

Unit for transporting, storing and/or handling a pyrotechnic product

The invention relates to the field of units for transporting, storing and/or handling pyrotechnic products.

More particularly, the invention relates to containers for goods, arranged to transport, store and/or handle pyrotechnic products.

In the remainder of the document, a "container," also described as a "unit for transporting, storing and/or handling," will refer to a box with a substantially parallelepiped shape, of standardized sizes, generally but non-limitingly made from metal, and designed for the transport, storage and/or handling of objects, for example pyrotechnic items. Within the meaning of the invention and throughout the document, a "pyrotechnic item" refers to any object including a pyrotechnic product.

Pyrotechnic products, also described as "explosive products," are generally made up of substances or mixtures of substances, the combustion of which is done without the participation of dioxygen present in the air. As non-limiting examples, such pyrotechnic products can be made up, in part or in whole, of trinitrotoluene, more commonly known by the abbreviation "TNT," or mixtures for fireworks, commonly described as "black powder," which are generally able to provide signals through their combustions, which are advantageously perceptible by the human eye, and which may be simple or made up of different colors and/or compositions, such as lights or smoke.

The combustion of said products may cause an explosion, that is to say, a chemical reaction of said products accompanied by a significant release of energy in a very short amount of time. When the propagation speed of a combustion is shorter than the propagation speed of sound waves, commonly called speed of sound or celerity, or substantially three hundred forty meters per second, said combustion is generally called "deflagration." On the contrary, when it is greater than the speed of sound, said combustion is commonly called "detonation". During the detonation, the propagation speed of the combustion can reach up to several thousand meters per second.

The release of energy created during a deflagration or detonation can cause a rapid expansion of gas, heat and/or noise. A detonation is generally accompanied by a shockwave, that is to say, a reversible disruption of the local physical properties of the propagation medium. The propagation speed can then reach several tens of thousands of meters per second. The propagation of the shockwave is generally called blast of the explosion or "overpressure." Furthermore, the pyrotechnic products are metastable, that is to say, they can react following a voluntary or involuntary outside event, for example a mechanical impact, friction, a discharge of static electricity and/or a temperature increase.

Furthermore, such pyrotechnic products can be incorporated into pyrotechnic items and participate in the working of the latter. Said pyrotechnic products are thus contained in many items from various fields, such as, for example, fireworks from the events sector, firearm cartridges and/or shells from weaponry, signal rockets and distress flares from maritime security, airbags and/or ejector seats from the automotive and aeronautic industries, etc. Said items then constitute a casing enclosing pyrotechnic products. In the remainder of the document and within the meaning of the invention, a "casing" will refer to any pyrotechnic item as previously defined, but also any object or any enclosure that may contain or enclose pyrotechnic products, such as, by way of non-limiting examples, a box, a container or a building.

When the pyrotechnic products are enclosed by a hermetic casing, the release of energy caused during the combustion of said pyrotechnic products may cause a sudden increase in the pressure within said casing. The latter, under such pressure, may then give way, fracture, fragment and/or explode

violently, then projecting many fragments and/or debris around it. Such a projection of debris may ultimately damage objects and/or elements located nearby, or even in some cases, injure individuals in a surrounding area. The transport, storage and handling of pyrotechnic products are, for this reason in particular, generally subject to government regulations, seeking to avoid accidents related to involuntary initiation of the combustion of the pyrotechnic products.

When pyrotechnic products are conveyed to their usage site, for example, they may experience various events that can alter their stability and initiate spontaneous combustion. As non-limiting examples, the temperature within a casing containing pyrotechnic products can increase considerably after prolonged exposure to the sun, or on the contrary, decrease considerably at night, for example. The temperature within the casing, and therefore the atmosphere around the pyrotechnic products, can therefore vary greatly. Said pyrotechnic products thus stored can deteriorate, or even be initiated, then causing a chain reaction, sometimes leading to the explosion of their packaging casing. Additionally, when they are conveyed, the containers can be transported by sea, rail, air and/or road, involving many loading and/or unloading operations of said containers within various means of transportation. During these loading and/or unloading operations, impacts and/or jolts produced on or within the containers can create a disturbance within said containers and thus initiate a combustion of the pyrotechnic products, damaging any packages containing the pyrotechnic products, or even said pyrotechnic products directly, then preventing them from being used.

