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(54) **Mine, particularly underwater mine**

Mine, insbesondere Unterwassermine

Mine, notamment mine sous-marine

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Description

This invention relates to a mine, particularly an underwater mine, comprising a container of reinforced plastic for explosive.

Underwater mines of the type described above comprise a mine case typically made of aluminium. Although insensitive to corrosion, aluminium has several problematic properties when used in the mine case. Aluminium is electrically conductive, on the basis of which it can be detected. Furthermore, aluminium has an excellent thermal conductivity so that explosive substance contained in an aluminium case reaches the ambient temperature very rapidly. A fire, for instance, may thus cause a risk situation or an explosion. The aluminium case also contributes to the spreading of explosion, as it spreads splinters around it when it explodes, and such splinters are able to penetrate into other similar mines, thus causing them to explode. Further, the coefficient of thermal expansion of aluminium is somewhat higher, perhaps two times higher than that of typical explosives. For this reason, a gap tends to be formed between the aluminium case and the explosive so that detection of the mine may become possible.

The above-mentioned disadvantageous properties in particular have led to attempts to provide underwater mines in which the mine case is made of reinforced plastic. A problem therewith is, however, that it is difficult to provide reinforced plastic with sufficient strength without having to excessively increase the material thickness. Underwater mines are usually planted by dropping them to the sea bottom. When they hit the bottom, they are exposed to impacts which may damage the mine case.

The object of the present invention is to provide an underwater mine comprising an explosive container of reinforced plastic, which avoids the above-mentioned problems. This is achieved by means of an underwater mine according to the invention which is characterized in that the outer surface of the container of reinforced plastic is covered by a flexible rubber or elastomer layer having a density of about 0.7 to 2.0 g/cm^3.

In most cases the mine case of an underwater mine is substantially cylindrical, and the centre of gravity of the mine is in the middle of the mine. On falling freely in water, the mine thus moves similarly as a falling leaf, swinging longitudinally to and fro. It is therefore to be preferred that the elastomer layer portion covering the bottom of the container is several times, preferably about ten times thicker than the elastomer layer portion covering the sides of the container. In this way the elastomer layer provides the best possible protection against impacts within container portions which are likely to hit the sea bottom first, that is, within the bottom area of the cylindrical explosive container.

In the following an underwater mine according to the invention and advantages offered by it will be described in more detail with reference to the attached drawing, the figure of which is a partial sectional side view of the mine case of the underwater mine according to the invention.

The figure shows a mine case of a mine according to the invention, intended to be used particularly as an underwater mine. The mine case comprises a container 1 of reinforced plastic and an elastomer layer 2 surrounding the container. To be operative, the mine, of course, also needs a detonator and a fuse; however, for the sake of clarity, these fully conventional mine components are not shown in the figure. The container 1 of reinforced plastic forming the inner portion of the mine case comprises a substantially cylindrical central portion 6, and a -bottom portion 7 at one end and an inlet portion 5 at the other end of the central portion. The container 1 of reinforced plastic may be integral, or more usually and more easily, it may comprise the above-mentioned three portions 5, 6 and 7, the bottom portion 7 and the inlet portion 5 being attached to the cylindrical body portion 6 by gluing. For this purpose, the joint surfaces between the portions are bevelled suitably to achieve a sufficiently long joint surface. The container may be made of conventional fibre reinforced thermoset plastics, that is, reinforced plastics comprising glass, carbon or other similar fibre, and plastic such as epoxy resin, vinyl ester or polyester. Reinforced plastic used in the container 1 may further contain conventional additives to improve its flexibility.

