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Use of Elements Made of a Fibre-reinforced Composite Material with Ceramic Matrix

Abstract

This invention relates to the use of elements made of fibre-reinforced or fibre-bundle-reinforced composite materials with a ceramic matrix for partial or complete absorption of at least one impact-like load focussed at a point.

According to one embodiment, the present invention resides in use of elements made of a fibre-reinforced composite material with a ceramic matrix which contains at least 10wt% silicon carbide, the portion of carbon fibres and/or graphite fibres with respect to the weight of the fibres being at least 5wt%, for partial or complete absorption of at least one impact-like load focussed at a point, wherein at least one of the dimensions of the element in a direction at right angles to the load is equal or larger than 3cm.

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FOR A STANDARD PATENT

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Invention Title:	Use of Elements Made of a Fibre-reinforced Composite Material With Ceramic Matrix

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

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USE OF ELEMENTS MADE OF A FIBRE-REINFORCED COMPOSITE MATERIAL WITH CERAMIC MATRIX

The invention relates to the use of elements made of fibre-reinforced or fibre-bundle-reinforced composite materials with ceramic matrix for partial or complete absorption of at least one impact-like load focussed at a point, in particular as structural components.

In the following and in the claims, both individual fibres and the fibre bundles used for the most part, which compared with individual fibres can have a substantially greater width and also height, are referred to together under the term "fibres".

Fibre-reinforced composite materials with ceramic matrix have been known for a long time and are in general distinguished by a high strength and rigidity with simultaneously low weight. These properties are maintained even up to high temperatures. The fibre-reinforced composite materials have a high thermal conductivity and at the same time a low thermal expansion and thus an excellent resistance to thermal shocks.

Starting from carbon-fibre-reinforced composite materials with carbon matrix (CFC), composite materials with SiC as a matrix have been developed to an increasing extent over the last ten years, with carbon fibres (C/SiC) and silicon carbide fibres (SiC/SiC) being used as reinforcing fibres.

A silicon carbide body reinforced with short graphite fibres, which body has a quasi-ductile breaking behaviour, is known from DE 197 10 105 A1. The reinforcing short graphite fibres are surrounded by at least one shell of graphitised carbon obtained by impregnation with carbonisable impregnating agents and subsequent carbonisation. The shell of the fibres is partly converted into silicon carbide during the production of the C/SiC composite material. To that end, the composite body is infiltrated with liquid silicon, wherin the at least partial conversion of the carbon matrix of the carbonised initial product into silicon carbide also takes place.

In the discussion of this prior art, lining materials for reusable space missiles, nozzle linings of jet engines, turbine blades or even friction linings are generally spoken of as possibilities of use for composite materials. The composite materials described in DE-A-197 10 105 can be used as portions of gas turbines, as components of burners and nozzles, as hot-gas pipes, or even as friction materials for high loads, such as linings for brakes.

A process for producing fibre-reinforced composite ceramics with high temperature fibres which are reaction-bonded with a matrix based on silicon and silicon carbide or a silicon alloy, as described in DE 41 27 693 A1, for example, is known from DE 197 11 829 C1. Composite bodies of this type are used for the production of mass-produced components, such as brake discs.

The use of ceramics as an armour plating system, because of their light weights, is also known. Ceramics are generally distinguished by high rigidity and hardness. In the case of the use for armour plating, it is essential that the ceramics can withstand a plastic deformation under high load. A high tensile strength is required particularly on the rear surface of an armour plate. For this reason, therefore, a typical armour plating in which a ceramic composite is used consists of a ceramic front side which is provided, on its rear side, with a fibrous composite or metal substrate as reinforcement (backing). Usually, these different materials are connected to each other by gluing. Glass, glass-ceramics, or technical ceramics such as oxides, borides or even carbides are used as the ceramic material. In particular, aluminium oxide has distinguished itself because it is also relatively favourable in terms of cost. The ability to withstand a plastic deformation, however, is not particularly satisfactory in ceramics. Because ceramics display a brittle breaking behaviour, a loading of the ceramic material focussed on a point, for example by a projectile, leads to a continuous cracking in the ceramic material. The ceramic material is therefore destroyed over a large area and thus loses its protective effect. Heretofore, this problem could be remedied only by mounting on a backing small ceramic segments having a maximum extent of 3 cm for a very high protection (safety for cars) and 10 cm for a simple, for example military, protection in the plane perpendicular to the action of the point-focal load. Thus, if a projectile impacts, always only one ceramic segment is ever destroyed. The production of a composite made up of such ceramic segments is, however, very costly. However, ceramics alone have not hitherto been able to be used as a large-surface protective element.

When an armour plate is hit by a projectile, in the case of a conventional ceramic material, a breakage of the ceramic plate itself results because of reflection of the stress waves within the ceramic plate. Only because a further rear side, for example made of metal, is mounted behind the ceramic plate, that it is possible to prevent the projectile from completely penetrating this armour plate.

In the case of the use for armour plates, it is necessary for the ceramic material to have a clearly greater hardness than the material of the projectile, which usually has a Vicker's hardness of approximately 6.5 to 8.0 kN/mm^2. It would therefore be favourable to use materials having a hardness of more than approximately 9.8 kN/mm^2. If the ceramic material is too soft, the projectile core penetrates through the ceramic material, because it is not damaged or flattened by the ceramic material.

However, there is also ammunition with clearly greater hardness, particularly if ammunition having a core of tungsten carbide in a nickel-iron matrix is used. In such a case, the hardness can rise to approximately 11 kN/mm^2, for example.

A ceramic material made of highly pure aluminium oxide could withstand such a projectile because it has a hardness of more than approximately 16.6 kN/mm^2. It is likewise possible to use other ceramic materials, for example silicon carbide, already mentioned above, boron carbide, or even titanium diboride, the hardness of which is clearly greater.

It is likewise known to use zirconia-reinforced aluminium oxide, or titanium borides. However, a hot-press process has to be used during production in order to obtain the optimal properties. In order to do this, the powders from the respective starting material are compacted and heated in a graphite nozzle under a protective gas atmosphere. Because of the complicated production process, the costs of a single armour plate are consequently high.

In view of the price/output ratio, aluminium oxide has hitherto been considered the ceramic material of choice.

In the meantime, first attempts were made to use fibre-reinforced composite materials with ceramic matrix instead of the conventional ceramics for protection against projectiles. For this purpose, trials were carried out with SiC/SiC composite materials. They displayed a limited damage to the material by the impacting projectile, so that a protection by the material is given against multiple bombardment from an automatic weapon (multi hit). However, the protective effect against projectiles is very low in comparison with the known ceramics. (Orsini and Cottenot, 15th International Symposium on Ballistics, Jerusalem, 1995).

It is therefore the object of this invention at least in preferred embodiments to find a ceramic material which has a low specific weight, which has a good resistance to bombardment and thereby withstands even a repeated bombardment.

Apart from this, the material which is sought is desirably to be able to be shaped as a large-surface element by means of simple shaping processes.

Apart from this, it was a further object of the invention at least in preferred embodiments to select the material in such a way that it satisfies even high safety demands with respect to bombardment and other impact-like loads. In this connection, the material which is sought is to either form the protective element alone or have a conventional rear-side reinforcement.

In accordance with the invention there is provided the use of elements made of a fibre-reinforced composite material with a ceramic matrix which contains at least 10wt% silicon carbide, the portion of carbon fibres and/or graphite fibres with respect to the mass of the fibres being at least 5wt%, for partial or complete absorption of at least one impact-like load focussed at a point, the dimensions of which in a direction perpendicular to the direction of the load are equal to or larger than 3cm, preferably, however, equal to or larger than 10cm and particularly preferably equal to or larger than 30cm.

