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(54) **COMPOSITE PASSIVE ARMOR PROTECTION**

PASSIVER VERBUNDSCHUTZPANZER

PROTECTION À BLINDAGE PASSIF COMPOSITE

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Description

[0001] The invention relates to a composite passive armor protection to safeguard objects from the effect of projectiles and projectile fragments.

[0002] Known from the DE1578324 description armor consists of a non-metallic matrix, in which totally embedded are a plate and, arranged above said plate, the energy-absorbing layers, comprising elements which have the shape of plates or of cylindrical solids arranged side by side or at certain distances in the layers. On the other hand, the protective screen to defend against explosion as disclosed in the PL171251 description is made of air-permeable side layers, having the form of pre-cut sheets of metal foil, and of a porous core, placed between these foils, containing the beads or ellipsoids made of the same material as the sheet. Preferably, the sheets of metal foil contain magnesium alloy. A passive armor known from the PL181177 description consists of the main inner protective metal layer and the outer protective layer comprising a number of rectangular, metallic cassettes containing ceramic layers. The spaces between the ceramic layers and the surfaces of the cassette walls are filled with a composition of small ceramic pieces mixed with glue and concrete. The cassettes in an outer protective layer of the armor are removably secured to the main inner protective metal layer by means of various connecting and clamping elements. A safety element used to protect the life and health of the crew of a military vehicle against the explosion of mine under this vehicle known from the PL206571 description consists of a shield having through-holes on its entire surface. The shield is connected by means of the vertical supports with a thin intermediate plate, which, through springs and connected to these springs mounting plates, is attached to the underside of the vehicle floor. Discharge ducts are running from the shield surface. US patent specification No US4945814, which forms the starting point for the preamble of claim 1, discloses a moulded composite armour provided with ceramic inserts. The ceramic inserts are closed within shells having positioning protuberances. The shells are disposed and positioned by means of the protuberances in regular manner in the mould in a predetermined network to ensure the ballistic efficiency, and leave gaps between them for the liquid metal. Then liquid metal is poured into the mould to fill the gaps and embed the inserts. After solidification of the metal, the ceramic inserts are anchored in the composite armour protection.

[0003] A composite passive armor protection according to the present invention comprises the features of claim 1. Advantageously the geometric solids are spheres or truncated pyramids with a square base. The geometric solids are ceramic solids or metallic solids. The rods are preferably made of high-strength stainless steel. Owing to its specific construction, the composite passive armor protection according to the present invention is resistant to projectile impacts. The protruding part of geometric solids prevents the penetration of AP-type

projectiles, projectile fragments, and small arms projectiles. The mere shape and very hard material of the geometric solids cause distortion in the projectile flight path, or ricochet and weakening of the projectile kinetic energy.

5 Brackets and rods passing through these brackets reinforce the plate and act as a shock absorbing cushion for the geometric solids. The matrix made of a light alloy protects the armor against tearing. The composite passive armor protection according to the present invention, the matrix whereof is made of a light alloy, is highly effective in protection against the AP projectiles of up to 10 12.6 mm. The use of light alloy as a matrix material reduces the armor weight, thereby increasing the mobility of the protected vehicles, reducing fuel consumption and enabling the armor to be used as a means of protection for the aircraft and watercraft.

[0004] The composite passive armor protection is made by casting methods. The structure composed of geometric solids resting on brackets passing through the holes in the plate and brackets with fixed rods is placed in a specially designed foundry mould and poured with a liquid light metal alloy. The alloy solidification is carried out under the conditions of elevated pressure. As a last step, the armor is subjected to machining to the required dimensions.

[0005] The composite passive armor protection according to the present invention is shown in a sample embodiment in the accompanying drawings, where Figure 1 shows a vertical section of the composite passive armor protection, and Figure 2 its schematic representation.

[0006] The composite passive armor protection comprises a structure, embedded in the light alloy matrix 1, wherein said structure is made of ceramic balls 2, resting on brackets 3, passing through the holes in plate 4, wherein said brackets 3 have through-holes located at a height above and below the plate 4, wherein in said through-holes are secured rods 5 in such a way that they form a rectangular grid. The ceramic balls 2 are embedded in the light alloy matrix 1 to a level above one half of their diameter. The rods 5 made of high-strength stainless steel are fixed coaxially with the ceramic balls 2.