In the mine case shown in the figure, the elastomer layer 2 covers the outer surface of the container 1. The elastomer layer 2 is preferably cast upon the container 1 in a closed mould where the container 1 is positioned centrally. In this way the elastomer can be provided with desired properties. In order that the elastomer would have sufficient strength and sufficient flexibility, being thus similar to rubber, its density should range from 0.7 to 2 g/cm^3, preferably about 1 g/cm^3. The elastomer layer 2 thus contains elastomer and an additive which causes the elastomer to be foamed to the above-mentioned density within the closed mould. In addition, it is possible to add a colouring agent to the elastomer so as to dye it throughout in a desired way. The most important function of the elastomer layer 2 is to protect the container 1 of reinforced plastic against external impacts. An excellent resistance to impacts is achieved with a relatively small layer thickness when the elastomer layer 2 has the above-mentioned properties. As mentioned above, when the mine is dropped into the sea, impacts mainly act on the ends of the mine, and therefore the elastomer layer is clearly thicker within the area of the bottom 7 of the container 1. The thickness of an elastomer layer 4 upon the cylindrical portion of the container is thus perhaps only 1/10 of the thickness of an elastomer layer 3 upon the bottom 7 of the container on the central line of the case. As a result, the case bottom and particularly the corners of the container will be extremely resistant to impacts. As appears from the figure, the bottom 7 and the inlet portion of the container 1 are rounded to increase strength, which is known from conventional

mine cases.

As further appears from the figure, the inlet portion 5 of the container 1 is provided with various protruding parts and recesses for fastening the detonator and the fuse. These parts, however, are not particularly essential to the invention, and their shape and structure may vary according to the requirements.

The underwater mine according to the invention has a number of excellent properties particularly as compared with an underwater mine with an aluminium case. First, its material is not electrically conductive or magnetic, and so it cannot be detected on the basis of these properties. However, the material may be made electrically conductive, if required. On exploding the mine does not either spread splinters around it which might penetrate into other mines in its vicinity, e.g. in the same storage. Accordingly, the explosion of one mine in the storage is not likely to cause the other mines in the storage to explode. The coefficient of thermal expansion of the container of reinforced plastic is equal to that of a number of explosives. Gaps thus do not tend to form between the explosive and the container. The mine according to the invention is also extremely resistant to environmental effects as the layer covering it is of closed-cell, hermetic elastomer. On the other hand, the thermal conductivity of elastomer is only a fraction of that of aluminium. Accordingly, the mine according to the invention explodes only after a very long time even if it gets into a fire. As mentioned above, the material of the mine case may be dyed throughout so that no external impacts will change its colour. The structure of the mine according to the invention is also simpler than that of the mine with an aluminium case, in which several components are required to interconnect the different portions. A further advantage of the container of reinforced plastic is that it can be shaped as desired. Furthermore, the container of reinforced plastic around the explosive may be given a desired flexibility by varying the plastic material.

The mine according to the invention and the advantages offered by it have been described above only by means of a single illustrating embodiment. It is to be understood that the structural solution according to the invention may be applied to mine cases of almost any type without, however, deviating from the scope of protection defined in the accompanying claims. Accordingly, the outer surface of the mine case may be shaped in different ways, or the elastomer layer on the surface may be strengthened in a desired way at different points to achieve various properties, such as resistance to impacts, or to vary the appearance.

Claims

1. Mine, particularly an underwater mine, comprising a container (1) of reinforced plastic for explosive, **characterized** in that the outer surface of the container (1) of reinforced plastic is covered by a flexible rubber or elastomer layer (2) having a density of about 0.7 to 2.0 g/cm^3.

2. Mine according to claim 1, where the explosive container is substantially cylindrical, **characterized** in that an elastomer layer portion (3) covering a bottom (7) of the container is several times thicker than an elastomer layer portion (4) covering sides (6) of the container.