Thus, the combustion and/or the alteration of pyrotechnic products can depend on many factors, such as, by way of non-limiting examples, conditions related to the transport of said products, weather conditions and/or any other element that may alter the stability of said products.

In order to address the aforementioned drawbacks, containers of goods have advantageously been arranged to transport and store pyrotechnic products. The floor, walls, ceiling and doors of said containers, then making up a casing within which pyrotechnic products can be stored, are covered with thermal insulation, in order in particular to limit the temperature variations within said containers. Such containers further cooperate with sensors to prevent a risk of alteration and/or initiation of combustion, such as, by way of non-limiting examples, hygrometry sensors and/or temperature sensors. In case of risks, such risks being defined by determined thresholds, said sensors may warn an operator located nearby, for example by triggering a sound alarm, and/or a remote operator, for example by sending him an alert message. In order to limit the risks related to an initiation of pyrotechnic products, by a discharge of static electricity and/or by electromagnetic radiation, such containers may cooperate with a system making it possible to discharge static electricity via grounding. In order to protect the surrounding objects and the individuals located near said containers, during spontaneous initiation of said pyrotechnic products, said containers are generally made hermetic. The walls, doors, floor and ceiling of said containers are then reinforced by metal walls and/or concrete formwork, in order to increase the strength of the structure of such containers and to avoid bursting and/or fragmentation of the casing. All measures are taken so that any explosions are contained within said containers.

However, these structural improvements are insufficient. Indeed, as already mentioned, under the influence of a sudden increase in the pressure caused by a combustion of the deflagration or detonation type, the structure of the containers may give way, break, fragment and/or explode violently, then projecting many fragments and/or debris all around them that may damage surrounding objects and/or elements, or even, in some cases, injure nearby individuals. The quantity of said debris is further increased by the presence of a quantity of additional material due to the formwork and/or metal

reinforcements. Additionally, such a reinforcement or formwork of the structure of the containers makes said container(s) considerably heavier and greatly reduces the inner volume available to store pyrotechnic products, said containers meeting strict sizing standards. Lastly, the addition of extra materials in order to strengthen the structure of said container(s) is also expensive.

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The invention makes it possible to address all or some of the drawbacks of the known solutions.

The many advantages provided by the invention include that a unit for transporting, storing and/or handling pyrotechnic products according to the invention makes it possible to preserve the integrity of said unit if any combustion of pyrotechnic products within it is initiated, thus avoiding the projection of fragments and/or debris, which may then damage objects and/or injure individuals located near such a unit.

The chance or untimely combustion of pyrotechnic products may potentially cause flames to be produced. A unit for transporting, storing and/or handling pyrotechnic products according to the invention, in particular owing to a casing that is advantageously structured, further makes it possible to contain and limit the spread of any flames within such a unit.

Furthermore, a unit for transporting, storing and/or handling pyrotechnic products according to the invention is generally inexpensive compared to the units currently used, since such a unit according to the invention does not require the addition of extra material in order to solidify the casing and/or to guarantee its integrity. Thus, the inner volume available for storing pyrotechnic products and the mass of said unit are advantageously optimized, the casing of such unit remaining substantially similar, or even identical, to that of a conventional unit for transporting, storing and/or handling pyrotechnic products.

Additionally, a transport, storage and/or handling unit according to the invention makes it possible to transport, by sea, land, air and/or rail, pyrotechnic products, or more generally explosive materials and objects:

- that are sensitive to an overpressure, or more generally involving a risk of mass explosion, such as materials or objects containing trinitrotoluene (TNT);
- having only a minor risk in case of ignition or initiation during transport, such as safety fuses and firearm bullets or cartridges, for example;
- able to start a fire with a gentle breeze or a few projections without risk of mass explosion, such as fireworks, by way of non-limiting example.