In order to meet the high safety demands with respect to bombardment and other impact-like loads, elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix are preferably used. The elements consist of 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, the fibre portion of the composite material being 5 to 40wt% of the total weight. In this connection, the average fibre length of the reinforcing fibres is 0.2 to 15mm and the fibres are coated with at least one layer of carbon. In this connection, the minimum thickness of the elements in the direction of the action of force is to meet the safety demands in an appropriate way, as described in detail in the following. In order to save on material and thus on costs, the thickness of the elements is to be chosen to be as small as possible.

The thickness of the elements made of the fibre-reinforced composite material that are used can be reduced in particular in composites according to the invention in which the elements have a rear reinforcement (also referred to as a backing), which is generally stuck on.

In particular, the elements and composites in according with the invention are used as structural components. They are here used for armour plates, among other things in the construction of vehicles of both civil and military types including tanks, in automobile construction, in the construction of aircraft, for example of helicopters and aeroplanes, in shipbuilding and in the construction of railway vehicles. The armouring of stationary objects such as buildings and strong rooms, for example, is also possible with the elements and composites according to the invention, for example as a structural component. Furthermore, the elements and composites according to the invention can also be used in protective vests.

Even projectiles making impact during travel through space can, with appropriate design of the elements and composites according to the invention, be absorbed by the latter so that a use for the protection of spacecraft is also possible.

As a result of the use of the above-described elements and composites, it is possible, in particular, for a loading, for example by shell splinters, by bombardment, for example by projectiles of any kind, to be absorbed without the composite body cracking and exploding into a plurality of pieces. This behaviour is completely surprising and could not have been expected, in particular because it was well known hitherto that non-fibre-reinforced ceramic materials have a relatively brittle behaviour, and thus in the case of bombardment, a plate made of this ceramic material breaks up into a plurality of pieces. If the elements and the elements which have been reinforced on the rear side have a comparatively small thickness, a shot can pass through, although without a shattering or splintering, that is unwanted in conventional ceramic materials, occurring at the same time.

Since the elements and composites according to the invention do not shatter in the case of a point-focal load, they also offer, in contrast to the known ceramic-based armour platings, protection against multiple bombardment. The elements according to the invention made of reinforced composite materials with ceramic matrix can therefore be used as armour plating even with larger dimensions than the ceramics used until now. In contrast to the latter, the one-part elements and composites according to the invention can have dimensions greater than 3 cm, preferably greater than 10 cm and particularly preferably greater than 30 cm. Even larger dimensions are possible for the elements so that, for example, portions of motor vehicles can be replaced by them as armour-plating protection.

Furthermore, the elements and composites according to the invention also display a very good behaviour when bombarded with automatic weapons (multi-hit properties), because the material is weakened only directly in the area of bombardment.

The fibre-reinforced composite material with ceramic matrix of the elements according to the invention is suitable for the substantial absorption of any impact-like load focussed at a point and can therefore be used in the widest variety of ways in protection technology. In particular, the use of the elements and composites in the form of armour plates, for example for automobiles, is of technical interest. Thus, for example, it is possible to produce body portions or body reinforcements for aeroplanes, missiles, trains or even cars from this composite material and thus to obtain vehicles which are completely secure against bombardment without their weight increasing too much.

It is likewise possible, as a result of the use of the fibre-reinforced composite material, to line the floor region of a helicopter cockpit, for example.

A similar protection against bombardment can also be given to ships, which can be manufactured at least partially from this material.

It is likewise possible to use the fibre-reinforced composite material for the protection of buildings, bunkers and stores, for example fuel depots or personnel shelters (tented camps), but also telecommunications systems or radar stations, without expensive or very heavy materials having to be used for this purpose.

According to the invention, it is, of course, also possible to use the fibre-reinforced composite material as splinter protection, in particular as protection against grenade splinters or grenade fragments. In this case, the thickness of a protective plate made of this composite material can even be made thinner than in the case of the protection against projectiles.

The use of the fibre-reinforced composite material with ceramic matrix also includes protection in the civil field, for example in the form of linings for protective vests or generally for clothing worn on the human body.

Furthermore, it is possible to obtain as a result of the use described according to the invention a protection of components of space stations, for example against meteorite impacts.

The fibre-reinforced composite materials used according to the invention are distinguished in particular as a result of the fact that the solid-body structure is retained for a very long time during the energy action. The incident energy is then transformed inside the material.

Apart from this, the elements and composites used in according with the invention are distinguished by a particularly low specific weight. While known ceramic materials such as aluminium oxide have a relatively high specific weight (the specific weight of aluminium oxide is 3.8 g/cm^3), the composite materials used according to the invention have a clearly lower specific weight of only 2.0 to 2.7 g/cm^3, in particular 2.3 to 2.4 g/cm^3. This means that the composite materials used according to the invention have in particular a considerably lower specific weight than the metallic, ballistic steels used hitherto, which have a density of approximately 7.8 g/cm^3. Their specific weight, however, is even lower than that of the known aluminium oxide ceramics. This makes possible a pronounced weight saving potential when these materials are used in vehicle construction, aircraft construction and shipbuilding and also in the protection of people.

The composite bodies used according to the invention are distinguished by a very good breaking behaviour, as could be observed in the bombardment tests set out later. The mechanical impulse energy of a projectile that acts on the material is absorbed by way of internal energy-distorting effects in the composite body, inducing micro-cracks in the regions of the matrix between the fibres, which gradually absorb the energy of the bullets. In this connection, a flattening or mushrooming of the impacting projectiles results, in which case the bullet is braked and a conversion of the kinetic energy into energy for crack formation takes place.

In addition to carbon fibres and graphite fibres also technically equivalent fibres, such as aluminium oxide fibres, silicon nitride fibres and Si/B/C/N fibres, which are presented in DE 197 11 829 C1, for example, can be used as fibres. These can be contained in the composite material of the elements and composites according to the invention in addition to or instead of the carbon fibres and graphite fibres. Preferably fibres based on silicon, carbon, boron, nitrogen, aluminium or mixtures thereof are used.

Basically, when selecting the fibres, the criterion that these fibres are high-temperature fibres and can thus withstand temperatures of up to approximately 1600°C should be fulfilled in order that they are not quickly damaged upon infiltration with molten materials. Conventional materials have no fibre protection (shell) so that, for example, unprotected carbon fibres are attacked upon infiltration with silicon and it is impossible to obtain a ductile material. The fibres used according to the invention therefore advantageously have a protective coating. This preferably consists of at least one carbon layer or graphite layer which results from the coking of synthetic resins, for example, and/or other carbon-donating substances and possibly subsequent graphitising. A plurality of protective layers made of carbon or graphite is particularly preferred. The production of such a fibre provided with protective shell(s) is known from DE 197 10 105 A1, for example.

In addition to short fibres, fibres having a greater length can also be used in the composite materials of the elements according to the invention. Basically, there is no restriction with respect to the fibre length. If short fibres (fibre lengths of up to approximately 4 mm) and fibres of greater length are placed in the composite material, the longer fibres above all contribute to the reinforcement of the material. The portion of these longer fibres is therefore denoted as reinforcing fibres in the following and in the claims. In composite materials which contain only short fibres, these are the reinforcing fibres. The bundle thickness of the fibres (actual fibre bundle) is usually 1000 to 920,000 filaments. The fibres of the elements in according with the invention preferably have a bundle thickness of 1 to 3000 filaments.

An organic polymer such as polyacrylonitrile or cellulose, for example, can even be used as starting material for the fibres, from which material flat shaped bodies such as woven fabrics or nonwoven fabrics can be produced, as described in DE 195 17 911 A1. If cellulose is used, it is made unmeltable in a pre-process. It is also possible to use inorganic polymers, which are spun to form nonwoven fabrics.

Polysilanes, polysilazanes, carbosilanes, which are made unmeltable, or nonwoven fabrics made of boron-containing silazanes can be mentioned as materials. It is favourable if woven fabrics are impregnated with substances of low viscosity, such as furfurylcohol, polyphenylenes, polyimides or polyacrylates, in order to achieve a good wetting.

