the container. In addition, it can be included some written instructions that explain the correct direction of rotation.

[0100] However, it may still occur situations in that careless users do not observe the instructions on the upper face of the closing element **1***a* and, being used to turning caps counterclockwise to open containers, then perform a rotation on the automatic opening device for containers **1** in the counterclockwise direction. In order to avoid this problem, variations of the first embodiment of the automatic opening device for containers **1** will be described hereafter in order to prevent this improper handling from occurring.

[0101] FIG. **8**A depicts a first variation of the automatic opening device for containers **1**, in which the internal screw thread flanks **5** are bipartite, and comprise an upper section **5***s* and a lower section **5***i*. The intermediate portion of each internal screw thread **5** was removed, as can be seen in FIG. **8**A.

[0102] It can be seen in FIG. **8**A that a guiding element **22** is provided in the external portion of the elongated cylindrical body **13** of the spout **12** and extends parallel to the upper edge of the spout **12**. In this variation, the upper end **21** of the upper flank **14***b* of the external screw thread **14** extends up to the guiding element **22**, as can be seen in FIG. **8**A. As a result, a limiter of rotation **23** is formed between the upper end **21** of the upper flank **14***b* and the guiding element **22**.

[0103] If a user inadvertently applies a counterclockwise rotation to the upper portion of the automatic opening device for containers **1**, formed by the closing element **1***a* and the base element **1***b*, then the lower sections **5***i* of the internal screw thread flanks **5** will move over the upper face of the upper ring **16** until they engage the limiter of rotation **23**, as shown in FIG. **8**B. Consequently, the user will no longer be able to turn the automatic opening device for containers **1** counterclockwise.

[0104] This will then cause the user to direct his attention to the automatic opening device for containers **1**, and consequently the user will notice the instructions for the correct direction of rotation, making him/her rotate the automatic opening device for containers **1** in the correct direction (clockwise), to open the container.

[0105] FIG. **9**A depicts a front partial cutting view of a second variation of the automatic opening device for containers **1**, in which the upper end **21** of the internal screw thread flanks **5** extend beyond the upper ring **16** to a shorter extent than the length observed in FIGS. **4**A, **4**B, **4**C and **4**D, and the lower flank **14***a* has its upper end facing with the lower portion of the upper ring **16**, as can be seen in FIG. **9**A. In this variation, the locking elements **6***b* of the locking device **6** are designed in such a way that their upper ends maintain a gap in relation to the lower face of the intermediate ring **18**, as indicated by the circles P in FIG. **9**A.

[0106] If a user inadvertently applies a counterclockwise rotation to the upper portion of the automatic opening device for containers **1**, formed by the closing element **1***a* and the base element **1***b*, then the entry tips **5***a* of the internal screw thread flanks **5** will approach the upper ends **21** of the upper flanks **14***b* of the external screw thread **14**.

[0107] When the entry tips **5***a* contacts the upper ends **21** of the upper flanks **14***b*, as shown in FIG. **9**A, the user will feel a resistance to the continuity of the rotation. If the user still persists in turning counterclockwise, the gap between the upper ends of the locking elements **6***b* of the locking device **6** in relation to the lower face of the intermediate ring **18** will then enable the entry tips **5***a* of the internal screw thread flanks **5** to move past the upper end **21** of the upper flanks **14***b*, as shown in FIG. **9**B.

[0108] With the continuation of the undue rotary movement in a counterclockwise direction, the entry tips **5***a* of the internal screw thread flanks **5** will then move past the upper ends **21** of the upper flanks **14***b*, and consequently the entry tips **5***a* will return to displace on the upper face of the upper ring **16**, as shown in FIG. **9**C.

[0109] The passage of the entry tips **5***a* over the upper ends **21** of the upper flanks **14***b* will produce a noise, which should alert the user that something has not been done correctly. This should compel the user to direct his attention to the automatic opening device for containers **1**. Consequently, the user will then notice the instructions regarding the correct direction of rotation, and will then be able to rotate the automatic opening device for containers **1** in the correct clockwise direction to open the container.

[0110] Note that the clearance between the upper ends of the locking elements **6***b* of the locking device **6** in relation to the lower face of the intermediate ring **18** must be designed so that it is sufficient to allow the internal screw thread flanks **5** to move past the upper end **21** of the upper flanks **14***b*.

[0111] For this aim, it is necessary that the gap has an extension greater than the vertical extension H that the upper ends **21** of the upper flanks **14***b* raise beyond the upper ring **16**, as shown in FIG. **9**B. Therefore, in the event that the user applies an anti-clockwise rotation to the upper portion of the automatic opening device for containers **1**, the gap between the upper ends **21** of the upper flanks **14***b* in relation to the lower face of the intermediate ring **18** will always allow that the upper ends **21** of the upper flanks **14***b* may extend beyond the upper ring **16**, as can be seen by the circles T shown in FIG. **9**B.

[0112] If the noise from the passage of the entry tips **5***a* over the upper ends **21** of the upper flanks **14***b* was not sufficient to show the user that something was not done correctly, the continuation of the counterclockwise rotation will cause the automatic opening device for containers **1** to keep rotating without any linear or vertical displacement, as it will not occur engagement of the internal screw thread flanks **5** in the roots **15** of the external screw thread **14**, which will certainly indicate to the user that something is not being made correctly, and will lead him/her to finally observe the instructions on the upper face of the closing element **1***a* in that the rotation must be made in a clockwise direction in order to cause the opening of the container.

[0113] FIG. **9**D depicts another variation of the automatic opening device for containers **1**, similar to the variation depicted in FIGS. **9**A, **9**B and **9**C, in which the only difference is that the locking device **6** is provided with a circular wing **6***e* at its lower portion, the latter extending from the end of the locking device **6**, completely encircling the lower ring **17**, as can be seen in FIG. **9**D.

[0114] In this variation of the invention there is a gap between the upper ends of the locking elements **6***b* of the locking device and the lower face of the intermediate ring **18**, thereby allowing some clearance for longitudinal movements of between the automatic opening device for containers **1** and the spout **12**. The circular wing **6***e* is intended to prevent anyone from inserting any object between the locking device **6** and the upper face of the lower ring **17** in order to unduly disconnect the automatic opening device for containers **1** from the spout **12**.

[0115] FIG. **10** depicts a third variation of the first embodiment of the automatic opening device for containers **1**. In this variation, the internal screw thread flanks **5** comprise a left hand oriented screw thread, this being the only difference between the first embodiment and this variation.

[0116] Consequently, it will be necessary in this variation of the first embodiment of the invention that the spout **12** be provided with an external screw thread **14** with left hand orientation, as shown in FIG. **10**. FIG. **11** depicts in more detail this spout with left angle orientation.

[0117] The process for applying the automatic opening device for containers **1** having internal screw thread flanks **5** with left angle orientation to the spout **12** will be exactly the same as previously described in relation to FIGS. **4**A, **4**B, **4**C and **4**D, and the only difference in the process of opening the container **20** in relation to what was previously described in relation to FIGS. **6**A, **6**B, **6**C and **6**D is that in this variation users must rotate counterclockwise the automatic opening device for containers **1** to open the container **20**.

[0118] This is the great advantage in using this variation of the first embodiment of the invention, because in this case, users will have to rotate the device in a counterclockwise direction of rotation, which is what they are used to do for opening containers with screw-threaded caps, because most of the containers are provided with right hand orientated screw threads.

[0119] This means that, although a left hand orientated screw thread is used in this variation of the invention, users will hardly notice any difference from the regular right hand oriented threaded caps and threaded spouts. In other words, as usually the action for opening a cap is associated with a counterclockwise rotation, users will not be surprised with the need to apply a counterclockwise rotation to the automatic opening device for containers **1** to open container **20**.

[0120] Notice that in the present specification the expression "open the container" means to tear the sealing element that is applied to the rim of the spout of a container to protect its contents, thereby allowing the product into the container to be removed. Notice that, according to the teachings of the invention, once the user has opened the container, there is no need to execute any further action, and the product stored in the container can be served immediately.

[0121] In other words, it is a one-step procedure, differently from what is observed nowadays, in that users need to execute some more steps, usually three, in order to start using the product stored in the container, namely, the steps to unscrew and remove the cap from the spout, then manually remove the sealing element, and next screw back the cap on the spout.

[0122] It is also important to mention that this third variation can be combined with any of the previous variations of the first embodiment of the invention described hereinbefore, being only necessary to make some modifications due to the use of a left hand oriented screw thread.

[0123] FIGS. **12**A, **12**B and **12**C depict front views, in partial cut, of a fourth variation of the automatic opening device for containers depicted in FIGS. **1**A, **1**B, **1**C and **2**. The difference observed in this variation is the provision of a locking device **6'** of lesser longitudinal extension, as can be seen in the Figures, due to a partial screwing of the internal screw thread flanks **5** in the roots **15** of the external screw thread **14**, as will be noted from the following description made in the next paragraphs.

[0124] The locking device **6'** comprises an elongated and substantially cylindrical body provided at its upper edge with a plurality of upper rupture elements **6***a'*, as can be seen in more detail in FIG. **12**A, the upper rupture elements **6***a'* being connected to the lower edge of the base element **1***b*. A plurality of lower locking elements **6***b'* is provided in the lower inner portion of the locking device **6'**.

[0125] An automatic opening device for containers **1** with the same characteristics described above in relation to the device shown in FIGS. **1**A, **1**B, **1**C and **2** is depicted in the FIGS. **12**A, **12**B and **12** C, as well as it is depicted the same spout **12** previously described in relation to said FIGS. **1**A, **1**B, **1**C and **2**. Consequently, there is no need to repeat here the description of the constituent parts of both the automatic opening device for containers **1** and the spout **12**.

[0126] The same comments regarding the characteristics of the internal screw thread **5** and the external screw thread **14** apply to the fourth variation of the automatic opening device for containers depicted in FIGS. **12**A, **12**B and **12** C. In these Figures the internal screw thread **5** and the external screw thread **14** comprise screw threads of multiple entries of right hand orientation. However, single or multiple screw threads having right or left hand orientation can be used.

[0127] The application of this fourth variation of the automatic opening device for containers **1** to the spout **12** is made at a factory, by means of an equipment not shown in the Figures, which executes a sequential pressing and rotating process. Initially, a downward longitudinal movement is applied to the automatic opening device for containers **1**, as indicated by the arrow M in FIG. **12**A, whereby the lower part of the automatic opening device for containers **1** is pressed against the upper part of the spout **12** until the lower

regions of the lower locking elements **6***b*' touch the upper region of the intermediate ring **18**.

[0128] Next, a rotational movement is applied to the automatic opening device for containers **1**, as indicated by the circle N in FIG. **12**B, whereby the inner screw thread flanks **5** of the base element **1***b* engage the roots **15** of the external screw thread **14** of the spout **12**. With the continuation of this rotational movement, the lower locking elements **6***b*' will be forced against the edge of the intermediate ring **18**, and consequently the lower locking elements **6***b*' will retract outwardly towards the inner wall of the locking device **6**', until they move past totally the lower edge of the intermediate ring **18**. From this moment on, the lower locking elements **6***b*' will hamper the application of rotational movements to the automatic opening device for containers **1**, thereby preventing it from being unscrewed from the spout **12**.

[0129] The rotary movement for screwing the automatic opening device for containers **1** in the spout **12** will cease when the lower region of the locking device **6**' touches the upper region of the lower ring **17**, as can be seen in FIG. **12**C. With that, the container will be ready for sale. Note in FIG. **12**C the partial engagement of the internal screw thread flanks **5** in the roots **15** of the external screw thread **14**.

[0130] When a user starts to open the container **20**, he/she must apply a rotational movement to the automatic opening device for containers **1**, applying a torque enough to break the upper rupture elements **6***a*', thereby allowing the internal screw thread flanks **5** to displace along the roots **15** of the external screw thread **14**. This screwing movement will cause the cutting elements **3***a* of the cutting device **3** to tear the sealing element **19** of the spout **12**, thereby opening the container and allowing the product stored inside the container to be served.

[0131] The reduction of the longitudinal extension of the locking device **6**', if compared with the longitudinal extension of the locking device **6**, occurs due to the characteristic of the partial engagement of the internal screw thread flanks **5** in the roots **15** of the external screw thread **14** in the fourth variation of the automatic opening device for containers.

[0132] The lower locking elements **6***b*' must be designed to make them strong enough to preclude any attempt to unscrew the automatic opening device for containers **1** in the spout **12**, especially if right hand oriented screw threads are used in the internal screw thread flanks **5** and in the external screw thread **14**. In this case, as the normal habit of users is to apply a counterclockwise movement in a cap to open a container, the difficulty users would face to apply a counterclockwise rotary movement to the automatic opening device for containers **1** would serve to draw their attention to the remarks in the upper region of the closing element **1***a*, which indicate that the correct rotational movement must be in a clockwise direction to open the container.

[0133] In case a spout **12** as shown in FIG. **11** was used, having an external left hand orientated screw thread, in this case it will suffice for a user to, to open the container the user to apply a counterclockwise rotational movement to the automatic opening device for containers **1** to open the container **20**. As counterclockwise rotational movement is what users are used to applying to a cap for unscrewing it from a threaded spout that are provided with right hand oriented screw threads, consequently users would easily apply the rotary movement correctly, and probably would not even realise that the threaded spout of the container is provided with a left hand oriented screw thread.

[0134] FIGS. **13**A and **13**B depict, respectively, an upper perspective view and an upper cutting perspective view of a fifth variation of the automatic opening device for containers **1**, in which the base element **1***b* is provided with a suction spout **24**, which comprises a hollow body which extends above the base element **1***b* and encircles the throughout orifice **2***a*. In this variation, the suction spout **24** is provided at its upper end with a mouth ring **24***a*, and the protruding sealing element **4** of the upper element **8** of the sealing element **1***a* is designed to house in the mouth ring **24***a* and to close the throughout orifice **2***a* of the base element **1***b* when the closing element **1***a* and the base element **1***b* are closed.