Within the meaning of the present invention, "mass explosion" or "overpressure" refers to any explosion quasi-instantaneously affecting practically all of a load of pyrotechnic products, or more generally explosive materials and objects, present within a unit for transporting, storing and/or handling pyrotechnic products. Such pyrotechnic products, or more generally such explosive objects or materials, are, respectively and by way of non-limiting examples, defined in France by Risk Divisions 1.1, 1.3 and 1.4 of the UN classification on dangerous goods.

To that end, in particular provided is a unit for transporting, storing and/or handling pyrotechnic products, including a casing for containing said products and including a decompression device comprising a cover and cooperating with said casing, said cover being arranged to rise up when a surplus of energy occurs within said casing and thus to create an opening in said casing, the decompression device further including a locking means of the cover cooperating with said cover. In order to preserve the integrity of said casing, during the combustion of said pyrotechnic products within it, the locking

means of the decompression device of a transport, storage and/or handling unit according to the invention is made up of a thermofusible material.

Preferably but non-limitingly, in order to allow the cover to give way in the presence of heat at an appropriate temperature, the locking means of the cover may be arranged to give way at an internal temperature within the casing of between seventy and ninety degrees Celsius.

In order to limit the projection of debris during any overpressure, or even during a fracturing, of a transport, storage and/or handling unit according to the invention, the decompression device of said transport, storage and/or handling unit may include a grid extending over all of said opening.

Preferably but non-limitingly, to maximally preserve the integrity of a transport, storage and/or handling unit according to the invention, the latter may include a second decompression device comprising a second cover and cooperating with the casing, said second cover being arranged to rise up when a surplus of energy occurs within said casing and thus to create a second opening in said casing.

In a variant or additionally, in order to regulate the temperature within the casing of a transport, storage and/or handling unit according to the invention, the latter may include a ventilation device integrated within the casing.

Furthermore, advantageously but non-limitingly, in order to limit the temperature variations within its casing, a transport, storage and/or handling unit according to the invention may cooperate with a thermal insulation cooperating with all or part of its casing.

Preferably but non-limitingly, in order to improve the performance of a transport, storage and/or handling unit according to the invention, the thermal insulation may primarily be made up of rockwool.

Other features and advantages will appear more clearly upon reading the following description, related to one exemplary embodiment provided for information and non-limitingly and upon examining the accompanying figures, in which:

- figure 1 describes one preferred, but non-limiting embodiment of a transport, storage and/or handling unit for pyrotechnic products according to the invention;
- figures 2a and 2b, as well as 3a and 3b respectively describe first and second advantageous, but non-limiting exemplary embodiments of decompression devices of a unit for transporting, storing and/or handling pyrotechnic products according to the invention.

By way of one preferred, but non-limiting exemplary application, the invention will be described through a transport, storage and handling unit, such as a container 20. The invention cannot, however, be limited to this exemplary embodiment alone. In a variant, the invention could be transposed to a sedentary storage unit.

Figure 1 illustrates an advantageous, but non-limiting exemplary embodiment of a unit for transporting, storing and/or handling pyrotechnic products according to the invention, such as, by way of non-limiting example, a container measuring about twenty feet.