45 Claims

1. A composite passive armor protection having a structure comprising geometric solids, said structure being embedded in a light alloy matrix (1), wherein said geometric solids (2) are embedded in the light alloy matrix (1) to a level above one half of their total height, **characterized in that** said structure is made of the geometric solids (2), resting on brackets (3), passing through holes in a plate (4), wherein said brackets (3) have through-holes located at a height above and below the plate (4), wherein in said through-holes are secured rods (5) in such a way that they form a grid, and whereon the rods (5) are

fixed in such a way that and wherein the rods (5) are fixed in such a way that their longitudinal axes coincide with the axes of the geometric solids (2).

2. The composite passive armor protection of claim 1, wherein said geometric solids (2) are ceramic solids. 5
3. The composite passive armor protection of claim 1, wherein said geometric solids (2) are metallic solids. 10
4. The composite passive armor protection of claim 1, wherein said geometric solids (2) are in the shape of spheres or truncated pyramids with a square base.
5. The composite passive armor protection of claim 1, wherein said rods (5) are made of high-strength stainless steel. 15

Patentansprüche

1. Passiver Verbundgusschutzpanzer mit einer Konstruktion aus geometrischen Körpern, die in einer Matrix aus der Leichtmetalllegierung 1 eingeschmolzen sind, wo geometrische Körper 2 bis an das Niveau über die Hälfte seiner gesamten Höhe in dieser ober genannten Matrix eingeschmolzen sind, ist **dadurch gekennzeichnet, dass** die Panzerkonstruktion aus geometrischen Körpern 2 besteht, die sich auf den Konsolen 3 befinden und diese Konsolen 3 über die Öffnungen in der Platte 4 schlüpfen, diese Öffnungen befinden sich in der Höhe über und unter der Platte 4 und in diesen Öffnungen sind Stäbe 5 so befestigt, dass sie einen Fachwerk bilden und seine Längsachsen mit Achsen der geometrischen Körper 2 übereinstimmen. 25
2. Passiver Verbundgusschutzpanzer nach Anspruch 1 ist **dadurch gekennzeichnet, dass** die geometrischen Körper 2 aus Keramik sind. 40
3. Passiver Verbundgusschutzpanzer nach Anspruch 1 ist **dadurch gekennzeichnet, dass** die geometrischen Körper 2 aus Metall sind. 45
4. Passiver Verbundgusschutzpanzer nach Anspruch 1 ist **dadurch gekennzeichnet, dass** die geometrischen Körper 2 eine Kugel- oder Pyramidenstumpfgestalt mit einer quadrantischen Grundfläche haben. 50
5. Passiver Verbundgusschutzpanzer nach Anspruch 1 ist **dadurch gekennzeichnet, dass** die Stäbe 5 aus nicht rostender Stahl mit erhöhter Festigkeit sind. 55

Revendications

1. Blindage de protection passif en composite, constitué d'une structure comprenant des solides géométriques et noyée dans la matrice en alliage léger 1, étant donné que les solides géométriques 2 sont noyés dans la matrice en alliage léger 1 jusqu'au-dessus de la moitié de leur hauteur totale, **caractérisé en ce que** ladite structure est constituée de solides géométriques 2, installés sur les supports 3 qui passent à travers les trous situés au-dessus et au-dessous de la plaque 4; ces trous reçoivent les barres 5, fixées de manière à former une grille ; les barres 5 sont fixées de sorte à ce que leurs axes longitudinaux coïncident avec les axes des solides géométriques 2.
2. Blindage de protection passif en composite selon la revendication 1, **caractérisé en ce que** les solides géométriques 2 sont en céramique. 20
3. Blindage de protection passif en composite selon la revendication 1, **caractérisé en ce que** les solides géométriques 2 sont en métal. 25
4. Blindage de protection passif en composite selon la revendication 1, **caractérisé en ce que** les solides géométriques 2 ont la forme de sphères ou de pyramides tronquées à base carrée. 30
5. Blindage de protection passif en composite selon la revendication 1, **caractérisé en ce que** les barres 5 sont en acier inoxydable à résistance accrue. 35