[0135] Containers provided with suction spouts are normally used to store liquids that are usually consumed by users when they are on the move, cases of cyclists, long-distance runners or even people who prefer to consume the product stored in the container while on the move

[0136] In this fifth variation of the first embodiment of the invention, the assembling of the automatic opening device for containers **1** and the opening of the container **20** are carried out exactly in the same manner as described hereinbefore, since all the other components of this variation are the same as previously described.

[0137] Note that this fifth variation can be combined with any of the variations of the first embodiment of the invention described herein before. If it is made a combination of the third variation with the fifth variation, it will only be necessary to make the necessary to make some modifications due to the use of a left hand oriented screw thread.

[0138] FIGS. **14**A and **14**B respectively depict a front view, in partial cut, and a upper perspective view, in partial cut, which show details of a spout adapter device intended to serve as an interface for the application of an automatic opening device for containers **1** in a spout provided with an external screw thread which is different from the internal screw thread of the automatic opening device for containers **1**. A sealing element **19** is affixed to the rim of the spout **26**. External upper end of the spout **26** is provided with an external screw thread **30**, a retaining ring being located below the external screw thread **30**.

[0139] The automatic opening device for containers **1** depicted in FIGS. **14**A and **14**B is substantially similar to the one that has been described regarding FIGS. **4**A, **4**B, **4**C and **4**D, and therefore it is not necessary to repeat the description herein. Any of the previous variations of the automatic opening device for containers **1** described hereinbefore could have been depicted in FIGS. **14**A and **14**B, which would normally operate in conjunction with the spout adapter device **25**, meaning that there are no limitations for the use of any type of automatic opening device for containers **1** in conjunction with the spout adapter device **25**.

[0140] The lower external region of the spout **26** is provided with a base ring **28**, larger in diameter than the retaining ring **33**. The external screw thread **30** depicted in FIGS. **14**A and **14**B has a shape different from the internal screw thread **5** of the automatic opening device for containers **1**. In the Figures is depicted a screw thread of a single entry, having a right hand orientation, although other types of screw threads could be used, such as, for example, a multiple entry screw thread and/or a left hand oriented screw thread.

[0141] As can be seen in FIGS. **14**A, **14**B and **14**C, the spout adapter device **25** comprises an upper portion **25***s* rigidly connected to a lower portion **251**, of larger diameter, both being substantially cylindrical portions. The upper outer region of the upper portion **25***s* is provided with a protruding ring **25***c*, located near to the upper edge of the spout adapter device **25**, and an external screw thread **27**, the latter comprising a lower flank **27***a* and an upper flank **27***b*. A root **27***c* is formed between the lower flank **27***a* and the upper flank **27***b*. A three entries right hand oriented screw thread is shown in the FIGS. **14**A, **14**B and **14**C, merely for exemplification. However, a screw thread with any number of entries could be used.

[0142] As shown in FIG. **14**A, the upper flank **27***b* of the external screw thread **27** has an upper end **31** that extends beyond the protruding ring **25***c*, in order to facilitate the screwing of the external screw thread flanks **5** of the automatic opening device for containers **1** in the root **27***c*, as will be seen hereafter. Conversely, the lower flank **27***a* has the upper end leveled with the lower portion of the protruding ring **25***c*.

[0143] An internal screw thread **29** is provided in the inner region of the upper portion **25***s* of the spout adapter device **25**, as can be seen in FIGS. **14**B, **14**C and **14**D. This internal screw thread **29** is sized to engage the external screw thread **30** of the spout **26**, as will be seen hereafter. For the sake of facilitating visualization, an internal screw thread **29** of one entry is depicted in the Figures, although a multiple entry screw thread could be depicted.

[0144] The inner lower region of the lower portion **251** is provided with a plurality of lower locking elements **25***a*, each of them located in front of openings **25***b* formed in the lower portion **251**, as can be seen in the Figures. The lower locking elements **25***a* are similar to the lower locking elements **6***b* of the locking device **6**, and comprise circularly distributed and spaced apart lugs, the lower portion of each lug being joined to the lower region of the lower portion **251** of the spout adapter device **25**, and the body of each lug being tilted towards the geometric axis of the spout adapter device **25**.

[0145] The lower locking elements **25***a* are designed to be able to undergo small radial bends towards the inner wall of the spout adapter device **25** when it is connected to the spout **26**, as will be seen hereafter. Other locking means can be used to replace the lower locking elements **25***a*, provided that they are able to lock the spout adapter device **25** into the spout **26**.

[0146] The automatic opening device for containers **1** must be applied to the spout adapter device **25** by means of a pressing process, a downward longitudinal movement wherein the lower part of the automatic opening device for containers **1** is pressed against the top of the spout adapter device **25**, thereby causing a strong assembly between them. This application will be made in a factory.

[0147] Likewise what occurred in the process to apply the automatic opening device for containers **1** in the spout **12**, in relation to FIGS. **4**A, **4**B, **4**C and **4**D, in the pressing process to apply the automatic opening device for containers **1** against the upper part of the spout adapter device **25** there will be a slight interference between some component parts of the automatic opening device for containers **1** and component parts of the spout adapter device **25**. Therefore, the same observations made hereinbefore regarding FIGS. **4**A, **4**B, **4**C and **4**D are valid herein.

[0148] In this process of applying the automatic opening device for containers **1** on the spout adapter device **25**, the lower locking elements **6***b* of the locking device **6** will be pressed by the lower portion **251** of the spout adapter device **25**, and consequently will tend to incline towards the internal wall of the locking device **6**, which will allow the continuity of the downward longitudinal movement of the automatic opening device for containers **1**. FIG. **15** shows an upper perspective cutting view in which the automatic opening device for containers **1** can be seen in the spout adapter device **25**.

[0149] Preferably, the lower locking elements **6***b* of the locking device **6** should fit into the openings **25***b* formed in the lower portion **251** of the spout adapter device **25**, which are in front of the lower locking elements **25***a*. Thereby the lower locking elements **6***b* and the lower locking elements **25***a* will be facing each other, as shown in FIG. **15**.

[0150] FIG. **16** depicts a front view of the spout adapter device **25** showing an alternative embodiment for the lower portion **251** of the spout adapter device **25**, the latter in this embodiment being not provided with openings **25***b*. In this embodiment the upper region of the lower portion **251** is provided with a ring that protrudes in relation to the lower region of the lower portion **251**, thereby forming a retaining edge **25***r*, which will serve to retain the lower locking elements **25***a* soon after they move past the retention edge **25***r*, as shown in FIG. **16**, and especially in the circles K.

[0151] FIG. **17** depicts an assembly formed by the automatic opening device for containers land the spout adapter device **25** both already assembled each other in a position immediately prior to the beginning of the application of the assembly to the spout **26**. This application is made in a factory by means of a rotating applicator, not shown in FIG. **17**, which applies a clockwise rotation to the assembly, as indicated by circle G in the Figure.

[0152] Similarly to what occurred in the process to apply the automatic opening device for containers **1** in the spout adapter device **25**, or in the spout **12** depicted in FIGS. **4**A, **4**B, **4**C and **4**D, a slight interference will occur between some component parts of the spout adapter device **25** and component parts of the spout **26** during the process for applying the assembly comprising the automatic opening device for containers **1** and the spout adapter device **25** against the spout **26**. Therefore, the same observations made hereinafter are valid here.

[0153] Consequently, in this process the lower locking elements **25***a* of the spout adapter device **25** will be pressed by the edge of the retaining ring **33** and will tend to incline towards the inner wall of the spout adapter device **25**, thereby allowing the continuity of the downward longitudinal movement of the assembly formed by the automatic opening device for containers **1** and the spout adapter device **25**, until the process is finished.

[0154] FIG. **18** depicts the assembly formed by the automatic opening device for containers **1** and the spout adapter device **25** duly applied to the spout **26**. Notice that the lower locking elements **25***a* of the spout adapter device **25** had already passed over the retaining ring **33** of the spout **26** at the end of the process to apply said assembly to the spout **26**. Consequently, the container **20** will be ready to for sale, to be opened later by a user.

[0155] The operation to open the container **20** will be carried out in the same way as described previously regarding FIGS. **6**A, **6**B, **6**C and **6**D, and for that reason the

description of this process will not be repeated herein. Therefore, the same observations made hereinafter with regard to the process to open the container **20** by means of the automatic opening device for containers **1** applied to the spout **12** are valid herein.

[0156] FIGS. **19**A, **19**B and **19**C depict an exploded front view, in partial cut, an upper perspective view, in partial cut, and a front view, respectively, showing an alternative embodiment of a spout adapter device **35** to be used in conjunction with the automatic opening device for containers **1**. The spout adapter device **35** comprises an upper portion **35***s*, a medial portion **35***m* and a lower portion **35***i*.

[0157] A protruding ring **35***c* is provided, located on the upper part of the outer portion of the upper portion **35***s*. An external screw thread **37** is also provided, which is similar to the external screw thread **27** of the spout adapter device **25** of the previous embodiment. The external screw thread **37** comprises a lower flank **37***a* and an upper flank **37***b*, a root **37***c* being formed between the flanks **37***a* and **37***b*. A three entry screw thread is shown in the Figures, merely for illustrative effect. It is important to mention that a screw thread with any number of entries can be used, according to the design needs.

[0158] The upper flank **37***b* of the external screw thread **37** has an upper end **32** extending beyond the protruding ring **35***c*, intended to facilitate the screwing of the external screw thread flanks **5** of the automatic opening device for containers **1** in the roots **37***c*, as will be seen hereafter, while the lower flank **37***a* has its upper end facing with the lower portion of the protruding ring **35***c*.

[0159] As shown in FIGS. **19**A, **19**B and **19**C, a rim **34** is provided in the lower region of the upper portion **35***s* of the spout adapter device **35**. The medial portion **35***m* is shaped like a trunk-cone and its upper portion is connected to the lower region of the rim **34**, while its lower region is connected to the upper region of the lower portion **35***i*. There is a radial gap in the region that connects the medial portion **35***m* to the lower region of the rim **34**, the radial gap intended to engage to the lower locking elements **6***b* of the automatic opening device for containers **1** when it is applied to the spout adapter device **35**, as will be seen hereafter.

[0160] The medial portion **35***m* is provided with a plurality of spaced apart and circumferentially distributed radial openings **35***a*. A internal screw thread **36** having one entry is provided in the inner portion of the lower portion **35***i* of the spout adapter device **35**. This internal screw thread **36** is sized to screw to the outer screw thread **30** of the spout **26**, as will be seen hereafter.

[0161] A plurality of lower locking elements **35***b* is provided in the lower inner region of the lower portion **35***i*, similar to the lower locking elements **25***a* of the spout adapter device **25**, the lower locking elements **35***b* comprising a plurality of spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the lower portion **35***i* of the spout adapter device **35**, and the body of each lug being tilted towards the geometric axis of the spout adapter device **35**. The lower locking elements **35***b* are able to bend slightly towards the inner wall of the spout adapter device **35** when it is connected to the spout **26**, as will be seen hereafter.

[0162] Due to the increase of the height of the assembly formed by the spout adapter device **35** and the automatic opening device for containers **1**, when such assembly is applied to the spout **26**, it is then necessary to lengthen the cutting devices **3** of the automatic opening device for containers **1** to offset such increase of the height of the assembly, as will be seen hereafter. Therefore, the cutting device **3** of such assembly is lengthy than the cutting devices **3** of the variations of the invention described hereinbefore.

[0163] The automatic opening device for containers **1** must be applied to the spout adapter device **35** by means of a pressing process, a downward longitudinal movement in which the lower part of the automatic opening device for containers **1** is pressed against the top of the spout adapter device **35**, which causes a forced assembly between them. This application will be made in a factory.

[0164] Likewise what occurred in the process to apply the automatic opening device for containers **1** in the spout **12** (FIGS. **4**A, **4**B, **4**C and **4**D), by pressing the automatic opening device for containers **1** against the upper part of the spout adapter device **35** it will occur a slight interference between some component parts of the automatic opening device for containers **1** and component parts of the spout adapter device **35**.

[0165] During the process of applying the automatic opening device for containers **1** to the spout adapter device **35**, the lower locking elements **6***b* of the locking device **6** will be pressed by the rim **34** of the spout adapter device **35**, and consequently will tend to incline towards the internal wall of the locking device **6**, thereby allowing the automatic opening device for containers **1** to make a downward longitudinal movement.

[0166] At the end of this downward longitudinal movement to apply the automatic opening device for containers **1** to the spout adapter device **35**, the lower locking elements **6***b* had been totally passed over the rim **34**, thereby causing the retention of the automatic opening device for containers **1** in the spout adapter device **35**. FIG. **20** depicts a perspective view in cut wherein the automatic opening device for containers **1** is totally applied to the spout adapter device **35**.

[0167] The previous observations made regarding the process to apply the automatic opening device for containers **1** in the spout adapter device **25** or in the spout **12** (FIGS. **4**A, **4**B, **4**C and **4**D) are valid here. Preferably the lower locking elements **6***b* of the locking device **6** should fit into the radial openings **35***a* of the medial portion **35***m* of the spout adapter device **35**, as shown in FIG. **20**.

[0168] FIG. **21** shows the assembly formed by the automatic opening device for containers **1** already applied to the spout adapter device **35**, in a position immediately before starting the application of said assembly to the spout **26**. This application will be made in a factory by means of a rotating applicator, not shown in FIG. **21**. Said applicator applies a rotation to the assembly, in this case, a clockwise rotation, as indicated by circle J in the Figure.