Such a unit in the form of a container 20 is generally of substantially parallelepiped or cubic shape. Said container 20 is made up of a lower structure 21 facing an upper structure 22, a rear structure 23b facing a front structure 24, said front structure 24 generally being made up of an opening with two leaves or panels generally making it possible to access said container 20, and two side structures 23 facing one another and coupling the rear structure 23b to the front structure 24. Said structures 21, 22, 23, 23b and 24, also described as "faces," may for example be made up of one or

several sheets of corrugated steel, the respective ends of which are welded to a framework made up of spars 26, corresponding to the edges of the parallelepiped, coupled by welding or riveting to corner parts 25, called "ISO corners," forming the apexes of said parallelepiped. Such corner parts 25 generally and respectively consist of cubes pierced in three locations, such that the container 20 may be anchored on different supports, for example the ground, or during transport, a second container. Said spars 26 and corner parts are generally made from steel. Furthermore, the two leaves or panels of the front structure 24 are advantageously hinged relative to the framework along a pivot link, for example using one or several hinges. Each contour of said leaves or panels may for example include a sealing gasket against air and water. The lower structure 21 is also made up of crosspieces 27 cooperating with the framework, for example by welding or by any other means capable of embodying a mechanical link of the embedding type. The inner surface of said lower structure 21 may further be covered with wood or aluminum planks, in order to offer an inner floor suitable for the use of the container 20.

For simplification purposes, in the remainder of the document, the term "casing" will refer to the assembly formed by the lower structure 21, the upper structure 22, the rear structure 23b, the front structure 24 and the side structures 23 of the container 20. Preferably but non-limitingly, the sheet, or more generally the materials making up the casing of the storage, transport and/or handling unit 20 according to the invention, may have a thickness of one thousand two hundred microns (1.2 mm).

To ensure a substantially constant temperature within the casing of a container 20 according to the invention, the invention provides that such a container 20 may include a thermal insulation 50, said insulation 50 advantageously cooperating with the casing of said container 20. Such an insulation 50 may be applied on the inner wall of the casing, as shown in figure 1. In a variant, said insulation 50 may be applied to the outside of said container 20, over all or part of the casing, such as, advantageously but non-limitingly, on the upper structure 22, the rear and front structures 23b and 24 and/or the side structures 23.

Such a thermal insulation 50 may consist, by way of non-limiting example, of mineral wool, more specifically rockwool, such insulation also being known under the commercial name "Decaroc," optionally in the form of one or several panels with a thickness of forty millimeters, or any other insulating material, and which is preferably but non-limitingly fire-resistant. The temperature within a container having an open top primarily increasing, through the action of the sun's rays on the upper structure 22 of said container 20, said upper structure 22 may cooperate with or include one or several insulating panels with a thickness of one hundred twenty millimeters. Such thermal insulation may preferably, but non-limitingly, be arranged, due in particular to its composition, to withstand fires during a minimal period of sixty minutes. In a variant or in addition, the thermal insulation 50 may further comprise or consist of an athermic paint applied on the outer wall of all or part of the casing of a container 20 according to the invention, in particular in order to reflect the infrared rays emitted by the sun on said casing. Furthermore, according to another variant embodiment, the thermal insulation 50 of a container 20 according to the invention may include an anti-heat cover for example manufactured from and/or made up of silicate, advantageously cooperating with all or part of the casing of said container 20.

Still according to the invention, in a variant or in addition, to allow the regulation of the temperature within a container 20 according to the invention, the latter may also include a ventilation device 40 located, preferably but non-limitingly, in the rear structure 23b, the front structure 24 and/or the side structures 23 of said container 20. Such a ventilation device 40 may for example include one or several adjustable flaps or slats mounted rotating, independently or connected, on a framework.

According to another exemplary embodiment, in addition, such a ventilation device 40 may advantageously be motorized, the rotation or more generally of the flaps or slats making up said ventilation device 40 being actuated automatically.

5 One of the primary aims of the invention is in particular to preserve the integrity of the casing of a container 20 according to the invention, during any combustion of pyrotechnic products stored within said casing. To that end, a container 20 according to the invention, or more specifically the casing of the latter, includes a decompression device 10. Indeed, as previously described, a combustion of
10 pyrotechnic products creates a release of energy, the action of which on the inner wall of the casing of a conventional container can cause the fracture or fragmentation of said casing. Such a fracture or fragmentation can then cause the rupture of such a casing, and ultimately a projection of fragments or debris that may damage objects or elements, or even injure individuals, located near the container 20. The decompression device 10 of a container 20 according to the invention thus makes it possible to
15 discharge a surplus of energy produced by such a combustion, then decreasing the pressure exerted on the inner wall of the casing of the container 20, and thereby avoiding a fracture thereof.