The composite materials used in the elements according to the invention preferably also have phases of silicon and carbon in the matrix in addition to silicon carbide. It is particularly preferably, if the matrix contains only phases of silicon carbide, silicon and carbon.

The composite material of the elements and composites in according with the invention contains at least 10% by weight silicon carbide, advantageously 20% by weight and particularly preferably 30% by weight with respect to the total weight. The proportion of the fibres with respect to the total weight should be at least 5% by weight, preferably even 10%, and particularly preferably is a proportion of the fibres above 15% by weight. Furthermore, it is very advantageous if the composite material of the elements and composites according to the invention has a ductile breaking behaviour.

In order to use the elements and composites according to the invention also as protection against the penetration of large calibre bullets, fibre-reinforced composite materials having the following properties are to be used.

A good protection is achieved if the composite material has, with respect to its total weight 40 to 85% by weight, preferably 55 to 80% by weight and particularly preferably 65 to 75% by weight silicon carbide, 5 to 55% by weight, preferably 10 to 40% by weight and particularly preferably 15 to 25% by weight carbon (including fibres) and 0 to 30% by weight, preferably 2 to 20% by weight and particularly preferably 5 to 15% by weight silicon. Here, the proportion of the fibres with respect to the total weight is to be 5 to 40% by weight, preferably 8 to 30% by weight and particularly preferably 10 to 20% by weight. Furthermore, the average fibre length of the reinforcing fibres is here between 0.2 mm and 15 mm, preferably between 0.5 mm and 5 mm and particularly preferably between 1 mm and 2 mm. Apart from this, the fibres are coated with at least one layer of carbon.

An element made of a composite material of this type prevents the penetration of bullets having a kinetic energy of up to 942.9 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 20 mm to 100 mm, preferably 24 mm to 60 mm and particularly preferably 28 mm to 40 mm. It prevents the penetration of bullets having a kinetic energy of up to 1510 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 25 mm to 100 mm, preferably 28 mm to 70 mm and particularly preferably 36 mm to 50 mm. Apart from this, it prevents the penetration of bullets having a kinetic energy up to 1805 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 32 mm to 100 mm, preferably 36 mm to 80 mm and particularly preferably 40 mm to 60 mm.

Furthermore, an element made of a composite material of this type prevents the penetration of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a mass of up to 10.2 g and a bullet velocity of up to 430 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 20 mm to 100 mm, preferably 24 mm to 60 mm and particularly preferably 28 mm to 40 mm. It prevents the penetration of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a mass of up to 15.6 g and a bullet velocity of up to 440 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 25 mm to 100 mm, preferably 28 mm to 70 mm and particularly preferably 36 mm to 50 mm. Apart from this, it prevents the penetration of pointed bullets having a soft core made of lead with steel penetrator and a solid jacket made of copper with a mass of up to 4.0 g and a bullet velocity of up to 950 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 32 mm to 100 mm, preferably 36 mm to 80 mm and particularly preferably 40 mm to 60 mm.

A composite made up of an element made of such a composite material with a woven fabric of reinforcing fibres, which preferably has a thickness of up to 15 mm, which element and which woven fabric are connected to each other with an adhesive, prevents the penetration of bullets having a kinetic energy of up to 942.9 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 3.2 mm to 30 mm, preferably 4.5 mm to 25 mm and particularly preferably 6 mm to 20 mm. It prevents the penetration of bullets having a kinetic energy of up to 1510 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 4 mm to

40 mm, preferably 5.5 mm to 30 mm and particularly preferably 7.5 mm to 25 mm. Apart from this, it prevents the penetration of bullets having a kinetic energy of up to 1805 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 4.8 mm to 50 mm, preferably 6 mm to 40 mm and particularly preferably 8 mm to 30 mm. It prevents the penetration of bullets having a kinetic energy of up to 2105 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 5.5 mm to 50 mm, preferably 7 mm to 40 mm and particularly preferably 10 mm to 30 mm. It prevents the penetration of bullets having a kinetic energy of up to 3272 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 8 mm to 50 mm, preferably 10 mm to 40 mm and particularly preferably 12 mm to 30 mm.

Furthermore, a composite made up of an element made of such a composite material with a woven fabric of reinforcing fibres, which preferably has a thickness of up to 15 mm, which element and which woven fabric are connected to each other with an adhesive, prevents the penetration of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a mass of up to 10.2 g and a bullet velocity of up to 430 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 3.2 mm to 30 mm, preferably 4.5 mm to 25 mm and particularly preferably 6 mm to 20 mm. It prevents the penetration of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a mass of up to 15.6 g and a bullet velocity of up to 440 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 4 mm to 40 mm, preferably 5.5 mm to 30 mm and particularly preferably 7.5 mm to 25 mm. Apart from this, it prevents the penetration of pointed bullets having a soft core made of lead with steel penetrator and a solid jacket made of copper with a mass of up to 4.0 g and a bullet velocity of up to 950 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 4.8 mm to 50 mm, preferably 6 mm to 40 mm and particularly preferably 8 mm to 30 mm. It prevents the penetration of cone point-head bullets having a soft core made of lead with a steel penetrator and a solid jacket made of copper with a mass of up to 7.9 g and a bullet velocity of up to 730 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 5.5 mm to 50 mm, preferably 7 mm to 40 mm and particularly preferably 10 mm to 30 mm. It prevents the penetration of pointed bullets having a soft core made of lead and a solid jacket made of steel with a mass of up to 9.5 g and a bullet velocity of up to 830 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 8 mm to 50 mm, preferably 10 mm to 40 mm and particularly preferably 12 mm to 30 mm.

A particularly good protection is achieved if the composite material has, with respect to its total weight 55 to 80% by weight and preferably 65 to 75% by weight silicon carbide, 10 to 40% by weight and preferably 15 to 25% by weight carbon (including fibres) and 2 to 20% by weight and preferably 5 to 15% by weight silicon. Here, the proportion of the fibres with respect to the total weight is to be 8 to 30% by weight and preferably 10 to 20% by weight. Furthermore, the average fibre length of the reinforcing fibres is here between 0.5 mm and 5 mm and preferably between 1 mm and 2 mm. Apart from this, the fibres are coated with at least one layer of graphitized carbon.

An element made of a composite material of this type prevents the penetration of bullets having a kinetic energy of up to 942.9 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 15 mm to 100 mm, preferably 19 mm to 60 mm and particularly preferably 23 mm to 40 mm. It prevents the penetration of bullets having a kinetic energy of up to 1510 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 20 mm to 100 mm, preferably 25 mm to 70 mm and particularly preferably 30 mm to 50 mm. Apart from this, it prevents the penetration of bullets having a kinetic energy up to 1805 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 25 mm to 100 mm, preferably 31 mm to 80 mm and particularly preferably 37 mm to 60 mm.

Furthermore, an element made of a composite material of this type prevents the penetration of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a mass of up to 10.2 g and a bullet velocity of up to 430 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 15 mm to 100 mm, preferably 19 mm to 60 mm and particularly preferably 23 mm to 40 mm. It prevents the penetration of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a mass of up to 15.6 g and a bullet velocity of up to 440 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 20 mm to 100 mm, preferably 25 mm to 70 mm and particularly preferably 30 mm to 50 mm. Apart from this, it prevents the penetration of pointed bullets having a soft core made of lead with steel penetrator and a solid jacket made of copper with a mass of up to 4.0 g and a bullet velocity of up to 950 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 25 mm to 100 mm, preferably 31 mm to 80 mm and particularly preferably 37 mm to 60 mm.