[0169] Likewise what occurred in the process to apply the automatic opening device for containers **1** in the spout **12** (FIGS. **4**A, **4**B, **4**C and **4**D), by pressing the assembly comprising the automatic opening device for containers **1** and the spout adapter device **35** against the spout **26**, it will occur a slight interference between some component parts of the automatic opening device for containers **1** and component parts of the spout **26**. Therefore, the same observations made hereinbefore are valid here.

[0170] Consequently, during the process the lower locking elements **35***b* of the spout adapter device **35** will be pressed by the edge of the retaining ring **33** and will tend to incline towards the inner wall of the spout adapter device **35**,

thereby allowing the automatic opening device for containers **1** and the spout adapter device **35** to make a downward longitudinal movement until the process is finished.

[0171] FIG. **22** is an upper perspective cutting view showing the assembly formed by the automatic opening device for containers **1** and the spout adapter device **35** duly applied to the spout **26**. The lower locking elements **35***b* of the device spout adapter **35** had passed the retaining ring **33** of spout **26** at the end of the process to apply said assembly to the spout **26**. Therefore, the container **20** will be ready for sale and to be subsequently opened by a user.

[0172] The operation to open the container **20** will be carried out in the same way as previously described regarding FIGS. **6**A, **6**B, **6**C and **6**D. Consequently, the description of this operation will not be repeated herein. The same observations made regarding the process to open the container **20** by means of the automatic opening device for containers **1** applied to the spout **12** are valid here.

[0173] The external screw thread **27** of the spout adapter device **25**, shown in FIGS. **14**A, **14**B, **14**C and **14**D, and the external screw thread **37** of the spout adapter device **35**, shown in FIGS. **19**A and **19**B, can both be left hand oriented screw threads if an automatic opening device for containers **1** is used in case the internal screw thread **5** is a left hand oriented screw thread.

[0174] FIGS. **23**A, **23**B, **23**C and **24** depict views of a further embodiment of the invention, showing an automatic opening device for containers **41** to be applied to a spout **47** of a container **51**. The spout **47** comprises an elongated cylindrical body **48**, a first upper ring **49** and a second lower ring **50**, larger in diameter than the first upper ring **49**. A sealing element **19** adheres to the upper rim of the spout **47**. The connection between the spout **47** and the automatic opening device for containers **41** is a bayonet connection, as will be seen hereafter.

[0175] The automatic opening device for containers **41** comprises a closing element **41***a*, a base element **41***b* and a guiding and locking device **46**. In FIG. **24** the closing element **41***a* is in the open position, and the connection between the base element **41***b* and the closing element **41***a* is made by a pivoting connecting element, not shown in the Figure, a connection similar to that used between the closing element **1***a* and the base element **1***b* previously described in relation to FIGS. **1**A, **1**B and **1**C and **2**.

[0176] The base element **41***b* comprises a first sidewall element **54** and an upper member **55** whose edges are joined to the upper edge of the first sidewall element **54**. A central protruding ring **39** is provided in the upper central portion of the upper member **55**, which encircles a throughout orifice **39***a*. An external screw thread **45** is provided in the lower external portion of the first sidewall element **54** of the base element **41***b*. In the Figures, an external screw thread with three entries is shown, for a exemplification only, as other types of screw threads may be used. It can be seen in the Figures the external screw thread flanks **45**. Henceforth the expressions "external screw thread **45**" and "external screw thread flanks **45**" will be used to refer to the same screw thread.

[0177] The closing element **41***a* comprises a second sidewall element **56**, in the form of an elongated cylindrical body, and an upper member **57**, circularly shaped, whose edges are joined to the upper edge of the second sidewall element **56**. A protruding sealing element **40** is provided in the inner central portion of the upper member **55** of the sealing element **41***a*. The sealing protruding element **40** is designed to house the protruding ring **39** and to close the throughout orifice **39***a* of the base element **41***b* when the closing element **41***a* and the base element **41***b* are closed.

[0178] The guiding and locking device **46**, shown in partial cut in FIGS. **23**A, **23**B, **23**C and **24**, comprises an elongated cylindrical body whose upper inner portion is provided with an internal screw thread **44**, in the Figure a three entries screw thread comprising a lower flank **44***a* and an upper flank **44***b*, with a root **44***c* formed between these two flanks. In order to facilitate the description of the automatic opening device for containers **41** and its use for the opening of container **51**, the flanks of the internal screw thread **44** of the guiding and locking device **46** are shown in the Figures, which would not appear in a cutting view.

[0179] The upper ends **44***d* of the upper flanks **44***b* extend above the upper ends of the lower flanks **44***a* to facilitate the screwing of the external screw thread flanks **45** in the roots **44***c*. Reinforcement lugs **46***d* are provided on the upper edge of the guiding and locking device **46**, located in the regions where the upper ends **44***d* of the upper flanks **44***b* are extended, thereby providing support for the upper ends **44***d* at the moment when the entries **45***a* of the external screw thread flanks **45** touch the upper ends **44***d*, as will be seen hereafter.

[0180] As can be seen in FIG. **23**C, a plurality of lower locking elements **46***b* are provided in the lower region of the inner portion of the guiding and locking device **46**, which comprise spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the inner portion of the guiding and locking device **46**, and the body of each lug being pivoted towards the geometric axis of the guiding and locking device **46**.

[0181] A plurality of upper rupture elements **46***a* connects the upper region of the guiding and locking device **46** to the lower edge of the base element **41***b*, as outlined by circle F in FIG. **23**C. A plurality of guiding fins **46***c* can also be seen in the Figure, provided in the lower inner portion of the guiding and locking device **46**. These guide fins **46***c* are optional and serve to facilitate the insertion of the guiding and locking device **46** in the spout **47**, thereby positioning it correctly.

[0182] In the Figures the screw thread **45** provided on the lower external portion of the first sidewall element **54** of the base element **41***b*, and the internal screw thread **44** provided on the upper internal portion of the guiding and locking device **46** comprise a screw thread with three entries. However, this is for exemplification only, and evidently the invention is not limited to the use of a screw thread with three entries.

[0183] A cutting device **43** is provided in the lower central portion of the upper member **55** of the base member **41***b*, the cutting device **43** comprising a hollow protruding body whose upper portion is connected to the lower central portion of the upper member **55** in the region where it is located the throughout orifice **39***a*, the latter being a continuation of the hollow portion of the cutting device **43**. The lower portion of the cutting device **43** is provided with a plurality of cutting elements **43***a*.

[0184] In FIGS. **25**A and **25**B, the automatic opening device for containers **41** is in a position immediately prior to the beginning of its application to the spout **47**, which is made by pressing the lower portion of the automatic opening device for containers **41** against the upper portion of the

spout **47**, an operation performed in a factory by means of an applicator not shown in FIGS. **25**A and **25**B.

[0185] FIG. **26**A is a partial front view showing the automatic opening device for containers **41** duly applied to the spout **47**. Notice that the lower locking elements **46***b* of the guiding and locking device **46** had passed the first upper ring **49** at the end of the process of applying the automatic opening device for containers **41** to the spout **47**. Consequently, the container **51** will be ready for sale and to be subsequently opened by a user.

[0186] To open the container **51***a* user must apply a clockwise rotation to the assembly formed by the closing element **41***a* and the base element **41***b*. This will cause the upper rupture elements **46***a* to rupture, and consequently, the entries **45***a* of the outer screw thread flanks **45** will be guided by the upper ends **44***d* of the upper flanks of the inner screw thread **44** to start screwing in the roots **44***c*. in FIG. **26**B the external screw thread flanks **45** are already screwed on the roots **44***c* of the internal screw thread **44**.

[0187] With the continuation of the clockwise rotary movement, the assembly formed by the closing element **41***a* and the base element **41***b*, besides rotating, will also execute a concomitant linear downward movement, and consequently the cutting elements **43***a* of the cutting device **43** will tear the sealing element **19**, to open the container **51**.

[0188] The rotational movement of the assembly formed by the closing element **41***a* and the base element **41***b* in a clockwise direction will end when the inner portion of the upper member **55** of the base element **41***b* touches the rim of the spout **47**, where it the sealing element **19** is adhered to. This will cause a compression between the upper member **55** of the base element **41***b* and the edge of the spout **47**, thereby contributing to create a sealing in this area of compression.

[0189] FIG. **27** is a partial perspective cutting view depicting a variation of the automatic opening device for containers **41**, in which the only difference regarding the automatic opening device for containers **41** depicted in FIGS. **23**A, **23**B, **23**C and **24** is that the lower region of the guiding and locking device **46** is provided with an internal screw thread **52**. This variation of the device for the automatic opening device for containers **41** can be used in containers provided with threaded spouts.

[0190] For exemplification only, the spout **26** of the container **20** shown in FIG. **27** is provided with a single entry screw thread with right angle orientation. However, screw threads having more than one entry can be provided to the spout **26**, as well as left hand oriented screw threads can be used. The internal screw thread **52** of the automatic opening device for containers **41** must be screwed onto the screw thread **30** of the screwed spout **26** by means of a rotating applicator, an operation executed in factory.

[0191] The operation to open the container **20** is to be executed by users in the same manner as described hereinbefore. Users are unlikely to even notice the differences between the modalities of the automatic opening device for containers **41** used in a container, whether the one depicted in FIG. **27** or the one depicted in FIGS. **23**A, **23**B, **23**C and **24**.

[0192] FIGS. **28**A and **28**B are perspective views depicting alternative embodiments for the guiding and locking device **46** of the automatic opening device for containers **41**. In FIG. **28**A the guiding and locking device **46** is not provided with reinforcement wings **46***d* (shown in the embodiment of FIGS. **25**A and **25**B). In this case, the upper ends **44***d* of the upper flanks **44***b* must be designed to withstand the stress to which they will be subjected at the moment of starting the operation to open the container, when they will come in contact with the entries **45***a* of the external screw thread flanks **45**.

[0193] In FIG. **28**B the elongated cylindrical body of the guiding and locking device **46** is extended to provide support for the upper ends **44***d* of the upper flanks **44***b*. Although this alternative shape of the guiding and locking device **46** is more complex to manufacture, it has the advantage of also providing protection for the external screw thread flanks **45**, which become less exposed. This precludes the external screw thread flanks **45** from being damaged in case of possible impacts caused by falls, notably in market shelves, where products are displayed for sale.

[0194] It is possible to make different combinations of internal screw threads **44** and external screw thread flanks **45** regarding those depicted in the previous Figures of the automatic opening device for containers **41**. For example, it is possible to invert the location of the internal screw threads **44** and the external screw threads flanks **45** without changing the operating manner of the embodiments of the invention regarding the automatic opening device for containers **41**.

[0195] FIG. **29**A depicts a front partial cutting view of the automatic opening device for containers **41** in which the lower flank **44***a* and the upper flank **44***b* of the spout **44** are applied to the upper region of the inner portion of the guiding and locking device **46**, as described previously, however it is possible to invert this configuration.

[0196] FIG. **29**B shows a front partial cutting view of the automatic opening device for containers **41** in which an automatic opening device for containers **41** is depicted, the outer portion of the lower region of the base element **41***b* of the containers **41** being provided with an external screw thread **144**, which comprises a lower flank **144***a* and an upper flank **144***b*. A root **144***c* is formed between these two flanks, wherein the lower ends **144***d* of the lower flanks **144***a* extend below the lower ends of the upper flanks **144***b*. An internal screw thread **145** is provided in the upper region of the internal portion of the guiding and locking device **46**.

[0197] In FIGS. **29**A and **29**B, for exemplification only, use is made of a three entries screw thread. The screw threads **144** and **145** can be of single or multiple entries, and, in this case, the internal screw thread **145** will then comprise a plurality of internal screw thread flanks.

[0198] If the embodiment shown in FIG. **29**B is used in the automatic opening device for containers **41**, the reinforcement lugs **46***d* on the upper edge of the guiding and locking device **46** will be located in the regions where the ends of the internal screw thread flanks **145** are extended above the upper edge of the guiding and locking device **46**.

[0199] Another difference regarding the embodiment depicted in FIG. **29**A will be notice at the moment of opening the container. In that, when a rotary movement is applied to the automatic opening device for containers **41**, the lower ends **144***d* of the lower flanks **144***a* of the external screw thread **144** will touch the upper ends of the internal thread flanks of the screw thread **145**, which, in the continuity of the rotary movement, will cause the screwing of these internal screw thread flanks **145** on the roots **144***c* of the external screw thread **144**.

[0200] The operation to open the container will be the same regardless of which embodiment be used among the two described in the previous paragraphs. A user probably would not notice the difference between these two embodiments. The choice of the screw thread configuration to be used will be a design option, being only necessary to make the due adaptations in the embodiment of the automatic opening device for containers **41** being used.

[0201] Although right hand oriented screw threads were depicted in the Figures of the previously described embodiments of the automatic opening device for containers **41**, left hand oriented screw threads can be used instead, as mentioned regarding the embodiments of the invention described hereinbefore.

[0202] Therefore, the same observations previously made are valid here, emphasizing that if a left angle oriented screw thread is used, it will only be necessary to make the necessary adaptations for the automatic opening device for containers **41** can be used without any difficulty, whichever is the embodiment used. FIGS. **30**A and **30**B are front cutting views showing an automatic opening device for containers **41** provided with left hand oriented screw threads, similar to those depicted in FIGS. **29**A and **29**B.

[0203] FIGS. **31**A and **31**B depict a front partial cutting view and a partial front perspective cutting view depicting an additional embodiment of an automatic opening device for containers **61** according to the teachings of the present invention. As can be seen in the Figures, the automatic opening device for containers **61** comprises a closing element **61***a*, a base element **61***b* and a locking device **62**.