Within the meaning of the invention and throughout the document, "pressure" refers to any force applied on the inner surface of the casing of the container 20 according to the invention by the release of energy produced during a combustion of pyrotechnic products within said casing. Such a force or pressure is substantially normal to the surface of the casing, as shown in figure 1 by bold arrows. Still
20 within the meaning of the invention and throughout the document, "surplus of energy" refers to any excess of the normal force on the inner surface of the casing that may cause it to break.

Figures 2a and 2b, as well as 3a and 3b, respectively describe first and second advantageous, but non-limiting exemplary embodiments of decompression devices of a unit for transporting, storing
25 and/or handling pyrotechnic products or a container 20 according to the invention. As already mentioned, a container 20 according to the invention, also described as a unit for transporting, storing and/or handling pyrotechnic products, includes a casing for enclosing said products. Such a container 20 then includes a decompression device 10 comprising a cover 13, said decompression device 10 advantageously cooperating with said enclosure according to a suitable mechanical link. The invention
30 cannot, however, be limited to this exemplary arrangement alone. Indeed, the invention provides that the decompression device 10 and the cover 13 may form a single and same entity. Within the meaning of the invention and throughout the document, a "cover" refers to any object or any moving part making it possible to close off an opening of a device, thus allowing it to be closed. Due to its mobility and its clever arrangement, said cover is arranged to rise up when a surplus of energy occurs within said
35 casing and thus to create an opening Op in said casing, thus allowing the release of the energy, while reducing the risk of overpressure and explosion.

According to a first exemplary embodiment of a decompression device 10 of a container 20 according to the invention described in connection with figures 2a and 2b, such a decompression device 10 comprises a frame 11, for example cooperating with the upper structure 22 of said container 20
40 according to a suitable mechanical link, such as, by way of non-limiting example, a link of the embedded type. However, the invention cannot be limited to this arrangement or configuration type alone. In a variant, the frame 11 of the decompression device 10 is integrated directly into the upper structure 22 of the casing of said container 20, the casing and the decompression device 10 thus forming only one physical entity. Said compression device 10 further includes a cover 13, cooperating with said frame
45 according to a suitable mechanical link. Still according to this first embodiment, an opening Op is

advantageously formed in the casing of said container 20, the dimensions of said opening advantageously being mutually adapted to those of the outer wall of the frame 11. The cover 13 then makes it possible to conceal said opening Op, when such a cover 13 is placed across from the latter, as in particular shown by figure 2b. To that end, the cover 13 of the decompression device 10 may have any shape suitable for performing its function, preferably but non-limitingly, a geometric shape, for example, advantageously, a square shape, in order to simplify the manufacture and installation of said cover 13. Similarly, the opening Op may have a shape similar to that of the cover, preferably but non-limitingly, a geometric shape, for example, advantageously, a square shape. When such a cover 13 and opening Op have substantially square shapes, they can, by way of non-limiting examples, be characterized by dimensions whose lengths and widths are substantially respectively equal to one point two meters (1.2 meters). The invention cannot, however, be limited to these aforementioned shapes and sizes alone. In a variant, the cover 13 and the opening Op could have any other geometry, for example polyhedral, elliptical, etc.

As already mentioned, such a cover 13 may cooperate with the frame 11 using a suitable mechanical link. As a non-limiting example, such a mechanical link may advantageously consist of a pivot link, preferably embodied by one or several hinges 14. The invention cannot, however, be limited to this type of link and/or this exemplary structural arrangement alone: any means capable of providing a suitable mechanical link could be used instead. Furthermore, in addition, in order to avoid the intrusion of individuals or objects in a container 20 according to the invention, the decompression device 10 of the latter may comprise a locking means, in the form, for example, of a hook 15 and/or lock 16 system, as shown in figure 2a, said hook 15 and/or lock 16 system cooperating with the cover and making it possible to seal said container 20.