A composite made up of an element made of such a composite material with a woven fabric of reinforcing fibres, which preferably has a thickness of up to 15 mm, which element and which woven fabric are connected to each other with an adhesive, prevents the penetration of bullets having a kinetic energy of up to 942.9 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 2.4 mm to 30 mm, preferably 3.5 mm to 25 mm and particularly preferably 5 mm to 20 mm. It prevents the penetration of bullets having a kinetic energy of up to 1510 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 3 mm to 40 mm, preferably 4.5 mm to 30 mm and particularly preferably 6.5 mm to 25 mm. Apart from this, it prevents the penetration of bullets having a kinetic energy of up to 1805 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 3.6 mm to 50 mm, preferably 5 mm to 40 mm and particularly preferably 7 mm to 30 mm. It prevents the penetration of bullets having a kinetic energy of up to 2105 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 4 mm to 50 mm, preferably 6 mm to 40 mm and particularly preferably 8 mm to 30 mm. It prevents the penetration of bullets having a kinetic energy of up to 3272 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 6 mm to 50 mm, preferably 7.5 mm to 40 mm and particularly preferably 9 mm to 30 mm.

Furthermore, a composite made up of an element made of such a composite material with a woven fabric of reinforcing fibres, which preferably has a thickness of up to 15 mm, which element and which woven fabric are connected to each other with an adhesive, prevents the penetration of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a mass of up to 10.2 g and a bullet velocity of up to 430 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 2.4 mm to 30 mm, preferably 3.5 mm to 25 mm and particularly preferably 5 mm to 20 mm. It prevents the penetration of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a mass of up to 15.6 g and a bullet velocity of up to 440 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 3 mm to 40 mm, preferably 4.5 mm to 30 mm and particularly preferably 6.5 mm to 25 mm. Apart from this, it prevents the penetration of pointed bullets having a soft core made of lead with steel penetrator and a solid jacket made of copper with a mass of up to 4.0 g and a bullet velocity of up to 950 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 3.6 mm to 50 mm, preferably 5 mm to 40 mm and particularly preferably 7 mm to 30 mm. It prevents the penetration of cone point-head bullets having a soft core made of lead and a steel penetrator and a solid jacket made of copper with a mass of up to 7.9 g and a bullet velocity of up to 730 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 4 mm to 50 mm, preferably 6 mm to 40 mm and particularly preferably 8 mm to 30 mm. It prevents the penetration of pointed bullets having a soft core made of lead and a solid jacket made of steel with a mass of up to 9.5 g and a bullet velocity of up to 830 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 6 mm to 50 mm, preferably 7.5 mm to 40 mm and particularly preferably 9 mm to 30 mm.

A extremely good protection is achieved if the composite material has, with respect to its total weight 65 to 75% by weight silicon carbide, 15 to 25% by weight carbon (including fibres) and 5 to 15% by weight silicon. Here, the proportion of the fibres with respect to the total weight is to be 10 to 20% by weight. Furthermore, the average fibre length of the reinforcing fibres is here between 1 mm and 2 mm. Apart from this, the fibres are coated with at least three layers of graphitized carbon.

An element made of a composite material of this type prevents the penetration of bullets having a kinetic energy of up to 942.9 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 12 mm to 100 mm, preferably 15 mm to 60 mm and particularly preferably 18 mm to 40 mm. It prevents the penetration of bullets having a kinetic energy of up to 1510 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 16 mm to 100 mm, preferably 20 mm to 70 mm and particularly preferably 24 mm to 50 mm. Apart from this, it prevents the penetration of bullets having a kinetic energy up to 1805 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 20 mm to 100 mm, preferably 24 mm to 80 mm and particularly preferably 28 mm to 60 mm.

Furthermore, an element made of a composite material of this type prevents the penetration of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a mass of up to 10.2 g and a bullet velocity of up to 430 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 12 mm to 100 mm, preferably 15 mm to 60 mm and particularly preferably 18 mm to 40 mm. It prevents the penetration of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a mass of up to 15.6 g and a bullet velocity of up to 440 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 16 mm to 100 mm, preferably 20 mm to 70 mm and particularly preferably 24 mm to 50 mm. Apart from this, it prevents the penetration of pointed bullets having a soft core made of lead with steel penetrator and a solid jacket made of copper with a mass of up to 4.0 g and a bullet velocity of up to 950 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 20 mm to 100 mm, preferably 24 mm to 80 mm and particularly preferably 28 mm to 60 mm.

A composite made up of an element made of such a composite material with a woven fabric of reinforcing fibres, which preferably has a thickness of up to 15 mm, which element and which woven fabric are connected to each other with an adhesive, prevents the penetration of bullets having a kinetic energy of up to 942.9 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 2 mm to 30 mm, preferably 2.5 mm to 25 mm and particularly preferably 4 mm to 20 mm. It prevents the penetration of bullets having a kinetic energy of up to

1510 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 2.5 mm to 40 mm, preferably 3 mm to 30 mm and particularly preferably 5.5 mm to 25 mm. Apart from this, it prevents the penetration of bullets having a kinetic energy of up to 1805 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 3 mm to 50 mm, preferably 4 mm to 40 mm and particularly preferably 6 mm to 30 mm. It prevents the penetration of bullets having a kinetic energy of up to 2105 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 3.5 mm to 50 mm, preferably 4.5 mm to 40 mm and particularly preferably 7 mm to 30 mm. It prevents the penetration of bullets having a kinetic energy of up to 3272 J if the minimum thickness of the element parallel to the direction of impact of the bullet is 5 mm to 50 mm, preferably 6 mm to 40 mm and particularly preferably 8 mm to 30 mm.

Furthermore, a composite made up of an element made of such a composite material with a woven fabric of reinforcing fibres, which preferably has a thickness of up to 15 mm, which element and which woven fabric are connected to each other with an adhesive, prevents the penetration of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a mass of up to 10.2 g and a bullet velocity of up to 430 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 2 mm to 30 mm, preferably 2.5 mm to 25 mm and particularly preferably 4 mm to 20 mm. It prevents the penetration of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a mass of up to 15.6 g and a bullet velocity of up to 440 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 2.5 mm to 40 mm, preferably 3 mm to 30 mm and particularly preferably 5.5 mm to 25 mm. Apart from this, it prevents the penetration of pointed bullets having a soft core made of lead with steel penetrator and a solid jacket made of copper with a mass of up to 4.0 g and a bullet velocity of up to 950 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 3 mm to 50 mm, preferably 4 mm to 40 mm and particularly preferably 6 mm to 30 mm. It prevents the penetration of cone point-head bullets having a soft core made of lead and a steel penetrator and a solid jacket made of copper with a mass of up to 7.9 g and a bullet velocity of up to 730 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 3.5 mm to 50 mm, preferably 4.5 mm to 40 mm and particularly preferably 7 mm to 30 mm. It prevents the penetration of pointed bullets having a soft core made of lead and a solid jacket made of steel with a mass of up to 9.5 g and a bullet velocity of up to 830 m/s if the minimum thickness of the element parallel to the direction of impact of the bullet is 5 mm to 50 mm, preferably 6 mm to 40 mm and particularly preferably 8 mm to 30 mm.

In addition to the fibres, various fillers can also be placed in the matrix. In particular, silicides, carbides, borides, metals and carbon, for example in the form of soot, graphite, coke or mixtures of these, are suitable as fillers. Silicon carbides, B_4C, soot, graphite or zirconium borides are of particular interest here. The use of soot and/or graphite is particularly preferred because a good conversion into SiC is rendered possible by these substances. The use of B_4C is common in applications at the present time if a high level of hardness of the composite body is to be achieved. Zirconium borides are used because of their resistance to high temperatures. Therefore, advantages are to be expected when they are used for the composite bodies used according to the invention, in particular in the case of bombardment with signal ammunition. If, however, composite bodies having a particularly low specific weight are to be used, it is preferable to use fillers other than zirconium boride, which has a high density.

The amount of the fillers to be used if appropriate can be determined as a function of the properties of the composite body that are to be achieved. When reacting fillers such as soot or graphite are used, the amount is preferably up to 40% by weight, with respect to the original mixture. At higher amounts, a deformation of the body or even cracking can occur. More preferably, the amount is up to 30% by weight. If non-reacting fillers, for example SiC, are used, even higher concentrations are usable. The proportion of such fillers depends fundamentally on the brittleness and the hardness which are to be adjusted.