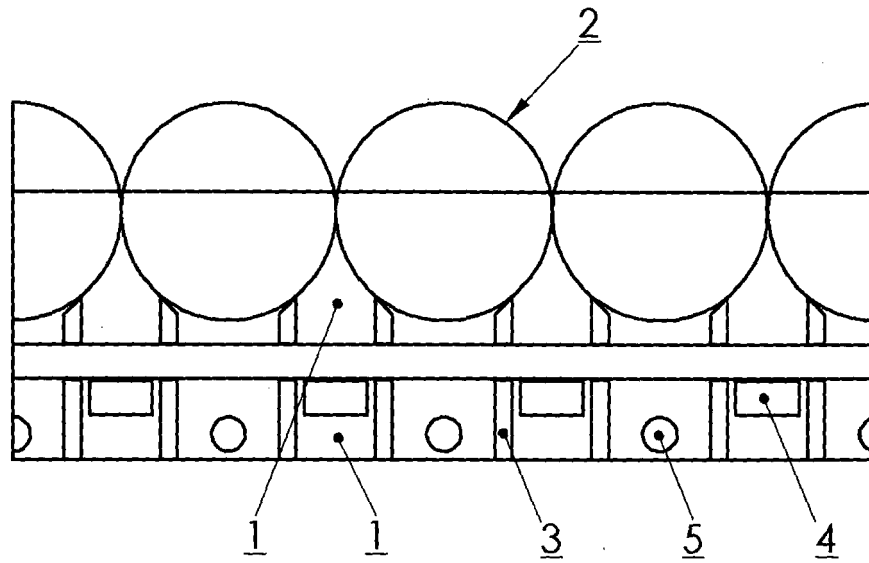


Fig. 1

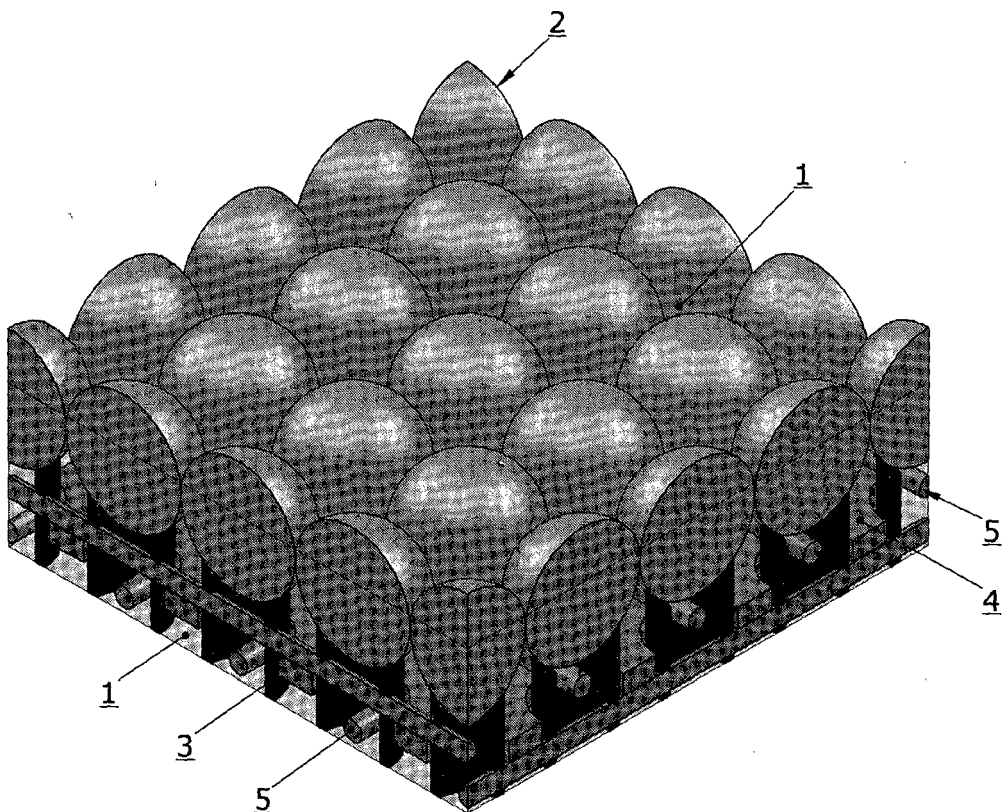


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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