Figures 3a and 3b illustrate a second exemplary embodiment of the decompression device 10 of a container 20 according to the invention. According to this variant embodiment, the cover 13 of the decompression device cooperates directly with the casing of the container 20 according to a suitable mechanical link. However, the invention cannot be limited to this arrangement or configuration type alone. In a variant, the cover 13 of the decompression device 10 may be integrated directly into the upper structure 22 of the casing of said container 20, the casing and the decompression device 10 thus forming only one same physical entity. According to this second embodiment described in particular in connection with figures 3a and 3b, the structural arrangements and the respective dimensions of the cover 13 and the opening Op formed in the casing are mutually arranged such that the cover 13 and the opening Op are then combined. By way of non-limiting example, according to the second embodiment described in connection with figure 3b, the cover 13 of the decompression device 10 may consist of a weak area 18 determined within the casing of a container 20 according to the invention, said weak area 18 being arranged to give way when a surplus of energy occurs due to an overpressure following a combustion of pyrotechnic products within said casing. By way of non-limiting examples, such a determined weak area 18 may have any suitable shape to perform the function, preferably but non-limitingly a geometric shape, for example, advantageously, a square shape. In order to determine such a weak area 18 and to create a cover 13, part of said casing, preferably but non-limitingly a part of the upper structure 22 of said casing, can then be perforated over at least three of the four sides of such a square shape, during the construction and before any use of a container 20 according to the invention. In a variant, still with the aim of defining such a weak area 18 and creating a cover 13, part of said casing, preferably but non-limitingly part of the upper structure 22 of said casing, may be subject to chemical pretreatment using a suitable acid solution, thus allowing the creation of a weak area 18 defining the contour of said cover 13. Lastly, according to another variant embodiment making it

possible to define such a weak area 18, the latter may consist of replacing the material making up said casing with a material of less resistance along the perimeter of the defined geometric shape. The invention cannot, however, be limited solely to the examples previously mentioned. Any other mechanical or chemical method making it possible to make a cover 13 cooperate with the casing of a container 20 according to the invention could be considered instead.

Furthermore, as already mentioned, in order to prevent the intrusion of individuals or objects in a container 20 according to the invention, the invention provides that the decompression device 10 of the latter may comprise a locking means. Thus, according to the second embodiment of the decompression device described in connection with figures 3a and 3b, said locking means is made from a thermofusible material, that is to say, a material that melts under the effect of heat, such as, by way of non-limiting example, tin. The ends of the cover 13 of such a decompression device may then be fastened to said casing using such a thermofusible material. Preferably, in order to meet fire safety standards and optimize the operation of a transport, storage and/or handling unit 20 according to the invention, the locking means may be arranged to give way at an interior temperature within the casing of between seventy and ninety degrees Celsius. The invention cannot, however, be limited only to the exemplary structural arrangements previously mentioned. In a variant, any other locking means capable of performing an identical or similar function, in particular when the pyrotechnic products are present within a casing of a container 20 according to the invention, may be used.

Furthermore, in addition, still with the aim of limiting the temperature variations within a container 20 according to the invention, the cover 13 of the decompression device of the latter may cooperate, on its inner and/or outer walls, with thermal insulation, such as the thermal insulation 50 previously described, like the rest of the casing of said container 20. In a variant or also in addition, in accordance with figure 2a, a decompression device 10 of a container 20 according to the invention may include a grid 12 preferably covering the entire opening Op formed in the casing of said container 20, in order to avoid projecting debris created from objects present in the casing of said container 20, more specifically when any combustion of pyrotechnic products has been initiated in an untimely manner within said casing. The dimensions and shape of such a grid 12 are advantageously arranged to cover the opening Op. By way of non-limiting examples, such a grid 12 may consist of expended metal, for example steel, or a set of wires and/or cables structured in such a mesh. Furthermore, the grid 12, at its ends, may be welded or fastened by any other means, to the casing of the container 20. The invention cannot, however, be limited to the structural arrangement of such a grid or to the means used to ensure the cooperation between the grid 12 and the casing of a container 20 according to the invention.