[0204] As depicted in the Figures, the closing element **61***a* is in a closed position, engaged to the base element **61***b*. Preferably, both are connected to each other by means of a pivoting connection element, not shown in the Figures. This type of pivoting connection between base elements and closing elements is well known in the art, variations thereof being known, and can be used interchangeably in conjunction with the present invention. Any other connection means can be used to connect the closing element **61***a* to the base element **61***b*, and there may even be no connection means between them, and the connection between these two parts could be made by pressure, or by screwing, for example.

[0205] Likewise the automatic opening device for containers **1** and **41** described he hereinbefore, the base element **61***b* comprises a first sidewall **72**, in the form of an elongated cylindrical body, and a top element **73**, circularly shaped and whose edges are joined to the upper edge of the first sidewall **72**. The closing element **61***a* is also similar to the closing elements **1***a* and **41***a* described hereinbefore and comprises a second sidewall **71**, in the form of an elongated cylindrical body, and an upper element **75** shaped and whose edges are joined to the upper edge of the second sidewall **71**.

[0206] A cutting device **63** is provided in the inner region of the top element **73**, the cutting device **63** comprising a protruding hollow body which projects downwardly, as shown in FIG. **31**A, its lower portion being provided with a plurality of cutting elements **63***a*. In FIGS. **31**A and **31**B the cutting device **63** does not appear in cut so as to allow to view it in its entirety.

[0207] The top element **73** is provided in its upper region with a protruding ring **74**, which encircles a throughout orifice **74***a*. The upper region of the cutting device **63** is connected to the lower portion of the top element **73**, in the region where the throughout orifice **74***a* is located, the latter being a continuation of the hollow portion of the cutting device **63**. As the cutting device **63** has not been cut in the Figure, consequently the throughout orifice is not viewed in the Figure, the throughout orifice **74***a* being shown in the Figure in dashed lines, to indicate its location in the top element **73** in alignment with the hollow portion of the cutting device **63**.

[0208] A protruding sealing member **76** is provided in the inner portion of the upper member **75** of the closing member **61***a*. The protruding sealing member **76** is designed to house the protruding ring **74** when the closing element **61***a* and the base element **61***b* are closed, wherein the protruding sealing member **76** closes the throughout orifice **74***a* of the base element **61***b*, as shown in FIGS. **31**A and **31**B.

[0209] Preferably the second sidewall **71** of the closing element **61***a* and the first sidewall **72** of the base element **61***b* of the automatic opening device for containers **61** have substantially equal outside diameters when closed, as shown in FIG. **31**A. Therefore, the top element **73** of the base element **61***b* must be provided with a recess in the region of its edge at which it connects to the first sidewall **72**, to form an annular ring region **73***a*. Thus, when the closing element **61***a* is in the closed position, the lower region of the second sidewall **71** will engage to the annular ring region **73***a*, as can be seen in FIG. **31**A.

[0210] This feature is only intended to facilitate the manipulation of the automatic opening device for containers **61** by users, serving only to facilitate the use of the device. The configurations of the closing element **61***a* and the base element **61***b* can be different from those depicted in the Figures, provided that these different components do not cause difficulties for the operation of the automatic opening device for containers **61**.

[0211] The automatic opening device for containers **61** can even be provided without a closing element **61***a* such as the one shown in the Figures, and yet the automatic opening device for containers **61** will operate normally, as will be seen hereafter.

[0212] An internal screw thread **64** is provided in the inner portion of the first sidewall **72** of the base element **61***b*. In the embodiment shown in the Figures, the internal screw thread **64** comprises a right hand oriented screw thread of single entry. However, the internal screw thread **64** may comprise a screw thread with any number of entries and, consequently, the invention is not limited to the use of an internal screw thread **64** having a simple entry. Further, the orientation of the internal screw thread **64** may also be to the left.

[0213] The locking device **62** comprises an elongated substantially cylindrical body provided at its upper edge having a plurality of upper rupture elements **62***a* connected to the lower edge of the base element **61***b*, as can be seen in the Figures. A plurality of lower locking elements **62***b* is provided in the lower inner portion of the locking device **62**.

[0214] The lower locking elements **62***b* comprise spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the locking device **62** and the body of each lug being inclined towards the geometric axis of the locking device **62**. The lower locking elements **62***b* can undergo small radial bends towards the inner wall of the locking device **62**. Other embodiments of lower locking elements **62***b* may be used and, therefore, the invention is not limited to the embodiment depicted in FIGS. **31**A and **31**B.

[0215] The upper rupture elements **62***a* operate basically the same way as the upper rupture elements **6***a* and **46***a* described hereinafter, as well as the lower locking elements **62***b* have basically the same functions as the lower locking elements **6***b* and **46***b* described hereinafter. Therefore, it is not necessary to make herein a detailed description of these component parts.

[0216] Other embodiments of rupture elements may be used on the upper rupture elements **62***a*, provided that they are able to cause the same effects obtained by the rupture elements depicted in the Figure.

[0217] The automatic opening device for containers **61** should be screwed onto a spout **65** provided in a container **70**. The spout **65** comprises an elongated cylindrical body **66** provided in its outer region with an external screw thread **67**. The internal screw thread **64** of the base element **61***b* will screw onto the external screw thread **67** of the spout **65**, as will be seen hereafter. A retaining ring **68** is provided in the outer region of the elongated cylindrical body **66**, below the outer screw thread **67**, and a lower ring **69** is provided in the lower outer region of the elongated cylindrical body **66**, as can be seen in the Figures. Likewise the spouts **12** and **47** described hereinbefore, the spout **65** is provided in its rim with a sealing element **77**, as shown in FIG. **31**B.

[0218] In FIGS. **31**A and **31**B, the automatic opening device for containers **61** is in a position immediately prior to starting its application to the spout **65**. The application starts by inserting the lower portion of the automatic opening device for containers **61** against the upper portion of the spout **65**, by making a linear downward movement as indicated by the arrow N in FIG. **31**B. This operation will cease when the automatic opening device for containers **61** is in a position where a rotational movement can be initiated, to cause the internal screw thread **64** of the base element **61***b* to screw in the external screw thread **67** of the spout **65**. This operation is executed in a factory, using an applicator not shown in FIGS. **31**A and **32**B.

[0219] FIG. **31**C depicts the automatic opening device for containers **61** partially screwed onto the spout **65**, after the rotational screwing movement has started, as indicated by circle B. More particularly, the Figure depicts the moment of starting the rotational screwing movement, when the lower locking elements **62***b* touches the edge of the retaining ring **68**. Consequently, the lower locking elements **62***b* incline towards the internal region of the locking device **62**. When said rotational screwing movement is applied to the automatic opening device for containers **61**, it also undergoes a concomitant downward linear movement, as indicated by the arrow N in FIG. **31**C.

[0220] With the continuation of the rotational screwing movement, all the lower locking elements **62***b* moved past the edge of the retaining ring **68**, as shown in FIG. **31**D, and will return to their original position, thereby serving as a locking means, intended to prevent unscrewing of the automatic opening device for containers **61**.

[0221] The rotational screwing movement will cease when the lower edge of the locking device **62** touches the upper region of the lower ring **69**, as shown in FIG. **31**D. From that moment on, container **70** will be ready for sale.

[0222] A particular feature of this embodiment of the invention is that is partial the screwing of the internal screw thread **64** of the base element **61***b* of the automatic opening device for containers **61** on the external screw thread **67** of the spout **65**, as depicted in FIG. **31**D. This means that said rotational screwing movement of the automatic opening device for containers **61** onto the spout **65** would still be possible if it were not prevented by the touch of the lower edge of the locking device **62** in the upper region of the lower ring **69**, as previously described.

[0223] The use of the lower locking elements **62***b* is optional, although recommended, as it prevents inadvertent unscrewing of the automatic opening device for containers **61**, as described hereinbefore. However, the automatic opening device for containers **61** would operate normally if it were not provided with the lower locking elements **62***b*.

[0224] As a result of this partial screwing of the lower locking elements **62***b*, the lower ends of the cutting elements **63***a* of the cutting device **63** will be positioned close to the sealing element **77** adhered to the rim of the spout **65**, as shown in FIG. **31**D.

[0225] This partial screwing is fundamental to facilitate the opening of the container **70** by a user, who will only need to rotate the automatic opening device for containers **61** in a clockwise direction, thereby causing the tearing of the upper rupture elements **62***a*. Consequently, the screwing of the internal screw thread **64** of the base element **1***b* of the automatic opening device for containers **61** on the external screw thread **67** of the spout **65** will go on.

[0226] Concomitantly with this rotational screwing movement, a linear downward movement of the automatic opening device for containers **61** will also occur, and the combination of these two movements, clockwise rotational screwing and linear downward, will cause the cutting elements **63***a* of the cutting device **63** to progressively pierce the sealing element **77** adhered to the rim of the spout **65**.

[0227] These clockwise rotational and linear downward movements of the automatic opening device for containers **61** will cease when the rim of the spout **65** touches the lower region of the top element **73**, and when this occurs the cutting elements of the cutting device **63** will have already torn the sealing element, and the product stored in the container **70** can then be served, passing through the hollow interior of the cutting device **63** and the throughout orifice of the base element **61***b*.

[0228] Some aspects are relevant for designing the automatic opening device for containers **61**, to enable it to operate correctly to open container **70**. One of these relevant aspects is to design the lower locking elements **62***b* in such a way that, after they had move past the edge of the locking ring **68**, they must resist any attempts to unscrew the automatic opening device for containers **61**.

[0229] This is important because users are used to executing a counterclockwise rotational movement to unscrew a cap from a spout, due to the massive use of right-oriented screw threads on caps and spouts, and situations may occur where users inadvertently attempt to unscrew the automatic opening device for containers **61** from spout **65**, without first realizing the need to continue to perform a screwing operation of the automatic opening device for containers **61** in spout **65** to open of the container **70**.

[0230] In such situations it is desirable that the resistance opposed by the lower locking elements **62***b* to this attempt to unscrew the automatic opening device for containers **61** of the spout **65** is such that it makes it extremely difficult to occur. The user must then pay attention to the instructions to correctly open the container **70**, executing then a clockwise rotary operation to keep screwing. As mentioned hereinbe-

fore, these instructions may appear in the upper region of the upper element **75** of the closing element **61***a*.

[0231] An aspect of fundamental importance for the correct operation of the automatic opening device for containers **61** to open container **70** is the correct sizing of some components of the automatic opening device for containers **61** object of this embodiment of the invention, particularly the base element **61***b* and the locking device **62**, as will be seen hereafter.

[0232] In FIG. **31**A it can be seen that the spout **65** has a linear extension L_1 between its rim and the edge of the retaining ring **68**, and a linear extension C_1 between said edge of the retaining ring **68** and the portion of the upper region of the lower ring **69** where the edge bottom of the locking device **62** will touch, at the end of the assembly of the automatic opening device for containers **61** on the container **70**, as shown in FIG. **31**D.

[0233] It can also be seen from FIG. **31**A that the base element **61***b* has a linear extension L_2 between the lower part of the ring-shaped engagement region **74***a* and its lower edge, and a linear extension C_2 between that lower edge of the base element **61***b* and an imaginary plane that contains the upper region of the lower locking elements **62***b*.

[0234] In FIG. **31**D the linear extension L_3 represents the displacement of the linear extension of the spout **65** between its edge and the edge of the retaining ring **68** inside the automatic opening device for containers **61**, after the device is in the final position of its application to the spout **65**. The linear extension C_3 represents the spacing between the edge of the spout **65** and the bottom of the ring-shaped engagement region **73***a* of the upper member **73**.

[0235] In order for the automatic opening device for containers **61** object of this embodiment of the invention to operate in the manner previously described, it is necessary that the linear extensions L_1, L_2 e L_3 described above are substantially identical, allowing small variations resulting from manufacturing tolerances that do not harm the perfect engagement of the components related to these linear extensions. Likewise, the linear extensions C_1, C_2 e C_3 must also be substantially identical, the same comments regarding manufacturing tolerances applying here. These are geometric relationships that must be considered for the design of the automatic opening device for containers **61**.

[0236] FIGS. **32**A and **32**B are upper perspective views showing an automatic opening device for containers **41** whose base element **41***b* is provided with a pouring device **53**. In FIG. **32**A the closing element **41***a* is in the open position, and in FIG. **32**B is in the closed position, in a partial cut. The pouring device **53** comprises an integrally hollow body formed by a first curved portion **53***a* and a second portion **53***b*.

[0237] The first curved portion **53***a* has one end connected to the hollow body of the cutting device **43** (not shown in the Figures), and its other end is connected to one end of the second horizontal portion **53***b*, the latter extending over the face of the base element **41***b* towards the edge, as shown in FIG. **32**A. The other end of the second horizontal portion **53***b* is beveled and forms a rim **53***c*, which defines a throughout orifice **53***d*.

[0238] The closing element **41***a* is provided with a sealing element **54**, which is designed to rest on the rim **53***c* of the second horizontal portion **53***b* when the closing element **41***a* is in the closed position, as can be seen in FIG. **32**B. Consequently, the sealing element **54** blocks the undesirable passage of product through the throughout orifice **53***d* if, for example, the container is placed in an inclined position with the closing element **41***a* in the closed position, or even in an inverted position, supported on the upper face of the closing element **41***a*.

[0239] The sealing element **54** prevents the possibility for the product to flow through the throughout orifice **53***d* and accumulate inside the empty space formed between the closing element **41***a* and the base element **41***b*. In case the sealing element **54** were not provided, when a user would open the closing element **41***a*, an undesirable product spill would occur.