A significant advantage of the use of the fibre-reinforced composite material with ceramic matrix lies in that the elements can be produced directly in the shape of the desired structural component, so that shaping steps after the production of the elements can be avoided and thus a further reduction in costs in the production of protective plates or armour plates, for example, is obtained. In view of the high breaking strength of the elements, it is not absolutely necessary to provide the elements according to the invention with a rear-side reinforcement, in which case the reinforcing material, such as fibre fabric (for example aramide fibres) or metal plates, is glued on to the rear side of the composite material in order to obtain a bombardment-resistant armour plate. Instead, the composite body can itself already form this armour plate. However, the thickness of an element according to the invention made of a composite material is greater than that required for the element if, as a result of the rear-side reinforcement, a composite according to the invention having the same effect is made available.

The production of the composite material which is fibre-reinforced at least partly with carbon fibres and/or graphite fibres and has a ceramic matrix which contains silicon carbide can, for example, take place according to the processes known from DE 197 11 829 C1 or DE 197 10 105 A1. Reference to these two printed publications is made explicitly with respect to the production process.

Basically, all known processes can be used in order to produce fibre-reinforced C/SiC ceramics. In the processes cited above, the following production steps are carried out in order to produce composite materials into which individual fibres (or fibre bundles) are incorporated.

The incorporated fibres are, as described in DE 197 11 829 C1 and DE 197 10 105 A1, for example, pre-treated or produced and, by way of a mixer, mixed with a carbon-donating resin and moulded into the initial shape by way of a pressing mould and hardened at temperatures of up to approximately 150°C. The moulded bodies (CFC preliminary bodies) which result in this way are pyrolysed at temperatures of up to approximately 1000°C and possibly subsequently graphitised at temperatures of up to approximately 2000°C.

The CFC preliminary body obtained in this way is subsequently impregnated with liquid silicon at temperatures of up to approximately 1800°C in a vacuum. In this connection, a large portion of the matrix carbon reacts in an exothermal reaction with the silicon which is incorporated to form silicon carbide. Due to a special pre-treatment of the fibres, the carbon fibres are retained during this reaction and can thus contribute to the ductilisation of the ceramics.

Also suitable are the known 2D and 3D CFC woven-fabric structures with large volumetric contents of the fibers which can be produced, inter alia, directly from polyacrylonitrile planar fibre structures by way of the direct oxidation process and by subsequent pyrolysis. In this connection, the following process steps in particular are carried out.

The carbon-fibre reinforcing structure is made into a shape which corresponds to the desired final shape. The fibre body is impregnated with a resin matrix in a vacuum and under pressure at 130°C,, and after hardening and removal from the mould, is subsequently processed according to need.

The CFK preliminary bodies which result in this way are then pyrolysed at temperatures of up to 1000°C. Then, a secondary compression of this CFC material with a pitch-based or resin-based carbon-containing polymer can take place in one or more steps, with a further pyrolysis step following each secondary-compression step. In this way, a CFC material which is suitable for the subsequent infiltration is obtained. In that material the carbon fibres are sufficiently protected against the attack of the liquid silicon in particular. Subsequently, a graphitisation of the CFC composite material at temperatures of up to approximately 2000°C can take place.

The siliconizing is carried out at temperatures of up to approximately 1800°C in a vacuum.

For example, the shapes of vehicle doors or certain aircraft components can be formed directly by way of the concrete processes described above.

In addition to silicon, other materials also come into consideration as infiltration material, which materials are added to the silicon. Basically, the materials used for infiltration must be able to melt in the temperature range up to 1800°C. Aluminium, boron, magnesium, nitrogen, carbon and compounds or mixtures thereof as well as silicides come into consideration as further infiltration materials. Even silicides exclusively can be infiltrated in order to form a matrix containing silicon carbide.

Particularly preferably, silicon is used as infiltration material during the production of the composite bodies. During the addition of other substances, silicides, such as, for example, molybdenum silicides, iron silicides, chromium silicides, tantalum silicides or mixtures, are preferably added to silicon. Materials of this type can alter the melting point of the infiltration material.

It is likewise also possible to use silicon-based polymers as infiltration material. Examples of such polymers are, for example, boron-containing polysilazanes.

In the following, exemplary embodiments are presented in order to explain this invention further.

Examples 1 and 2: Production of elements made of a fibre-reinforced composite material with ceramic matrix.

First of all, a prepreg is produced from 3K carbon fibre bundles (3000 individual filaments), the carbon fibres having being produced on the basis of PAN fibres. For this purpose, the fibre bundles were interlaced to a twill fabric, the woven fabric was subsequently saturated in phenolic resin (resol type) and provided with an release paper on both sides. After this, the resinated fabric was heated to 130°C in order to establish the tackiness of the prepreg.

Subsequently, the prepreg plates were laid on top of each other and pressed to form a compact body. This was then baked at 900°C, the burning curve having a rise of 5°C per minute in the range between 400°C and 600°C. Then, three times, one after another, the CFC body obtained in this way was first impregnated with a coal tar pitch with a softening point of 60°C and then baked, again at 900°C, in order to compact it further.

The CFC body obtained in this way was then first broken up into small pieces in a jaw breaker (manufacturer: Alpine Hosokawa) and subsequently cut into fibre bundles in a cutting mill (manufacturer: Alpine Hosokawa). The fibre bundles were then classified in a wobble screening plant (manufacturer: Allgaier) into individual fibre fractions, the sieve inserts (sieving area 1.15 m^2) having a clear mesh aperture of 0.5 mm, 1 mm, 2 mm, 3 mm, 4 mm and 6 mm in according with ISO 9044. As a result of this sieving process, different fibre fractions were obtained, as a result of which there were, among others, a fraction A with fibres of the length 12.45 mm to 17.55 mm and the width 660 µm to 2.26 mm, a fraction B with fibres of the length 8.5 mm to 13.5 mm and the width 690 µm to 2.21 mm, a fraction C with fibres of the length 5.5 mm to 10.5 mm and the width 760 µm to 2.16 mm, a fraction D with fibres of the length 0.2 mm to 3 mm and the width 200 µm to 1 mm, a fraction E with fibres of the length 0.1 mm to 3 mm and the width 50 to 500 µm and a fraction F with fibres of the length 0.3 mm and the width 8 to 200 µm.

Subsequently this, for samples of Example 1, a mixture 1 made up of 70% of the total weight fibres, in according with the composition: 35% fraction D, 35% fraction E and 30% fraction F, and 30% of the total weight of phenolic resin (resol type) as binding agent, and for samples of Example 2, a mixture 2 made up of 70% of the total weight fibres, in according with the composition: 12% fraction A, 18% fraction B, 40% fraction C and 30% fraction D, and 21% of the total weight phenolic resin (resol type) and 9% of the total weight coal tar pitch (softening point: 230°C) as binding agent were produced in a Z-arm kneader (manufacturer: Werner & Pfleiderer) by mixing for 15 minutes at a rotational speed of 30 1/min. Subsequently, in each case 1200 g of the mixture 1 was pressed in a stamping press in a square pressing mould of the side length 325 mm at a specific pressure of 12 Kp/cm^2 and a temperature of 130°C. This temperature was maintained for 3 hours at constant mould pressure. After cooling to 30°C, the cured plate was removed from the pressing mould. As a result of this manner of proceeding, a CFK plate with a height (thickness) of 10 mm and a density of 1.2 g/cm^3 was obtained.

In an analogous manner, plates with a thickness of 38 mm and a density of 1.18 g/cm^3 were obtained in each case from 5100 g of the mixture 2.

After this, the carbonisation of the samples took place at 900°C under protective gas (heating rate of 2 K/min). The cooling of the plates to room temperature took place in an uncontrolled manner at up to 10 K/min. After carbonisation, these plates had densities of 1.05 g/cm^3 (Example 1) and 1.03 g/cm^3 (Example 2).