Let us now study the working of a container 20 according to the invention, more specifically of its decompression device 10, when a combustion of pyrotechnic products is initiated within the casing of said container 20.

During such a combustion, the cover 13 of the decompression device of such a container 20 is intended to rise up, even to be partially or completely separated from the casing of said container 20, thus creating an opening Op of said casing. Such a separation in particular takes place when the pressure exerted on the inner walls of the casing of the container 20 is substantially less than or equal to the fracture or fragmentation threshold of said casing, such a pressure being due to the release of energy caused by the combustion. Such a fracture or fragmentation threshold is more specifically determined by the strength of the material used to manufacture the casing of a container 20 according to the invention, but also by the quality of the mechanical links ensuring the cooperation of the structures making up the casing, for example welds, thus allowing the casing to form a single intact entity. The

surplus of energy is thus discharged and/or released by said opening Op formed within the casing, preventing said casing from deforming, and then allowing the latter to remain intact. Due to the release of the surplus of energy through the opening Op, the pressure exerted on the inner walls of the casing of a container 20 according to the invention thus remains below a theoretical limit, past which a dislocation of said container 20 can occur, thus preventing any fragmentation of the casing. Such a situation is in particular shown by the first and second embodiments of the decompression device of a container 20 according to figures 2a and 3a.

We will now provide a more detailed description of the working of the second embodiment of the decompression device 10 described in particular in connection with figures 3a and 3b. As already specified, according to figures 3a and 3b, the cover 13 of the decompression device 10 is fastened, or even sealed, to a portion of the casing of a container 20 according to the invention, using a locking means primarily made up of a thermofusible material. Generally, a temperature increase precedes a deflagration, a detonation or a sudden increase in the internal pressure of the casing. Such a temperature increase causes melting of all or part of the thermofusible material making up the locking means, the latter giving way under the effect of the temperature and thus releasing the cover 13 of the decompression device 10. Thus, creating a determined weak area 18 then makes it possible to create a determined area of less resistance to a release of energy during any combustion of pyrotechnic products within the casing of a container 20 according to the invention, thus allowing the creation of an opening Op formed in one of the structures of the casing. Such an opening Op lastly ensures that the pressure exerted on the inner walls of the casing of said container 20 is kept below a limit or a threshold for deformation or potentially irreversible damage of said casing.

The invention further provides that a container 20 according to the invention may include additional accessory elements.

Therefore, as a variant or in addition, according to one preferred but non-limiting embodiment described in connection with figure 1, a container 20 according to the invention may further include a second opening 30, positioned, as advantageous but non-limiting examples, in the rear structure 23b or in side structures. Preferably but non-limitingly, such a second opening 30 may be arranged to allow the passage of a human being, and to that end, to have a substantially rectangular shape with respective dimensions of two point ten meters high by eighty centimeters wide. In order to allow the restricted and/or secure access to a container 20 according to the invention, said second opening may be obstructed by a door. Optionally, such a door may consist of a door of the blow-out panic type, that is to say, said door can open from the inside of the casing of said container 20 toward the outside using a panic bar and/or open under specific determined conditions, for example under the effect of a pressure substantially greater than or equal to seventy Newtons. Upon a combustion of pyrotechnic products, the surplus of energy can also and optionally by said second opening 30 if the decompression device is not sufficient to guarantee the integrity of the container 20, the door then acting as a second cover. According to this advantageous embodiment, the door, like the cover 13 previously described, may be arranged to rise up or more generally to open when a surplus of energy occurs within said casing and thus to create a second opening in said casing of the container 20. Lastly, in a variant or additionally, to avoid any untimely propagation of flames as a result of a combustion of pyrotechnic products present within the casing of a container 20 according to the invention, such a door may also be arranged or adapted to withstand fire for at least one hour (sixty minutes).