[0240] This embodiment of the pouring device **53** enables a user to pour the product stored in the container without having to place the container upside-down, in a position where the throughout orifice is substantially downwards, which can cause the product to overflow, in special thixotropic products.

[0241] For a user to pour the product into the container it suffices to slightly incline the container to initiate a flow of product. The control of such flow is easily made by varying the angle of inclination of the container, in conjunction with making a slight pressure in the container, in case that it is made of flexible material. The pouring device **53** may be used in conjunction with any of the embodiments and variations of the invention described hereinbefore. Therefore, mutatis mutandis, the automatic opening device for containers **1** shown in FIGS. **1**A to **12** and FIGS. **14**A to **22** may also be provided with a pouring device **53**.

[0242] In the description of the embodiments of the invention made hereinbefore it has always been shown that the automatic opening device for containers is provided with a closing element and a base element, joined by a pivoting connecting element. However, it is possible to use other configurations other than those described hereinbefore. For example, the closing element can be attached to the base element by means of a screw thread, or by means of a pressure coupling, as previously mentioned.

[0243] Alternatively, it is possible that the embodiments of the automatic opening device for containers disclosed hereinbefore be provided with only the base elements **1***b*, **41***b* or **61***b*. In this case the throughout orifice for the administration of the product would be permanently open, without a seal.

[0244] Some solutions can be used in order to avoid this problem. For example, as shown in FIG. **33**, regarding the embodiments depicted in FIGS. **1**A to **12**C, merely for example, the upper member **10** of the base element **1***b* may be provided with a protruding plugging element **58** formed by an elongated hollow body whose upper portion is closed, and the bottom portion is open and firmly connected to the base element **1***b*, with the hollow portion of the protruding plugging element **58** being aligned and in communication with the throughout orifice **2***a* and, consequently, with the hollow portion of the cutting device **3**.

[0245] Therefore, after a user has opened the container, it will suffice to use a cutting element, such as a knife, to make a transverse cut across section the body of the protruding plugging element **58** to provide a throughout orifice, in order to allow the product stored in the container to pass through hollow portion of the protruding plugging element **58**.

[0246] A cap **59** can be provided to close this throughout orifice in the hollow portion of the protruding plugging element **58**, in order to prevent that passage from being permanently open. Preferably the cap **59** is connected to the

base element **1***b* by means of a flexible connecting element **60**, to prevent the cap **59** from being inadvertently discarded by the user.

[0247] Evidently, mutatis mutandis, this solution could also be used in the embodiments depicted in FIGS. **23**A to **31**B. Notice that the cap **59** and the closing element **1***a*, or the closing element **41***a*, execute the same function of sealing the passage of the product stored in the container through the throughout orifices **2***a* or **39***a*, respectively. The only difference is that the cap **59** is sized to engage the body of the protruding plugging element **58**, thereby resulting in a smaller component and saving material.

[0248] FIGS. **34**A and **34**B depict perspective views showing an exemplary rotational locking system that can be used in conjunction with any of the automatic opening devices for containers described hereinbefore. For exemplification only, said rotational locking system is described in conjunction with the embodiment of the automatic opening device for containers **41** shown in FIGS. **23**A, **23**B, **23**C and **24**. It is important to mention that, mutatis mutandis, this rotational locking system can also be used in the automatic opening devices for containers **1** and **61** described hereinbefore.

[0249] FIGS. **34**A and **34**B depict an external screw thread flank **45** being screwed onto the internal screw thread **44**. Each of the external screw thread flanks **45** is provided with a locking recess **45***b* to preclude rotational movements, which is designed to latch into a locking protrusion **44***e* provided in one of the flanks of the screw thread **44**, thereby preventing rotational movements.

[0250] The location of each rotational locking recess **45***b* and each rotational locking shoulder **44***e* must be determined in such a way that the latch between them occurs at the same time as the inner portion of the upper member **55** of the base member **41***b* touches the edge of the spout **47**. Therefore, when a user opens the container, by means of a clockwise rotation of the assembly formed by the closing element **41***a* and the base element **41***b*, at the moment when the rotational locking recesses **45***b* latches into the locking shoulder **44** of the screw thread **44**, the user will hear a snap. From that moment on no rotation will occur, in any direction, as the whole assembly is locked in that position.

[0251] The rotational locking system depicted in FIGS. **34**A and **34**B prevents the assembly formed by the closing element **41***a* and the base element **41***b* from rotating to unscrew the screw thread **44** in an anti-clockwise direction. It therefore serves as a tamper resistant means that precludes removal of that assembly formed by the closing element **41***a* and the base element **41***b*, thereby preventing the container from being refilled after the product originally stored in the container has been fully poured.

[0252] If a container is provided with an automatic opening device for containers according to the invention in which there is no connecting element to hold the closing element **1***a* or **41***a*, or the cap **59**, connected to the base element **1***b*, or **41***b*, it is recommended that an tamper evidence device is used to cover the automatic opening device for containers, thereby preventing the closing elements **1***a*, **41***a*, **61***a* or the cap **59** from being improperly removed when the container is in market shelves.

[0253] FIG. **35** shows an automatic opening device for containers **81** according to a further embodiment of the invention. As can be seen in the Figure, the automatic opening device for containers **81** comprises a closing element **81***a*, a base element **81***b* and a locking device **6**. The automatic opening device for containers **81** is quite similar to the automatic opening device for containers **1** shown in FIGS. **1**A, **1**B and **1**C.

[0254] The closing element **81***a*, when is in the closed position, engage with the base element **81***b*, and both are connected to each other by means of a pivoting connection element **86**, as shown in FIG. **35**. There are variations of this type of pivoting connection, which can be used interchangeably in conjunction with the present invention. In addition, any other type of connection means can be used to connect the closing element **81***a* to the base element **81***b*, and there may even be no connection means between them, in which case the connection between these two parts could be made by pressure or screwing, for example.

[0255] The base element **81***b* comprises a first sidewall **78**, in the form of an elongated cylindrical body, and a circularly shaped top element **79** whose edges are joined to the upper edge of the first sidewall **78**. The upper region of the top element **79** is provided with a protruding element **84**, located in a region close to the edge of the top element **79**, preferably located 180° from the region where the connecting pivoting element **86** connects the base element **81***b* with the closing element **81***a*, although other locations can be chosen. The protruding element **84** encircles a throughout orifice **83**.

[0256] The closing element **81***a* comprises a second sidewall **80** in the form of an elongated cylindrical body and an upper element **82**, circular in shape and whose edges are joined to the upper edge of the second sidewall **80**. A protruding sealing element **85** is provided in the lower region of the upper element **82**, intended to close the throughout orifice **83** of the base element **81***b* when the closing element **81***a* and the base element **81***b* are closed. The protruding sealing element **85** can be designed to encircle the protruding element **84**, or, alternatively, engage with the throughout orifice **83** to create a sealing.

[0257] Consequently, the location of the protruding sealing element **85** in the lower region of the upper element **82** will be a function of the location of the protruding element **84**, and in the present case it will be located in a region close to the edge of the upper portion of the upper element **82**, preferably located at 180° from the region in which the connecting pivoting element **86** connects the base element **81***b* to the closing element **81***a*, although other locations can be chosen.

[0258] Preferably the automatic opening device for containers **81** is designed so that the second sidewall **80** of the closing element **81***a* and the first sidewall **78** of the base element **81***b* have substantially equal outside diameters when closed. To this aim, the top element **79** of the base element **81***b* must be provided with a recess in the region of its edge where it connects to the first sidewall **78**, to form a ring-shaped engagement region **79***a*. Thus, when the closing element **81***a* is in the closed position, the lower region of the second sidewall **80** will engage into said ring-shaped engagement region.

[0259] This feature intends to facilitate the manipulation of the automatic opening device for containers **81** by users. It is possible to use different configurations of the closing element **81***a* and the base element **81***b* than those depicted in the Figures, without, however, changing the functionality of these components for the operation of the automatic opening device for containers **81**. The automatic opening device for containers **81** may even be provided without a closing

element **81***a* as shown in FIG. **35**, and yet the automatic opening device for containers **81** will operate normally, according to the teachings of the invention.

[0260] As can be seen in FIG. **36**, an internal screw thread **87** is provided in the inner portion of the first sidewall **78** of the base element **81***b*. The configuration of the internal screw thread **87** may comprise, for example, a right-oriented screw thread with three entries, although the internal screw thread **87** may comprise a screw thread with any number of entries.

[0261] Therefore, this embodiment of the invention is not limited to the use of an internal screw thread with three entries, and such screw thread was only chosen for exemplification only, although the use of a screw thread with multiple entries is more suitable for the purposes of the invention. The internal screw thread **87** may be indistinctly oriented to the right, as shown in the Figures, or to the left.

[0262] The inner portion of the top element **79** is provided with a cutting device **88**, which comprises a hollow protruding body whose upper portion is connected to the lower portion of the top element **79** in the region where the throughout orifice **83** is located. The latter is a continuation of the hollow portion of the cutting device **88**, thereby forming a direct connection substantially between the throughout orifice **83** and the hollow portion of the cutting device **88**, through which the product contained in the container will pass. The lower portion of the cutting device **88** is provided with a plurality of cutting elements **88***a*.

[0263] The locking device **6** shown in FIGS. **35**, **36** and **37** is identical to the locking device that has been described in relation to the embodiment of the invention shown in FIGS. **1**A, **1**B, **1**C and **2**, and comprises an elongated substantially cylindrical body provided in its upper edge of a plurality of upper rupture elements **6***a* which are connected to the lower edge of the base element **1***b*, as can be seen in more detail in FIG. **1**C.

[0264] A plurality of lower locking elements **6***b* is provided in the lower internal portion of the locking device **6**. The lower locking elements **6***b* comprise spaced apart lugs circularly distributed, the lower portion of each lug being joined to the lower region of the locking device **6** and the body of each lug being inclined towards the geometric axis of the locking device **6**. The lower locking elements **6***b* are designed so that they can slightly incline radially towards the inner wall of the locking device **6**.

[0265] Other configurations of lower locking elements **6***b* can be used and, therefore, the invention is not limited to the configuration depicted in FIGS. **36** and **37**. The function of the upper rupture elements **6***a* and the lower locking elements **6***b* will be understood hereafter, in the description of the operation to apply the automatic opening device for containers **81** to a spout. The container **20** shown in FIGS. **36** and **37** is the same shown in FIG. **3**, which is provided with a spout **12** which comprises an elongated cylindrical body provided with an external screw thread **14**, in the Figure a three-entry, right-oriented screw thread, which comprises a lower flank **14***a* and an upper flank **14***b*, with a root **15** formed between these two flanks. The characteristics of the external screw thread **14** have been described hereinbefore, and for this reason, it will not be repeated here.

[0266] The choice of an external right-oriented screw thread, with three entries, is because this is the configuration used in the internal screw thread **5** of the base element **81***b*. The same comments presented hereinbefore with this regard are valid here, in that the use of a right-oriented thread with three entries is for exemplification only. Therefore, is evidently that the invention is not limited to use only a three-entries screw thread, be it right or left hand oriented. Therefore, the external screw thread **14** may be a screw thread with any number of entries, and its orientation can be indistinctly to the right, as shown in FIGS. **36** and **37**, or to the left, as long as it is compatible with the screw thread used in the internal screw thread **87**.

[0267] A sealing element **19** is affixed to the rim of the spout **12**. The spout **12** is also provided in its outer portion with an upper ring **16**, an intermediate ring **18** and a lower ring **17**, located in the upper, intermediate and lower regions, respectively. The diameter of the upper ring **16** is smaller than the diameter of the intermediate ring **18**, and the diameter of the intermediate ring **18** is smaller than the diameter of the lower ring **17**, as can be seen in FIGS. **36** and **37**.

[0268] The application of the automatic opening device for containers **81** to the spout **12** is made by means of a pressing process, a downward longitudinal movement, by means of which the lower part of the automatic opening device for containers **81** is pressed against the upper part of the spout **12**.

[0269] The process for applying the automatic opening device for containers **81** to the spout **12** of the container **20** is the same as previously described regarding the application of the automatic opening device for containers **1** to the spout **12** of the container **20**, and shown in FIGS. **4**A, **4**B, **4**C and **4**D. For this reason, the description of this process will not be repeated here. Consequently, the same observations made hereinbefore regarding the embodiment of the invention referring to FIGS. **4**A, **4**B, **4**C and **4**D are valid here.

[0270] In FIG. **36** depicts the automatic opening device for containers **81** in the position it remains after being applied to the spout **12** of the container **20**, an operation executed in factory. In that position, container **20** is ready for sale. When a user needs to open the container **20**, to pour the product contained therein, suffices to rotate the automatic opening device for containers **81** in order to make the cutting elements **88***a* of the cutting device **88** tear the sealing element **19**, thereby releasing the passage of the product through the hollow portion of the cutting device **88** and through the throughout orifice **83**.

[0271] The process of opening container **20** by means of the automatic opening device for containers **81** is exactly the same as that was described with regard to FIGS. **6**A, **6**B, **6**C and **6**D, referring to the process for open the container **20** by means of the automatic opening device for containers **1**. For this reason, the description of this process will not be repeated herein. Consequently, the same observations made hereinbefore regarding the embodiment of the invention referring to FIGS. **6**A, **6**B, **6**C and **6**D are valid here.

[0272] In FIG. **37** the automatic opening device for containers **81** is depicted in a position after a user has made a rotation that has made the cutting elements **88***a* of the cutting device **88** cut the sealing element **19**, thereby enabling the product to pass through the hollow portion of the cutter **88** and through the throughout orifice **83**.