Subsequently, the infiltration of the samples at 1700°C with liquid silicon took place in a vacuum in a high-temperature furnace with a silicon supply (particle size up to 5 mm) of one and a half times the sample weight, as a result of which the SiC structure of the matrix of the samples is generated. In this connection, the siliconization took place first of all with a temperature rise of 10 K/min to 1400°C and then 5 K/min to 1800°C. The temperature was then held for 45 minutes, then a temperature drop with 5 K/min to 1400°C and subsequently an uncontrolled cooling took place. The C/SiC composite materials obtained in this way had densities of 2.4 g/cm^3 and 2.35 g/cm^3. The plates made of the C/SiC composite material of Example 1 that were produced in this way had a fibre proportion with respect to the total weight of 15% and a composition with respect to the total weight of 68% silicon carbide, 22% carbon and 10% silicon. The average fibre length was 1.5 mm. The plates made of the C/SiC composite material of Example 2 had a fibre proportion with respect to the total weight of 17% and a composition with respect to the total weight of 58% silicon carbide, 31% carbon and 11% silicon. The average fibre length of the reinforcing fibres was 10 mm.

Example 3: Production of an element made of a fibre-reinforced composite material with ceramic matrix with a rear-side reinforcement.

The 10 mm thick plates produced in according with Example 1 were, additionally provided with a conventional rear-side reinforcement system (backing) in order to use them for protection against bombardment. In order to do this, the rear side of the ceramic plate was first blasted with silica sand and after this 10 layers of aramide fibre fabric T 750 (Akzo Nobel, Germany) were glued to the rear side of the C/SiC plate with the PUR glue SIKAFLEX7 225 FC (manufacturer: Sika Chemie GmbH, Germany) and an adhesive primer.

Results of bombardment tests

Bombardment tests were carried out with the elements made of fibre-reinforced composite materials with ceramic matrix with rear-side reinforcement in according with Example 3 and without rear-side reinforcement in according with Example 2. The testing process took place in a penetration test according to the Euro standard, DIN EN 1523. The test requirements were the impeding of penetration in the resistance classes according to Table 1 of the Euro standard DIN EN 1522. In order to set up the test, the plates were clamped on a stand, the test sample being fastened at an angle of 90° to the shooting direction. The firing distance was 5 or 10 m. The dispersion distance was 120 mm ± 10 mm.
First, bombardment tests were carried out on plates

having the dimensions 325 mm x 278 mm x 38 mm which were produced from plates in according with Example 2. It was found that the plates resisted the following bombardment tests, with at least three shots being fired at a plate in each case.

Test 1 (bombardment class FB 3)

A weapon type "test barrel" with a 357 magnum calibre was used as the weapon, and the bullet had a solid jacket made of steel, a cone point-head and a soft core made of lead. The bullet weight was 10.2 g. The test distance was 5 m. The bullet velocity was 430 m/s, the bullet energy 942.9 J.

Test 2 (bombardment class FB 4)

A weapon type "test barrel" with a 44 Rem. magnum calibre was used as the weapon, and the bullet had a solid jacket made of copper, a flat-head and a soft core made of lead. The bullet weight was 15.6 g. The test distance was 5 m. The bullet velocity was 440 m/s, the bullet energy 1510 J.

It emerged that the plates in the case of this test are also resistant to a multiple bombardment if the bullets hit with a spacing of 50 mm, which corresponds to the effect of automatic weapons (multi-hit capability).

Test 3 (bombardment class FB 5)

A weapon type "test barrel" with a 5.56 mm x 45 mm calibre was used as the weapon, and the bullet had a solid jacket made of copper, a pointed head and a soft core made of lead with steel penetrator (type SS 109). The bullet weight was 4.0 g. The test distance was 10

m. The bullet velocity was 950 m/s, the bullet energy 1805 J.

In all of these bombardment tests on the large-sized protective elements made of the C/SiC composite material, no crack preventing a further use as protection appeared in the elements.

Apart from this, elements having the dimensions 300 mm x 300 mm in according with Example 3, which had a C/SiC composite-material plate of only 10 mm thickness and a rear-side reinforcement, were exposed to the bombardment tests.

Test 4 (bombardment class FB 3)

A weapon type "test barrel" with a 357 magnum calibre was used as the weapon, and the bullet had a solid jacket made of steel, a cone point-head and a soft core made of lead. The bullet weight was 10.2 g. The test distance was 5 m. The bullet velocity was 430 m/s, the bullet energy 942.9 J.

Test 5 (bombardment class FB 4)

A weapon type "test barrel" with a 44 Rem. magnum calibre was used as the weapon, and the bullet had a solid jacket made of copper, a flat-head and a soft core made of lead. The bullet weight was 15.6 g. The test distance was 5 m. The bullet velocity was 440 m/s, the bullet energy 1510 J.

It emerged that the plates in the case of this test are also resistant to a multiple bombardment if the bullets hit with a spacing of 50 mm, which corresponds to the effect of automatic weapons (multi-hit capability).

Test 6 (bombardment class FB 4+)

A Kalashnikov AK 47 with a 7.62 mm x 39 mm calibre was used as the weapon, and the bullet had a solid jacket made of copper, a cone point-head and a soft core made of lead with steel penetrator. The bullet weight was 7.9 g. The test distance was 10 m. The bullet velocity was 730 m/s, the bullet energy 2105 J.

Test 7 (bombardment class FB 5)

A weapon type "test barrel" with a 5.56 mm x 45 mm calibre was used as the weapon, and the bullet had a solid jacket made of copper, a pointed head and a soft core made of lead with steel penetrator (type SS 109). The bullet weight was 4.0 g. The test distance was 10 m. The bullet velocity was 950 m/s, the bullet energy 1805 J.

Test 8 (bombardment class FB 6)

A weapon type "test barrel" with a 7.62 mm x 51 mm calibre was used as the weapon, and the bullet had a solid jacket made of steel, a pointed head and a soft core made of lead. The bullet weight was 9.5 g. The test distance was 10 m. The bullet velocity was 830 m/s, the bullet energy 3272 J.

No crack preventing a further use as protection appeared in the elements even in these bombardment tests on the large-sized protective elements made of the C/SiC composite material with rear-side reinforcement.

The prevailing temperature in the bombardment tests was

20 to 22°C.

On the basis of the above results, it is evident that elements made of C/SiC composite materials with and without rear reinforcement can be bombarded without shattering. In this connection, the plates display a resistance even in the case of high demands. In particular, the thickness of the C/SiC plates in the case of a rear-side reinforcement according to conventional technology can be chosen to be so small that an economical use is also provided and despite this a high level of safety is ensured.

The claims defining the invention are as follows:

1. Use of elements made of a fibre-reinforced composite material with a ceramic matrix which contains at least 10wt% silicon carbide, the portion of carbon fibres and/or graphite fibres with respect to the weight of the fibres being at least 5wt%, for partial or complete absorption of at least one impact-like load focussed at a point, wherein at least one of the dimensions of the element in a direction at right angles to the load is equal or larger than 3cm.

2. Use according to claim 1, wherein at least one of the dimensions of the element in a direction at right angles to the load is equal or larger than 10cm.

3. Use according to claim 1 or claim 2, wherein at least one of the dimensions of the element in a direction at right angles to the load is equal or larger than 30cm.

4. Use of elements in accordance with any one of claims 1 to 3, for partial or complete absorption of at least one impact-like load focussed at a point, wherein the ceramic matrix of the composite material also contains phases of carbon and/or silicon.

5. Use of elements in accordance with claim 4, for partial or complete absorption of at least one impact-like load focussed at a point, wherein the ceramic matrix of the composite material contains only silicon carbide and carbon and/or silicon.

6. Use of elements in accordance with any one of claims 1 to 5, for partial or complete absorption of at least one impact-like load focussed at a point, wherein the composite materials of which the elements consist possess only carbon fibres and/or graphite fibres.