Patentansprüche

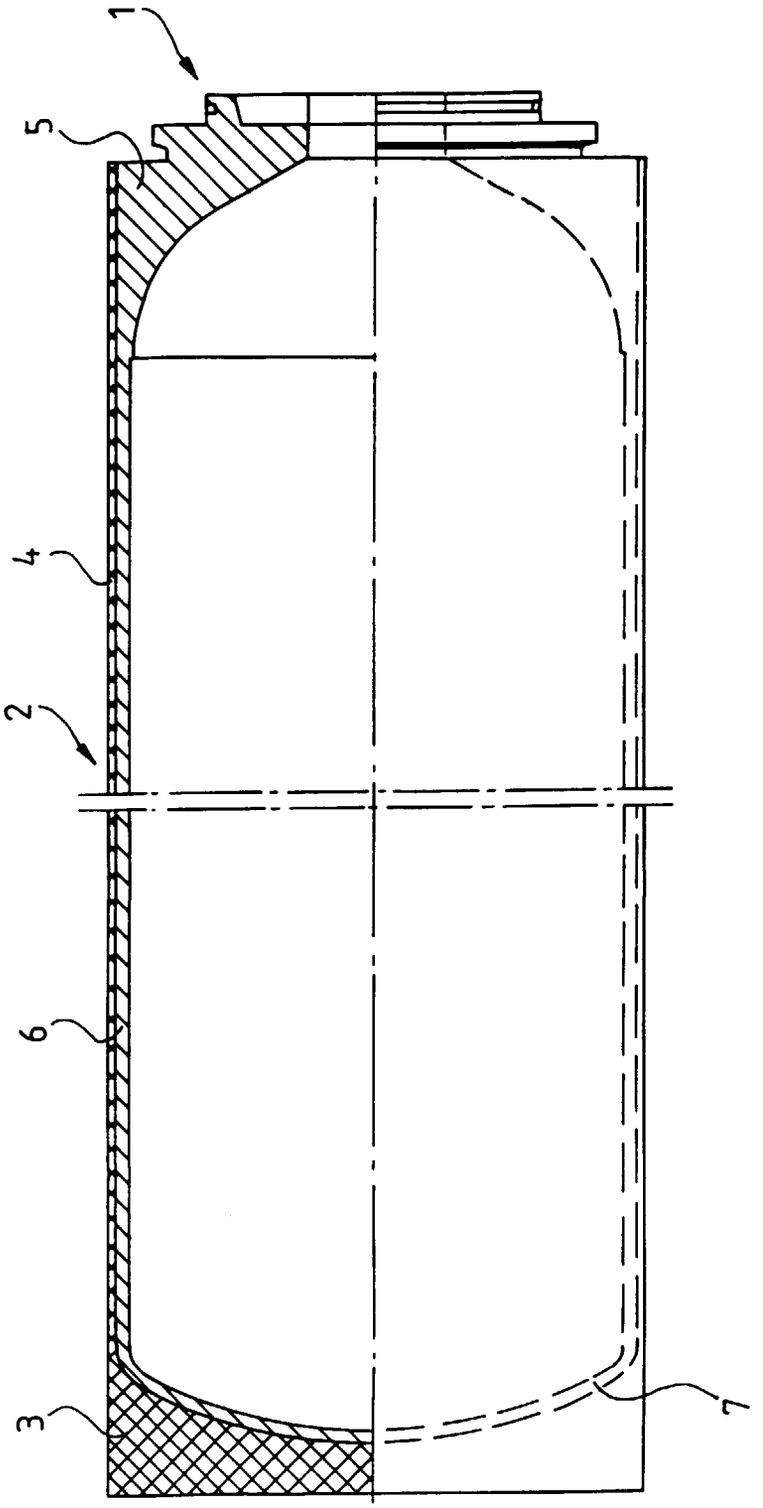
1. Mine, insbesondere eine Unterseemine, mit einem Behälter (1) aus verstärktem Kunststoff für Sprengstoff, dadurch **gekennzeichnet**, daß die Außenfläche des Behälters (1) aus verstärktem Kunststoff mit einer elastischen Gummi- oder Elastomerschicht (2) umhüllt ist, deren Densität etwa 0,7 bis 2,0 g/cm^3 beträgt.

2. Mine nach Anspruch 1, wobei der Sprengstoff-behälter wesentlich zylindrisch ist, dadurch **gekennzeichnet**, daß der Teil (3) der Elastomerschicht, der den Behälterboden (7) umhüllt, mehrere Male dikker ist als der Teil (4) der Elastomerschicht, der die Behälterseiten (6) umhüllt.

Revendications

1. Une mine, notamment une mine sous-marine, comprenant un conteneur (1) en plastigue renforcé et destiné à abriter les explosifs, caractérisée par le fait que la surface externe du conteneur (1) en plastique renforcé est recouverte d'une couche de caoutchouc flexible ou d'élastomère (2) d'une densité d'environ 0,7 à 2,0 g/cm^3.

2. Une mine ainsi revendiquée à la revendication 1, dans laquelle le conteneur à explosifs est de forme cylindrique, caractérisée par le fait que l'une des parties de la couche d'élastomère (3) recouvrant les extrémités du conteneur est plusieurs fois plus épaisse que la partie de la couche d'élastomère (4) recouvrant les côtés du conteneur.


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