[0273] FIG. **38** depicts a top perspective view of a variation of the throughout orifice of the fourth embodiment of the automatic opening device for containers depicted in FIGS. **35**, **36** and **37**. As can be seen in FIG. **38**, the protruding element **84** depicted in the Figure is has an

annular shape, which encircles a circular throughout orifice **83**. All the remaining components of the automatic opening device for containers **81** shown in FIG. **38** are identical to those described in relation to FIGS. **35**, **36** and **37**, and for that reason, the description of these components will not be repeated here.

[0274] The characteristic of that embodiment of the invention depicted in FIGS. **35** to **38** can also be used in any of the embodiments and variations of the invention disclosed in this specification, that is, the provision of a protruding element **84** that encircles a throughout orifice **83**, both provided in a region close to the edge of the upper portion of the top element **79** of the base element **81***b*, with a cutting device **88** duly positioned in the region where the throughout orifice **83** is located. In this case, mutatis mutandis, the necessary adaptations must be made so that it can be done.

[0275] FIGS. **39** to **45** depict a further embodiment of the present invention, which is similar to the embodiment of FIGS. **10** and **11**. The differences between the embodiment of FIGS. **39** to **45** and the embodiment of FIGS. **10** and **11** is the use of a cap comprising an upper sealing element and a base element and the manner these components are locked to form the automatic opening device for containers object of the present embodiment.

[0276] The use in the present embodiment of a cutting device having larger diameter is only an operational choice, since the dimensions of the cutting device used in the variation of the embodiment of the automatic opening device for containers shown in FIGS. **10** and **11** can be changed without being characterized as a new type of cutting device.

[0277] Thus, in the following description of the automatic opening device for containers **140** depicted in FIGS. **39** to **45**, mention will only be made regarding an upper sealing element **141***a* and a base element **141***b* that form part of the automatic opening device for containers **140**. The remaining components which are common to the embodiment of the automatic opening device for containers shown in FIGS. **10** and **11** will not be described here, and in FIGS. **39** to **45** the same indicative numerals will be used to refer to them.

[0278] In FIGS. **39** to **45** the upper sealing element **141***a*, the base element **141***b* and the locking device **6** are shown in the cut. As can be seen, the upper sealing element **141***a* comprises a disk-shaped body and substantially flat whose lower region is provided with a sealing projection **141***a*' having the shape of a trunk of a cylinder, the upper edge of the sealing projection **141***a*' being rigidly affixed to the lower region of the upper sealing element **141***a*, as can be seen in the Figures.

[0279] The base element **141***b* comprises a hollow cylindrical body whose internal region is provided with at least one segment of internal screw thread **5**, in FIGS. **39** to **45** three segment of internal screw threads **5** being shown as a not limiting example. Each segment of internal screw thread **5** is designed to engage on a respective segment of external screw thread **14** of the spout **12**. Evidently, the number of segment of internal screw threads **5** used in the base element **141***b* must be the same number of segment of external screw threads **14** of the spout **12**.

[0280] The base element **141***b* is also provided with a cutting device **143**, which comprises a hollow cylindrical body whose upper edge is affixed to the upper inner region of the base element **141***b* by means of a connecting ring **145**. The lower region of the device cutting element **143** is provided with at least one cutting element **143***a*.

[0281] The edge of the lower inner region of the base element **141***b* is provided with a plurality of upper locking elements **141***b*', each of them comprising in this embodiment a body projecting obliquely and upwardly towards the imaginary geometric axis of the element base **141***b*. The upper locking elements **141***b*' are designed to be able to slightly incline in opposition to the geometric axis of the base element **141***b*. A connecting link element **144** connects the upper sealing element **141***a* to the base element **141***b*.

[0282] The locking device **6** comprises a hollow body in a substantially cylindrical shape, whose top edge is provided with a plurality of rupture elements **6***a*, which are also connected to the bottom edge of the base element **141***b*, thereby forming a breakable interconnection between the locking device lock **6** and the base element **141***b*. The function of the rupture elements **6***a* will be understood from the description that will be made hereinafter regarding the mode to use the automatic opening device for containers **140**.

[0283] The edge of the lower internal region of the locking device **6** is provided with a plurality of lower locking elements **6***b*, each of them comprising in the present embodiment a body projecting obliquely and upwardly towards the imaginary geometric axis of the locking device **6**. The lower locking elements **6***b* are designed in such a way as to be able to slightly incline in opposition to the geometric axis of the locking device **6**.

[0284] FIGS. **39** and **40** depict the assembly formed by the upper sealing element **141***a*, the base element **141***b* and the locking device **6** before the assembly is inserted into the spout **12**. FIGS. **41** and **42** depict the assembly formed by the upper sealing element **141***a*, the base element **141***b* and the locking device **6** after the assembly is inserted into the spout **12**. As shown in FIGS. **41** and **42** the lower locking elements **6***a* of the locking device **6** have already move past the upper ring **16**. When the lower locking elements **6***b* touches the upper edge of the lower ring **17** they incline in opposition to the geometric axis of the locking device **6**, thereby allowing the lower locking elements **6***b* to move past the lower ring **17**.

[0285] Consequently, the assembly formed by the upper sealing element **141***a*, the base element **141***b* and the locking device **6** is locked in the position depicted in FIGS. **41** and **42**, and can no longer be removed by means of upward longitudinal movements. That is the mounting position in that the assembly formed by the upper sealing element **141***a*, the base element **141***b* and the locking device **6** and the spout **12** must remain to form the automatic opening device for containers **140** so that the latter can be applied to a container, an operation performed at a factory using a tool specially dedicated for this purpose. After being duly assembled, an automatic opening device for containers **140** should be applied, for example, to an aseptic carton package or to a plastic pouch.

[0286] When it is necessary to open the container, be it an aseptic carton package or a plastic pouch, it will be necessary to apply a counterclockwise rotary movement to the assembly formed by the upper sealing element **141***a* and the base element **141***b*. When this counterclockwise rotary movement is applied, initially each segment of internal screw thread **5** of the base element **141***b* is screwed into its respective segment of external screw thread **14** of the spout

12. Next, with the continuity of the rotary movement in the counterclockwise direction, the rupture elements **6***a* will be broken, thereby allowing the rotary movement to continue in the counterclockwise direction of the assembly formed by the upper sealing element **141***a* and the base element **141***b*.

[0287] Note that the upper portion **21** of each upper flank of the segment of external screw threads **5**, which extends beyond the upper ring **16** of the spout **12**, guarantees that each segment of internal screw thread **5** of the base element **141***b* can screw in its respective segment of external screw thread **14**, because when each segment of internal screw thread **5** touches the upper portion **21** of the respective upper flank, the only possibility for the continuation of the rotary movement in the counterclockwise direction will be the screwing of each segment of internal screw thread **5** in the respective segment of external screw thread **14**.

[0288] As the cutting device **143** is rigidly attached to the base element **141***b*, evidently the cutting device **143** will execute the same movements made by the base element **141***b*. Therefore, with the continuation of the counterclockwise rotary movement of the assembly formed by the upper sealing element **141***a* and the base element **141***b*, the cutting device **143** will execute the same counterclockwise rotary movement executed by the assembly formed by the upper sealing element **141***a* and the base element **141***b*.

[0289] Concomitantly with this movement, the assembly formed by the upper sealing element **141***a* and the base element **141***b* will also make an axial downward movement, resulting from the screwing of the segment of internal screw threads **5** of the base element **141***b* in their respective segment of external screw threads **14** of the spout **12**, as indicated by the arrow W in FIG. **41**. Consequently, the a cutting device **143** will perform the same downward axial movement indicated by the arrow W in FIG. **41**.

[0290] The composition of the counterclockwise and downward axial rotational movements made by the cutting device **143** will cause the cutting elements **143***a* of the cutting device **143** to cut the sealing element **19** of the container, adhered to the rim of the spout **12**.

[0291] In FIG. **43** the cutting device **143** is depicted in the final position, after the assembly formed by the upper sealing element **141***a* and the base element **141***b* has reached the lowest position in the previously described screwing operation, when the upper edge of the spout **12** touches the lower region of the connection ring **145**, as can be seen in more detail in FIG. **43**. Note in FIG. **43** that the upper locking elements **141***b*' moved past the intermediate ring **18** of the spout **12**. When the upper locking elements **141***b*' touched the upper edge of the intermediate ring **18** they inclined in opposition to the geometric axis of the base element **141***b*, which allowed the upper locking elements **141***b*' to move past the intermediate ring **18**

[0292] Detail X in FIG. **43** shown the upper locking elements **141***b*' having already moved past the intermediate ring **18**. Consequently, the assembly formed by the upper sealing element **141***a* and the base element **141***b* was locked in that position shown in FIG. **43**, and can no longer be released. The use of the upper locking elements **141***b*' is optional, and is only intended to prevent the removal of the assembly formed by the upper sealing element **141***a*, the base element **141***b*. Optionally, said locking of the assembly formed by the upper sealing element **141***a* and the base element **141***b* can be achieved between the segment of internal screw threads **5** and the segment of external screw threads **14**, at the end of their screwing.

[0293] After the container is open, as described above, it suffices to incline the upper sealing element **141***a* to pour the product contained within the container through the spout **12**. FIGS. **44** and **45** depict in cut the automatic opening device for containers **140** with the upper sealing element **141***a* shown in the open and closed positions, respectively.

[0294] It is important to note that in FIGS. **39** to **45** the segment of internal screw threads **5** of the base element **141***b* and the segment of external screw thread **14** of the spout **12** comprise a left-oriented screw thread. The choice of this type of orientation is due to the fact that users are accustomed to manipulating threaded caps and spouts provided with right hand oriented screw threads, wherein unscrewing is made by counterclockwise rotating movements to cause upward axial movements.

[0295] As in the present embodiment of the invention it is necessary that the assembly formed by the upper sealing element **141***a* and the base element **141***b* make first an axial downward movement to cause the sealing element to be torn, when a user is opening the container, it is then preferably to use a left hand oriented screw thread, wherein counterclockwise rotary movements cause axial downward movements. The use of right-hand oriented screw threads certainly would cause difficulties for most users to rotate said assembly correctly.

[0296] After this first rotation of the assembly formed by the upper sealing element **141***a* and the base element **141***b*, there will no longer be any need to apply rotational movement to any of the components of the automatic opening device for containers **140**. As seen from the description of the present embodiment of the invention, to pour the product contained in the container, it suffices to incline the container to pour the product through the spout **12**.

[0297] It is important to note that the segment of internal screw threads **5** of the base element **141***b* and the segment of external screw thread **14** of the spout **12** may comprise a right-hand oriented screw thread. In this case, users would have to be instructed to initially rotate the assembly formed by the upper sealing element **141***a* and the base element **141***b* in a clockwise direction to cause a downward axial movement said assembly in order to tear the sealing element **19**.

[0298] As it was noticed from the descriptions of the different embodiments and variations of the automatic opening device for containers object of the invention, the fundamental characteristic of all of them is the provision of a cutting device that, in addition to serving as a cap for the container, is provided with a means for executing a cutting operation of the sealing elements which are usually affixed to the rims of the spouts of the containers, thereby creating a passage to enable the product contained in the container to be poured. This eliminates the need to execute the operations of unscrewing and removing the cap, manually removing the sealing element and screwing back the cap on the spout of the container, as occurs nowadays. Therefore, the present invention obviates the need for users to even remove the cap from the threaded spouts of the containers in order to remove the sealing elements that are applied to the rim of the spouts.

[0299] With the use of the embodiments of the automatic opening device for containers of the invention, it is no longer necessary to use thick sealing elements adhered to the rim of the spouts, and so the thickness of the sealing element may

be reduce to simply seal the container. Therefore, it is no longer needed to use thick sealing elements solely to prevent users from inadvertently damaging or puncturing them at market shelves when they are checking if the container is duly sealed.

[0300] The use of a screw thread with multiple entries in the embodiments of the automatic opening device for containers previously described provides a much greater lead than it would be obtained by using a single entry screw thread, thereby allowing the operation of opening the containers to be rapidly executed. The faster the container is opened, the easier and faster is the tearing of the sealing element by the cutting elements of the cutting device, due to the fact that the sealing element is still well tensioned as a consequence of its strong adhesion to the rim of the spout.

[0301] The shapes of the cutting elements used in the cutting devices of the invention must be determined according to the cutting speed provided by the type of screw thread used in the automatic opening device for containers and the characteristics of the material used in the sealing element.

[0302] Tamper resistant devices may be used in conjunction with the various embodiments and variations of the invention described herein, in order to guarantee the user that the container has not been tampered with. For example, thermal wrappers around the spout and devices can be used, which are provided with tear lines that facilitate their removal, as is well known in the art.

[0303] The present invention has been described regarding its various embodiments and variations. Modifications or substitutions may be made in the invention without, however, departing from the inventive concept described and disclosed herein. Consequently, the invention is not limited only to the embodiments and variations described herein, being only limited by the scope of the accompanying claims to this specification.