7. Use of elements in accordance with any one of claims 1 to 5, for partial or complete absorption of at least one impact-like load focussed at a point, wherein the composite materials of which the elements consist also possess or only possess aluminium oxide fibres and/or silicon nitride fibres and/or Si/B/C/N fibres.

8. Use of elements in accordance with any one of claims 1 to 7, for partial or complete absorption of at least one impact-like load focussed at a point, wherein the composite materials of which the elements consist have a ductile breaking behaviour.

9. Use of elements in accordance with any one of claims 1 to 8, for partial or complete absorption of at least one impact-like load focussed at a point, wherein the fibres of the composite materials of which the elements consist have a coating.

10. Use of elements in accordance with claim 9, for partial or complete absorption of at least one impact-like load focussed at a point, wherein the coating of the fibres of the composite materials of which the elements consist consists of at least one layer of carbon and/or graphite.

11. Use of elements in accordance with claim 10, for partial or complete absorption of at least one impact-like load focussed at a point, wherein the fibres of the composite materials of which the elements consist are connected to a shell of carbon converted partially into silicon carbide, which carbon has resulted from the coking of synthetic resins and/or other carbon-donating substances.

12. Use of elements in accordance with claim 11, for partial or complete absorption of at least one impact-like load focussed at a point, wherein the shell of the fibres has resulted from the coking and subsequent graphitising of synthetic resins and/or other carbon-donating substances.

13. Use of elements in accordance with any one of claims 1 to 12, wherein the loading takes place by means of grenade splinters.

14. Use of elements in accordance with any one of claims 1 to 12, wherein the loading takes place by means of bombardment.

15. Use of elements in accordance with any one of claims 1 to 12, wherein the loading takes place by means of projectiles of any kind.

16. Use of elements in accordance with any one of claims 1 to 12, as an armour plate.

17. Use of elements in accordance with any one of claims 1 to 12, as a structural component.

18. Use of elements in accordance with claim 16 or claim 17, for armouring in the construction of vehicles.

19. Use of elements in accordance with claim 17 or claim 18, as a structural component for armouring in civil and military vehicle construction.

20. Use of elements in accordance with any one of claims 16 to 19, for armouring of automobiles, military vehicles, aeroplanes, helicopters, ships, railway vehicles or stationary objects.

21. Use according to claim 20, wherein the military vehicle is a tank.

22. Use according to claim 20, wherein the stationary object is a building or safe.

23. Use of elements in accordance with any one of claims 1 to 12, in protective vests.

24. Use of elements in accordance with claim 15, for the protection of spacecraft against projectiles of any kind.

25. Use of elements in accordance with any one of claims 1 to 24, the elements having a ductile behaviour and being connected by an adhesive to a backing to form a composite.

26. Use of elements in accordance with any one of claims 1 to 24, the elements being connected by an adhesive to a backing consisting of woven fabrics made of fibres or metal plates to form a composite.

27. Use according to claim 26, wherein the fibres are aramide fibres.

28. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, for complete absorption of bullets having a kinetic energy of up to 1805J, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 20mm to 100mm.

29. Use according to claim 28, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 24mm to 80mm.

30. Use according to claim 28 or claim 29, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 28mm to 60mm.

31. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect of the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, for complete absorption of bullets having a kinetic energy of up to 1805J, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 25mm to 100mm.

32. Use according to claim 31, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 31mm to 80mm.

33. Use according to claim 31 or claim 32, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 37mm to 60mm.

34. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, for complete absorption of bullets having a kinetic energy of up to 1805J, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 32mm to 100mm.

35. Use according to claim 34, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 36mm to 80mm.

36. Use according to claim 34 or claim 35, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 40mm to 60mm.

37. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, for complete absorption of pointed bullets having a soft core made of lead with steel penetrator and a solid jacket made of copper with a weight of up to 4.0g and a bullet velocity of up to 950m/s, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 20mm to 100mm.

38. Use according to claim 37, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 24mm to 80mm.

39. Use according to claim 37 or claim 38, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 28mm to 60mm.

40. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, for complete absorption of pointed bullets having a soft core made of lead with steel penetrator and a solid jacket made of copper with a weight of up to 4.0g and a bullet velocity of up to 950m/s, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 25mm to 100mm.

41. Use according to claim 40, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 31mm to 80mm.

42. Use according to claim 40 or claim 41, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 37mm to 60mm.

43. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, for complete absorption of pointed bullets having a soft core

made of lead with steel penetrator and a solid jacket made of copper with a weight of up to 4.0g and a bullet velocity of up to 950m/s, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 32mm to 100mm.

44. Use according to claim 43, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 36mm to 80mm.

45. Use according to claim 43 or claim 44, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 40mm to 60mm.

46. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, for complete absorption of bullets having a kinetic energy of up to 1510J, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 16mm to 100mm.

47. Use according to claim 46, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 20mm to 70mm.

48. Use according to claim 46 or claim 47, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 24mm to 50mm.

49. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, for complete absorption of bullets having a kinetic energy of up to 1510J, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 20mm to 100mm.

50. Use according to claim 49, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 25mm to 70mm.

51. Use according to claim 49 or claim 50, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 30mm to 50mm.

52. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, for complete absorption of bullets having a kinetic energy of up to 1510J, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 25mm to 100mm.

53. Use according to claim 52, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 28mm to 70mm.

54. Use according to claim 52 or claim 53, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 36mm to 50mm.

55. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with

respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, for complete absorption of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a weight of up to 15.6g and a bullet velocity of up to 440m/s, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 16mm to 100mm.

56. Use according to claim 55, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 20mm to 70mm.

57. Use according to claim 55 or claim 56, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 24mm to 50mm.

58. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, for complete absorption of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a weight of up to 15.6g and a bullet velocity of up to 400m/s, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 20mm to 100mm.

59. Use according to claim 58, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets 25mm to 70mm.

60. Use according to claim 58 or claim 59, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 30mm to 50mm.

61. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, for complete absorption of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a weight of up to 15.6g and a bullet velocity of up to 440m/s, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 25mm to 100mm.

62. Use according to claim 61, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 28mm to 70mm.

63. Use according to claim 61 or claim 62, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 36mm to 50mm.

64. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, for complete absorption of bullets having a kinetic energy of up to 942.9J, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 12mm to 100mm.

65. Use according to claim 64, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 15mm to 60mm.

66. Use according to claim 64 or claim 65, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of from 18mm to 40mm.

67. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, for complete absorption of bullets having a kinetic energy of up to 942.9J, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 15mm to 100mm.

68. Use according to claim 67, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 19mm to 60mm.

69. Use according to claim 67 or claim 68, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 23mm to 40mm.

70. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, for complete absorption of bullets having a kinetic energy of up to 942.9J, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 20mm to 100mm.

71. Use according to claim 70, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 24mm to 60mm.

72. Use according to claim 70 or claim 71, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 28mm to 40mm.

73. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, for complete absorption of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a weight of up to 10.2g and a bullet velocity of up to 430m/s, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 12mm to 100mm.

74. Use according to claim 73, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 15mm to 60mm.

75. Use according to claim 73 or claim 74, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 18mm to 40mm.

76. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres

being coated with at least one layer of graphitised carbon, for complete absorption of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a weight of up to 10.2g and a bullet velocity of up to 430m/s, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 15mm to 100mm.

77. Use according to claim 76, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 19mm to 60mm.

78. Use according to claim 76 or claim 77, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 23mm to 40mm.

79. Use of elements made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, for complete absorption of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a weight of up to 10.2g and a bullet velocity of up to 430m/s, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 20mm to 100mm.

80. Use according to claim 79, when the elements have minimum thickness parallel to the direction of impact of the bullets of 24mm to 60mm.

81. Use according to claim 79 or claim 80, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 28mm to 40mm.

82. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 3272J wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5mm to 50mm.

83. Use according to claim 82, wherein the elements have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 40mm.

84. Use according to claim 82 or claim 83, wherein the elements have minimum thickness parallel to the direction of impact of the bullets of 8mm to 30mm.