In a variant or additionally, a container 20 according to the invention may further include a grounding system, not shown in figure 1, using an equipotential link to couple the set of parts and

conductive elements of said container 20, such as metallic parts, for example. The use of such a grounding system is particularly advantageous, since it makes it possible to avoid any potential source of ignition that could cause an untimely combustion of pyrotechnic products present within the casing of a container 20 according to the invention. Additionally, such an equipotential link may advantageously be
5 connected to a system for discharging electric charges, such as, for example, a conductive metal stake driven into the ground when such a container 20 is placed on said ground.

According to another variant embodiment, to prevent the appearance of an electrostatic discharge near pyrotechnic products able to cause the spontaneous initiation of such pyrotechnic products, for example, during the manipulation or handling of said products by a user, a container 20
10 according to the invention may include an antistatic system in the form, for example, of a conductive cord coupling said user to a system for discharging electric charges by means of a terminal block. When a container 20 according to the invention simultaneously comprises a grounding system and an antistatic system, the respective systems for discharging electric charges and associated with the two systems may optionally be combined and consist of a single and same physical entity. Also, in a variant
15 or in addition, a container 20 according to the invention may include an extinguishing system able or arranged to extinguish any internal combustion that may have taken place spontaneously within the casing of said container 20. Lastly, to avoid any untimely combustion within the casing of a container 20 according to the invention, the latter may further include one or several combustion prevention sensors, such as, by way of non-limiting example, a temperature sensor, which, when the temperature within
20 said container reaches a determined threshold, for example thirty degrees, triggers an alarm to warn an operator of a risk of imminent spontaneous combustion being triggered. The invention cannot, however, be limited to this type of sensor alone.

The invention has been described during its use in connection with a unit for transporting,
25 storing and/or handling pyrotechnic products. The invention cannot, however, be limited solely to the examples previously described and could optionally be applied to a sedentary storage unit.

It could also be considered for a container or a unit for transporting, storing and/or handling pyrotechnic products to be able to include and/or cooperate with a plurality of decompression devices distributed over different structures of the casing, such as the side structures 23, for example, so as to
30 distribute the discharge surface uniformly formed by all of said decompression devices.

CLAIMS

- 5 1. A unit for transporting, storing and/or handling (20) pyrotechnic products, including a casing for containing said products and including a decompression device (10) comprising a cover (13) and cooperating with said casing, said cover being arranged to rise up when a surplus of energy occurs within said casing and thus to create an opening (Op) in said casing, the decompression device (10) further including a locking means (15, 16, 18) of the cover (13) cooperating with said cover (13), said transport, storage and/or handling unit (20) being characterized in that it is made up of a thermofusible material.
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2. The transport, storage and/or handling unit (20) according to the preceding claim, wherein the locking means of the cover is arranged to give way at an internal temperature within the casing of between seventy and ninety degrees Celsius.
- 15 3. The transport, storage and/or handling unit (20) according to any one of the preceding claims, wherein the decompression device (10) includes a grid (12) extending over all of said opening (Op).
4. The transport, storage and/or handling unit (20) according to any one of the preceding claims, including a second decompression device comprising a second cover and cooperating with the casing, said second cover being arranged to rise up when a surplus of energy occurs within said casing and thus to create a second opening in said casing.
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5. The transport, storage and/or handling unit (20) according to any one of the preceding claims, including a ventilation device (40) integrated within the casing.
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6. The transport, storage and/or handling unit (20) according to any one of the preceding claims, comprising a thermal insulation (50) cooperating with all or part of the casing.
7. The transport, storage and/or handling unit (20) according to any one of the preceding claims, wherein the thermal insulation is primarily made up of rockwool.
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