1. An automatic opening device for containers (**1**,**61**,**140**) provided with a sealing element (**19**,**77**) in a spout (**12**,**65**), an external screw thread (**14**,**67**) of at least one entry being provided in the said spout (**12**,**65**), the automatic opening device for containers (**1**,**61**,**140**) comprising a base element (**1***b*, **61***b*, **141***b*) and a locking device (**6**,**62**), in that:

the base element (**1***b*, **61***b*, **141***b*) comprises a first sidewall (**11**,**72**) and an upper element (**10**.**73**) whose edges are joined to the upper edge of the first sidewall (**11**,**72**);

the upper element (**10**,**73**) is provided with a throughout hole (**2***a*,**74***a*);

a screw thread (**5**,**64**) of at least one entry is provided in the internal region of the first sidewall (**11**,**72**) of the base element (**1***b*,**61***b*);

the locking device (**6**,**62**) comprises an elongated body provided at its upper edge with a plurality of upper rupture elements (**6***a*,**62***a*), which are connected to the lower edge of the base element (**1***b*,**61***b*); and

the locking device (**6**,**62**) is provided in its lower region with a means for locking the automatic opening device for containers (**1**,**61**) in the spout (**12**,**65**);

the automatic opening device for containers (**1**,**61**) characterized in that:

the upper element (**10**,**73**) is provided with a cutting device (**3**,**63**), which comprises a protruding hollow body extending downwardly, whose upper region is connected to the lower region of the upper element (**10**,**73**) where the throughout hole (**2***a*,**74***a*) is located, being a continuation of the hollow portion of the cutting device (**3**,**63**), the lower region of the cutting device (**3**,**63**) being provided with a plurality of cutting elements (**3***a*,**63***a*); and

the external screw thread (**14**,**67**) of the spout (**12**,**65**) and the internal screw thread (**5**,**64**) in the internal region of the first sidewall (**11**,**72**) of the base element (**1***b*, **61***b*) have the same number of entries and comprise screw threads of the same orientation, chosen from the group comprising right-hand orientation and left-hand orientation.

2- An automatic opening device for containers (**1**) according to claim **1**, characterized in that:

it is additionally provided with a closing element (**1***a*) which is connected to the base element (**1***b*) by means of a connection chosen from the group comprising a connecting pivoting element (**7**), a screwed-threaded connection and a pressure connection;

the closing element (**1***a*) comprises a second sidewall (**9**) and an upper element (**8**) whose edges are joined to the upper edge of the second sidewall (**9**), the upper element (**8**) being provided in its internal lower region with a protruding sealing element (**4**);

a central protruding ring (**2**) encircles the throughout hole (**2***a*) in the central region of the upper element (**10**); and

said means for locking the automatic opening device for containers (**1**) comprises a plurality of lower locking elements (**6***b*) in the form of spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the lower portion of the locking device (**6**), and the body of each lug being inclined towards the geometric axis of the locking device (**6**).

3- An automatic opening device for containers (**1**) according to claim **2**, characterized in that:

the internal screw thread (**5**) provided in the internal region of the first sidewall (**11**) comprises a screw thread of multiple entries, each screw thread (**5**) comprising flanks of internal screw thread;

an upper ring (**16**), an intermediate ring (**18**) and a lower ring (**17**) are provided in the upper, intermediate and lower regions, of the external region of the spout (**12**), respectively;

the diameter of the upper ring (**16**) is smaller than the diameter of the intermediate ring (**18**), and the diameter of the intermediate ring (**18**) is smaller than the diameter of the lower ring (**17**); and

the external screw thread (**14**) of the spout (**12**) comprises a multiple entries screw thread, each entry comprising a lower flank (**14***a*) and an upper flank (**14***b*), with a root (**15**) formed between the lower flank (**14***a*) and the upper flank (**14***b*), in that the upper flank (**14***b*) has an extended upper end (**21**), which extends beyond the upper ring (**16**), and the lower flank (**14***a*) has its upper end even with lower region of the upper ring (**16**).

4- An automatic opening device for containers (**1**) according to claim **2**, characterized in that:

the internal screw thread (**5**) provided in the internal region of the first sidewall (**11**) comprises a multiple entries screw thread, each comprising bipartite internal screw thread flanks, which comprise an upper section (**5***s*) and a lower section (**5***i*);

an upper ring (**16**), an intermediate ring (**18**) and a lower ring (**17**) are provided in the upper, intermediate and lower regions, respectively, of the external region of the spout (**12**);

the diameter of the upper ring (**16**) is smaller than the diameter of the intermediate ring (**18**), and the diameter of the intermediate ring (**18**) is smaller than the diameter of the lower ring (**17**);

a guiding element (**22**) is provided in the external region of the first sidewall (**11**), which extends parallel to the upper edge of the spout (**12**);

the external screw thread (**14**) of the spout (**12**) comprises a multiple entry screw thread, each entry comprising a lower flank (**14***a*) and an upper flank (**14***b*), with a root (**15**) formed between the lower flank (**14***a*) and the upper flank (**14***b*), where the upper flank (**14***b*) has an upper end (**21**) that extends to the guiding element (**22**) and the lower flank (**14***a*) has its upper end facing the lower region of the upper ring (**16**); and

a limiter of rotation (**23**) is formed between the upper end (**21**) of the upper flank (**14***b*) and the guiding element (**22**).

5- An automatic opening device for containers (**1**) according to claim **3**, characterized in that:

the locking device (**6**) is provided in its lower portion with a circular wing (**6***e*), which extends from the lower end of the locking device (**6**) and completely encircles the lower ring (**17**); and

a spacing (H) is provided between the upper ends of the locking elements (**6***b*) of the locking device (**6**) regarding the lower face of the intermediate ring (**18**).

6- An automatic opening device for containers (**1**) according to claim **5**, characterized in that each external screw thread flanks (**5**) is provided with a rotational locking recess and each internal screw thread flanks (**14**) is provided with a rotational locking projection, said locking recess and projection being designed to fit and lock the automatic opening device for containers (**1**) at the end of the rotation operation for opening said container.

7- An automatic opening device for containers (**1**) according to claim **4**, characterized in that each external screw thread flank (**5**) is provided with a locking recess and each internal screw thread flank (**14**) is provided with a locking projection, said locking recess and locking projection being designed to fit and lock the automatic opening device for containers (**1**) to preclude rotational movements at the end of the operation to open said container.

8- An automatic opening device for containers (**1**) according to claim **1**, characterized in that:

the base element (**1***b*) be provided with a pouring device (**53**) which comprises an integrally hollow body formed by a first curved portion (**53**) and a second portion (**53***b*), which extends over the upper face of the base element (**1***b*) towards the edge, where the first curved portion (**53**) has one end connected to the hollow body of the cutting device (**3**), and the other end of the first curved portion (**53**) is connected to one end of the second portion (**53***b*), whose other end is chamfered and forms an edge (**53***c*), which defines a throughout hole (**53***d*); and

a closing element (**1***a*) is additionally provided, which is connected to the base element (**1***b*) by means of a pivoting connecting element, the closing element (**1***a*) being provided with a sealing element (**54**), which is designed to rest on the edge (**53***c*) of the second horizontal portion (**53***b*) when the closing element (**1***a*) is in the closed position.

9- An automatic opening device for containers (**1**) according to claim **8**, characterized in that each external screw thread flank (**5**) is provided with a locking recess and each internal screw thread flank (**14**) is provided with a locking projection, said locking recess and locking projection being designed to fit and lock the automatic opening device for containers (**1**) to preclude rotational movements at the end of the operation to open said container.

10- An automatic opening device for containers (**1**) according to claim **1**, characterized in that:

be provided with a closing element (**1***a*), which comprises a second sidewall (**9**) and an upper element (**8**) whose edges are joined to the upper edge of the second sidewall (**9**), the upper element (**8**) being provided in its internal central region with a protruding sealing element (**4**);

a suction spout (**24**) is provided in the upper region of the base element (**1***b*), the suction spout (**24**) comprising a hollow body that extends above the base element (**1***b*) and encircles the throughout hole (**2***a*), a mouth ring (**24***a*) being provided at the upper end of the suction spout (**24**);

the internal screw thread (**5**) provided in the internal region of the first sidewall (**11**) comprises a screw thread of multiple entries, each comprising internal screw threads flanks;

an upper ring (**16**), an intermediate ring (**18**) and a lower ring (**17**) are provided in the upper, intermediate and lower regions, respectively, of the external region of the spout (**12**);

the diameter of the upper ring (**16**) is smaller than the diameter of the intermediate ring (**18**), and the diameter of the intermediate ring (**18**) is smaller than the diameter of the lower ring (**17**);

the external screw thread (**14**) of the spout (**12**) comprises a multiple entries screw thread, each comprising a lower flank (**14***a*) and an upper flank (**14***b*), with a root (**15**) formed between the lower flank (**14***a*) and the upper flank (**14***b*), where the upper flank (**14***b*) has an extended upper end (**21**), which extends beyond the upper ring (**16**), and the lower flank (**14***a*) has its upper end even with the lower region the upper ring (**16**); and

said locking means comprises a plurality of lower locking elements (**6***b*) in the form of spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the lower portion of the locking device (**6**), and the body of each lug being inclined towards the geometric axis of the locking device (**6**).

11- An automatic opening device for containers (**1**) according to claim **10**, characterized in that:

said internal screw thread flanks (**5**) are bipartite, and comprise an upper section (**5***s*) and a lower section (**5***i*);

a guiding element (**22**) is provided in the outer region of the first sidewall (**11**), which extends parallel to the upper edge of the spout (**12**); and

a limiter of rotation (**23**) is formed between the upper end (**21**) of the upper flank (**14***b*) and the guiding element (**22**).

12- An automatic opening device for containers (**1**) according to claim **10**, characterized in that a spacing (H) is

provided between the upper ends of the locking elements (**6***b*) of the locking device (**6**) regarding the lower face of the intermediate ring (**18**).

13- Automatic opening device for containers (**1**) according to claim **12**, characterized in that each external screw thread flank (**5**) is provided with a locking recess and each internal screw thread flank (**14**) is provided with a locking projection, said locking recess and locking projection being designed to fit and lock the automatic opening device for containers (**1**) to preclude rotational movements at the end of the operation to open said container.

14- Automatic opening device for containers (**1**) according to claim **11**, characterized in that each external screw thread flank (**5**) is provided with a locking recess and each internal screw thread flank (**14**) is provided with a locking projection, said locking recess and locking projection being designed to fit and lock the automatic opening device for containers (**1**) to preclude rotational movements at the end of the operation to open said container.

15- An automatic opening device for containers (**1**) according to claim **1**, characterized in that:

the base element (**1***b*) is additionally provided with a protruding plugging element (**58**) formed by an elongated hollow body whose upper portion is closed, and the lower portion is open and firmly connected to the upper element (**10**) of the base element (**1***b*), the hollow portion of the protruding plugging element (**58**) being aligned and in communication with the throughout hole (**2***a*); and

a cap (**59**) is connected to the base element (**1***b*) by means of a flexible connecting element (**60**).

16- An automatic opening device for containers (**1**) according to claim **15**, characterized in that each external screw thread flank (**5**) is provided with a locking recess and each internal screw thread flank (**14**) is provided with a locking projection, said locking recess and locking projection being designed to fit and lock the automatic opening device for containers (**1**) to preclude rotational movements at the end of the operation to open said container.

17- An automatic opening device for containers (**61**) according to claim **1**, characterized in that:

It is additionally be provided with a closing element (**61***a*), which is connected to the base element (**61***b*) by means of a connection chosen from the group comprising a pivoting connection, a screwed-threaded connection and a pressure connection;

the closing element (**61***a*) comprises a second sidewall (**71**) and an upper element (**75**) whose edges are joined to the upper edge of the second sidewall (**71**), the upper element (**75**) being provided in its internal lower region with a protruding sealing element (**76**);

a central protruding ring (**74**) encircles the throughout hole (**74***a*) in the upper member (**73**);

said means for the locking of the automatic opening device for containers (**61**) comprises a plurality of lower locking elements (**62***b*) in the form of spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the lower portion of the locking device (**62**), and the body of each lug being inclined towards the geometric axis of the locking device (**62**);

the spout (**65**) is provided with a retaining ring (**68**), located below the external screw thread (**67**), and a lower ring (**69**) located in its lower region;

the spout (**65**) has a linear extension (L_1) between its edge and the edge of the retaining ring (**68**), and a linear extension (C_1) between the edge of the retaining ring (**68**) and the upper portion of the lower ring (**69**) where the lower edge of the locking device (**62**) will touch, at the end of the assembly of the automatic opening device for containers **61** in the container (**70**);

the base element (**61***b*) has a linear extension (L_2) between the lower part of the ring-shaped engagement region (**74***a*) of the element and its lower edge, and a linear extension (C_2) between that lower edge of the base element (**61***b*) and an imaginary plane formed by the upper region of the lower locking elements (**62***b*); and

said linear extensions (L_1) and (L_2) are substantially identical, and the linear extensions (C_1) and (C_2) are also substantially identical.

18- An automatic opening device for containers (**61**) according to claim **17**, characterized in that each external screw thread flank (**67**) is provided with a locking recess and each internal screw thread flank (**64**) is provided with a locking projection, said locking recess and locking projection being designed to fit and lock the automatic opening device for containers (**61**) to preclude rotational movements at the end of the operation to open said container.

19- An automatic opening device for containers (**1**) according to claim **1**, characterized in that:

the base element (**61***b*) is additionally provided with a protruding plugging element (**58**) formed by an elongated hollow body whose upper portion is closed, and the lower portion is open and firmly connected to the upper element (**73**) of the base element (**61***b*), the hollow portion of the protruding plugging element (**58**) being aligned and in communication with the throughout hole (**74***a*);

a cap (**59**) is connected to the base element (**1***b*) by means of a flexible connecting element (**60**);

said means for locking the automatic opening device for containers (**61**) comprises a plurality of lower locking elements (**62***b*) in the form of spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the lower portion of the locking device (**62**), and the body of each lug being inclined towards the geometric axis of the locking device (**62**);

the spout (**65**) is provided with a retaining ring (**68**), located below the external screw thread (**67**), and a lower ring (**69**) located in its lower region;

the spout (**65**) has a linear extension (L_1) between its edge and the edge of the retaining ring (**68**), and a linear extension (C_1) between the edge of the retaining ring (**68**) and the upper portion of the lower ring (**69**) where the lower edge of the locking device (**62**) will touch, at the end of the assembly of the automatic opening device for containers **61** in the container (**70**);

the base element (**61***b*) has a linear extension (L_2) between the lower part of the ring-shaped engagement region (**74***a*) of the element and its lower edge, and a linear extension (C_2) between that lower edge of the base element (**61***b*) and an imaginary plane formed by the upper region of the lower locking elements (**62***b*); and

said linear extensions (L_1) and (L_2) are substantially identical, and the linear extensions (C_1) and (C_2) are also substantially identical.

20- An automatic opening device for containers (**61**) according to claim **17**, characterized in that:

the base element (**61***b*) is provided with a pouring device (**53**) which comprises an integrally hollow body formed by a first curved portion (**53***a*) and a second portion (**53***b*), which extends over the upper face of the base element (**1***b*) towards the edge, where the first curved portion (**53**) has one end connected to the hollow body of the cutting device (**3**), and the other end of the first curved portion (**53**) is connected to one end of the second portion (**53***b*), whose other end is chamfered and forms an edge (**53***c*), which defines a throughout hole (**53***d*); the

the closing element (**61***a*) is provided with a sealing element (**54**), which is designed to rest on the edge (**53***c*) of the second horizontal portion (**53***b*) when the closing element (**61***a*) is in the closed position;

said means for locking the automatic opening device for containers (**61**) comprises a plurality of lower locking elements (**62***b*) in the form of spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the lower portion of the locking device (**62**), and the body of each lug being inclined towards the geometric axis of the locking device (**62**);

the spout (**65**) is provided with a retaining ring (**68**), located below the external screw thread (**67**), and a lower ring (**69**) located in its lower region;

the spout (**65**) has a linear extension (L_1) between its edge and the edge of the retaining ring (**68**), and a linear extension (C_1) between the edge of the retaining ring (**68**) and the upper portion of the lower ring (**69**) where the bottom edge of the locking device (**62**) will touch, at the end of the assembly of the automatic opening device for containers (**61**) in the container (**70**);

the base element (**61***b*) has a linear extension (L_2) between the lower part of the ring-shaped engagement region (**74***a*) of the element and its lower edge, and a linear extension (C_2) between that lower edge of the base element (**61***b*) and an imaginary plane formed by the upper region of the lower locking elements (**62***b*); and

said linear extensions (L_1) and (L_2) are substantially identical, and the linear extensions (C_1) and (C_2) are also substantially identical.

21- An automatic opening device for containers (**61**) according to claim **20**, characterized in that each external screw thread flank (**67**) is provided with a locking recess and each internal screw thread flank (**64**) is provided with a locking projection, said locking recess and locking projection being designed to fit and lock the automatic opening device for containers (**61**) to preclude rotational movements at the end of the operation to open said container.

22- An automatic opening device (**41**) for containers (**51**) provided with a sealing element (**19**) in a spout (**47**), the automatic opening device (**41**) comprising a base element (**41***b*) and a guiding and locking device (**46**), where:

the spout (**47**) comprises an elongated cylindrical body (**48**), a first upper ring (**49**) and a second lower ring (**50**), larger in diameter than the first upper ring (**49**), the connection between the spout (**47**) and the automatic opening device for containers (**41**), one from the group comprising screwed-thread and bayonet;

the base element (**41***b*) comprises a first sidewall element (**54**) and an upper member (**55**) whose edges are joined to the upper edge of the first sidewall element (**54**);

the central region of the upper member (**55**) is provided with a throughout hole (**39***a*);

the guiding and locking device (**46**) comprises an elongated body provided at the upper edge with a plurality of upper rupture elements (**46***a*), which are connected to the lower edge of the base element (**41***b*); and

the internal lower region of the guiding and locking device (**46**) is provided with a locking means;

the automatic opening device for containers (**41**) characterized in that:

the lower central region of the upper member (**55**) of the base member (**41***b*) is provided with a cutting device (**43**), which comprises a hollow protruding body whose upper region is connected to the lower region of the upper member (**55**) where the throughout hole (**39***a*) is located, which is a continuation of the hollow portion of the cutting device (**43**), the lower region of the cutting device (**43**) being provided with a plurality of cutting elements (**43***a*);

a screw thread (**45**,**145**) of at least one entry is provided in the lower external region of the first sidewall element (**54**) of the base element (**41***b*);

the upper internal region of the guiding and locking device (**46**) is provided with an internal screw thread (**44**,**144**) of at least one entry; and

the screw thread (**45**,**145**) provided in the external lower region of the first sidewall element (**54**) of the base element (**41***b*) and the internal screw thread (**44**,**144**) provided in the upper internal region of the guiding and locking device (**46**) comprise screw threads of equal orientation, defined between right and left

23- An automatic opening device for containers (**41**), according to claim **22**, characterized in that:

additionally be provided with a closing element (**41***a*) which is connected to the base element (**41***b*) by means of a connection chosen from the group comprising a pivoting connection element, a screw-threaded connection, and a pressure connection element, the closing element (**41***a*) comprising a second sidewall element (**56**) and an upper member (**57**) whose edges are joined to the upper edge of the second sidewall element (**56**), the upper member (**57**) being provided in its internal center region of a protruding sealing element (**40**);

a central protruding ring (**39**) encircling the throughout hole (**39***a*) in the central region of the upper member (**55**);

the screw thread (**44**,**144**) comprises a screw thread of multiple entries, each comprising a lower flank (**44***a*, **144***a*) and an upper flank (**44***b*, **144***b*), with a root (**44***c*, **144***c*) formed between these two flanks, wherein the upper ends (**44***d*, **144***d*) of the upper flanks (**44***b*, **144***b*) extend above the upper ends of the lower flanks (**44***b*, **144***b*); and

said locking means comprise a plurality of lower locking elements (**46***b*) in the form of spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the lower portion of the guiding and locking device (**46**), and the body of each

lug being inclined towards the geometric axis of the guiding and locking device (**46**).

24- An automatic opening device for containers (**41**) according to claim **23**, characterized in that:

the base element (**41***b*) is provided with a pouring device (**53**) which comprises a hollow body formed by a first curved portion (**53***a*) and a second portion (**53***b*), which extends over the upper face of the base element (**41***b*) towards its edge, where the first curved portion (**53***a*) has one end connected to the hollow body of the cutting device (**43**), and the other end of the first curved portion (**53***a*) is connected to one end of the second portion (**53***b*), whose other end is beveled and forms a rim (**53***c*), which defines a throughout hole (**53***d*); and

the closing element (**41***a*) is provided with a sealing element (**54**), which is designed to rest on the edge (**53***c*) of the second horizontal portion (**53***b*) when the closing element (**41***a*) is in the closed position.

25- An automatic opening device for containers (**41**) according to claim **24**, characterized in that reinforcement wings (**46***d*) are provided on the upper edge of the guiding and locking device (**46**), located in the regions where the upper ends (**44***d*, **144***d*) of the upper flanks (**44***b*, **144***b*) are extended.

26- An automatic opening device for containers (**41**) according to claim **25**, characterized in that each external screw thread flank (**45**,**145**) is provided with a locking recess and each internal screw thread flank (**44**,**144**) is provided with a locking projection, said locking recess and locking projection being designed to fit and lock the automatic opening device for containers (**41**) to preclude rotational movements at the end of the operation to open said container.

27- An automatic opening device for containers (**41**) according to claim **23**, characterized in that:

a plurality of guiding fins (**46***c*) is provided in the internal lower region of the guiding and locking device (**46**);

the base element (**41***b*) is provided with a pouring device (**53**) which comprises an integrally hollow body formed by a first curved portion (**53***a*) and a second portion (**53***b*), which extends over the upper face of the base element (**41***b*) towards the edge, where the first curved portion (**53***a*) has one end connected to the hollow body of the cutting device (**43**), and the other end of the first curved portion (**53***a*) is connected to one end of the second portion (**53***b*), whose other end is chamfered and forms an edge (**53***c*), which defines a throughout hole (**53***d*); and

the closing element (**41***a*) is provided with a sealing element (**54**), which is designed to rest on the edge (**53***c*) of the second horizontal portion (**53***b*) when the closing element (**41***a*) is in the closed position.

28- An automatic opening device for containers (**41**), according to claim **27**, characterized in that reinforcement wings (**46***d*) are provided on the upper edge of the guiding and locking device (**46**), located in the regions where the upper ends (**44***d*, **144***d*) of the upper flanks (**44***b*, **144***b*) are extended.

29- An automatic opening device for containers (**41**) according to claim **28**, characterized in that each external screw thread flank (**45**,**145**) is provided with a locking recess and each internal screw thread flank (**44**,**144**) is provided with a locking projection, said locking recess and locking projection being designed to fit and lock the automatic opening device for containers (**41**) to preclude rotational movements at the end of the operation to open said container.

30- An automatic opening device for containers (**41**) according to claim **23**, characterized in that:

an internal screw thread (**52**) is provided in the lower internal region of the guiding and locking device (**46**);

the base element (**41***b*) is provided with a pouring device (**53**) which comprises an integrally hollow body formed by a first curved portion (**53***a*) and a second portion (**53***b*), which extends over the upper face of the base element (**41***b*) towards the edge, where the first curved portion (**53***a*) has one end connected to the hollow body of the cutting device (**43**), and the other end of the first curved portion (**53***a*) is connected to one end of the second portion (**53***b*), whose other end is beveled and forms an rim (**53***c*), which defines a throughout hole (**53***d*); and

the closing element (**41***a*) is provided with a sealing element (**54**), which is designed to rest on the edge (**53***c*) of the second horizontal portion (**53***b*) when the closing element (**41***a*) is in the closed position.

31- An automatic opening device for containers (**41**) according to claim **30**, characterized in that reinforcement wings (**46***d*) are provided on the upper edge of the guiding and locking device (**46**), located in the regions where the upper ends (**44***d*, **144***d*) of the upper flanks (**44***b*, **144***b*) are extended.

32- An automatic opening device for containers (**41**) according to claim **31**, characterized in that each external screw thread flank (**45**,**145**) is provided with a locking recess and each internal screw thread flank (**44**,**144**) is provided with a locking projection, said locking recess and locking projection being designed to fit and lock the automatic opening device for containers (**41**) to preclude rotational movements at the end of the operation to open said container.

33- A spout adapter device (**25**,**35**) for application to a spout (**26**) of a container (**20**), where:

a sealing element (**19**) is firmly adhered to the rim of the spout (**26**);

the external upper region of the spout (**26**) is provided with an external screw thread (**30**) with at least one entry, with an orientation chosen from the group comprising right-hand and left-hand;

a retaining ring (**33**) is located immediately below the external screw thread (**30**); and

the external lower region of the spout (**26**) is provided with a base ring (**28**), larger in diameter than the retaining ring (**33**);

the spout adapter device (**25**,**35**) characterized in that it comprises an upper portion (**25***s*, **35***s*) connected to a lower portion (**25***i*, **35***i*), of larger diameter, in which:

the external upper region of the upper portion (**25***s*, **35***s*) is provided with a protruding ring (**25***c*, **35***c*), located near the upper edge of the spout adapter device (**25**,**35**);

an external screw thread (**27**,**37**) of at least one entry, having orientation chosen from the group comprising right-hand and left-hand, is provided in the external region of the upper portion (**25***s*,**35***s*), which comprises a lower flank (**27***a*,**37***a*) and an upper flank (**27***b*,**37***b*), with a root (**27***c*,**37***c*) formed between the lower flank (**27***a*, **37***a*) and the upper flank (**27***b*,**37***b*), the upper flank (**27***b*,**37***b*) of the external screw thread (**27**,**37**) is

provided with an upper end (**31**,**32**) that extends beyond the protruding ring (**25***c*,**35***c*), while the upper end of the lower flank (**27***a*,**37***a*) faces the lower portion of the protruding ring (**25***c*,**35***c*);

an internal screw thread (**29**.**36**) is provided in the internal region of the upper portion (**25***s*, **35***s*) of the spout adapter device (**25**.**35**); and

a locking means is provided in the internal lower region of the lower portion (**25***i*, **35***i*).

34- A spout adapter device (**25**) according to claim **33**, characterized in that the locking means provided in the internal lower region of the lower portion (**25***i*) comprises a plurality of lower locking elements (**35***b*) which comprise spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the lower portion (**35***i*) of the spout adapter device (**35**), and the body of each lug being inclined towards the geometric axis of the spout adapter device (**35**).

35- A spout adapter device (**25**) according to claim **33**, characterized in that:

the locking means provided in the internal lower region of the lower portion (**25***i*) comprises a plurality of lower locking elements (**35***b*) which comprise spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the lower portion (**35***i*) of the spout adapter device (**35**), and the body of each lug being inclined towards the geometric axis of the spout adapter device (**35**); and

a retaining edge (**25***r*) is provided in the upper region of the lower portion (**25***i*).

36- A spout adapter device (**35**) according to claim **33**, characterized in that:

it is additionally provided with a medial portion (**35***m*), the upper region of which is connected to the lower region of an edge (**34**) provided in the lower region of the upper portion (**35***s*), while the lower region of the medial portion (**35***m*) is connected the upper region of the lower portion (**35***i*);

the medial portion (**35***m*) is provided with a plurality of spaced apart radial openings (**35***a*) distributed circumferentially; and

the locking means provided in the internal lower region of the lower portion (**35***i*) comprises a plurality of lower locking elements (**35***b*) which comprise spaced apart lugs distributed circularly, the lower portion of each lug being joined to the lower region of the lower portion (**35***i*) of the spout adapter device (**35**), and the body of each lug being inclined towards the geometric axis of the spout adapter device (**35**).

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