85. Use according to any one of claims 82 to 84, wherein the woven fabric has a thickness of up to 15mm.

86. Use of a composite of an element made of a carbon fibre and/or graphite-fibre- reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 3272J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 50mm.

87. Use according to claim 86, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 7.5mm to 40mm.

88. Use according to claim 86, or claim 87, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 9mm to 30mm.

89. Use according to any one of claims 86, to 88, wherein the woven fabric has a thickness of up to 15mm.

90. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 3272J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 8mm to 50mm.

91. Use according to claim 90, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 10mm to 40mm.

92. Use according to claim 90 or claim 91, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 12mm to 30mm.

93. Use according to any one of claims 90 to 92, wherein the woven fabric has a thickness of up to 15mm.

94. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of pointed bullets having a soft core made of lead and a solid jacket made of steel with a weight of up to 9.5g and a bullet velocity of up to 830m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5mm to 50mm.

95. Use according to claim 94, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 40mm.

96. Use according to claim 94 or claim 95, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 8mm to 30mm.

97. Use according to any one of claims 94 to 96, wherein the woven fabric has a thickness of up to 15mm.

98. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of pointed bullets having a soft core made of lead and a solid jacket made of steel with

a weight of up to 9.5g and a bullet velocity of up to 830m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 50mm.

99. Use according to claim 98, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 7.5mm to 40mm.

100. Use according to claim 98 or claim 99, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 9mm to 30mm.

101. Use according to any one of claims 98 to 100, wherein the woven fabric has a thickness of up to 15mm.

102. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, with a woven fabric of reinforcing fibres which element and which woven fabric are connected to each other with an adhesive, for complete absorption of pointed bullets having a soft core made of lead and a solid jacket made of steel with a weight of up to 9.5g and a bullet velocity of up to 830m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 8mm to 50mm.

103. Use according to claim 102, wherein the elements of the composite have a minimum thickness parallel to the direction of the impact of the bullets of 10mm to 40mm.

104. Use according to claim 102 or claim 103, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 12mm to 30mm.

105. Use according to any one of claims 102 to 104, wherein the woven fabric has a thickness of up to 15mm.

106. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 2105J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3.5mm to 50mm.

107. Use according to claim 106, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4.5mm to 40mm.

108. Use according to claim 106 or claim 107, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 7mm to 30mm.

109. Use according to any one of claims 106 to 108, wherein the woven fabric has a thickness of up to 15mm.

110. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, with a woven fabric of

reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 2105J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4mm to 50mm.

111. Use according to claim 110, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 40mm.

112. Use according to claim 110 or claim 111, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 8mm to 30mm.

113. Use according to any one of claims 110 to 112, wherein the woven fabric has a thickness of up to 15mm.

114. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 2105J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5.5mm to 50mm.

115. Use according to claim 114, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 7mm to 40mm.

116. Use according to claim 114 to 115, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 10mm to 30mm.

117. Use according to any one of claims 114 to 116, wherein the woven fabric has a thickness of up to 15mm.

118. Use of a composite of an element made of carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect of the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of cone point –head bullets having a soft core made of lead and a steel penetrator and a solid jacket made of copper with a weight of up to 7.9g and a bullet velocity of up to 730m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3.5mm to 50mm.

119. Use according to claim 118, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4.5mm to 40mm.

120. Use according to claim 118 or claim 119, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 7mm to 30mm.

121. Use according to any one of claims 118 to 120, wherein the woven fabric has a thickness of up to 15mm.

122. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the

composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of cone point –head bullets having a soft core made of lead and a steel penetrator and a solid jacket made of copper with a weight of up to 7.9g and a bullet velocity of up to 730m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4mm to 50mm.

123. Use according to claim 122, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 40mm.

124. Use according to claim 122 or claim 123, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 8mm to 30mm.

125. Use according to any one of claims 122 to 124, wherein the woven fabric has a thickness of up to 15mm.

126. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of cone point head bullets having a soft core made of lead and a steel penetrator and a solid jacket made of copper with a weight of up to 7.9g and a bullet velocity of up to 730m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5.5mm to 50mm.

127. Use according to claim 126, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 7mm to 40mm.

128. Use according to claim 126 or claim 127, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 10mm to 30mm.

129. Use according to any one of claims 126 to 128, wherein the woven fabric has a thickness of up to 15mm.

130. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 1805J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3mm to 50mm.

131. Use according to claim 130, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4mm to 40mm.

132. Use according to claim 130 or claim 131, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 30mm.

133. Use according to any one of claims 130 to 132, wherein the woven fabric has a thickness of up to 15mm.

134. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 1805J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3.6mm to 50mm.

135. Use according to claim 134, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5mm to 40mm.

136. Use according to claim 134 to 135, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 7mm to 30mm.

137. Use according to any one of claims 134 to 136, wherein the woven fabric has a thickness of up to 15mm.

138. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 1805J, wherein the elements of the composite have a minium thickness parallel to the direction of impact of the bullets of 4.8mm to 50mm.

139. Use according to claim 138, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 40mm.

140. Use according to claim 138 or claim 139, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 8mm to 30mm.

141. Use according to any one of claims 138 to 140, wherein the woven fabric has a thickness of up to 15mm.

142. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of pointed bullets having a soft core made of lead and a steel penetrator and a solid jacket made of copper with a weight of up to 4.0g and a bullet velocity of up to 950m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3mm to 50mm.

143. Use according to claim 142, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4mm to 40mm.

144. Use according to claim 142 or claim 143, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 30mm.

145. Use according to any one of claims 142 to 144, wherein the woven fabric has a thickness of up to 15mm.

146. Use of composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of pointed bullets having a soft core made of lead and a steel penetrator and a solid jacket made of copper with a weight of up to 4.0g and a bullet velocity of up to 950m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3.6mm to 50mm.

147. Use according to claim 146, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5mm to 40mm.

148. Use according to claim 146 or claim 147, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 7mm to 30mm.

149. Use according to any one of claims 146 to 148, wherein the woven fabric has a thickness of up to 15mm.

150. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of pointed bullets having a soft core made of lead and a steel penetrator and a solid jacket made of copper with a weight of up to 4.0g and a bullet velocity of up to 950m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4.8mm to 50mm.

151. Use according to claim 150, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 40mm.

152. Use according to claim 150 or claim 151, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 8mm to 30mm.

153. Use according to any one of claims 150 to 153, wherein the woven fabric has a thickness of up to 15mm.

154. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for

complete absorption of bullets having a kinetic energy of up to 1510J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 2.5mm to 40mm.

155. Use according to claim 154, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3mm to 30mm.

156. Use according to claim 154 to 155, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5.5mm to 25mm.

157. Use according to any one of claims 154 to 156, wherein the woven fabric has a thickness of up to 15mm.

158. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 1510J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3mm to 40mm.

159. Use according to claim 158, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4.5mm to 30mm.

160. Use according to claim 158 or claim 159, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6.5mm to 25mm.

161. Use according to any one of claims 158 to 160, wherein the woven fabric has a thickness of up to 15mm.

162. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 1510J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4mm to 40mm.

163. Use according to claim 162, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5.5mm to 30mm.

164. Use according to claim 162 or claim 163, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 7.5mm to 25mm.

165. Use according to any one of claims 162 to 164, wherein the woven fabric has a thickness of up to 15mm.

166. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for

complete absorption of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a weight of up to 15.6g and a bullet velocity of up to 440m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 2.5mm to 40mm.

167. Use according to claim 166, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3mm to 30mm.

168. Use according to claim 166 or claim 167, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5.5mm to 25mm.

169. Use according to any one of claims 166 to 168, wherein the woven fabric has a thickness of up to 15mm.

170. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a weight of up to 15.6g and a bullet velocity of up to 440m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3mm to 40mm.

171. Use according to claim 170, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4.5mm to 30mm.

172. Use according to claim 170 or claim 171, wherein the elements of the composite have a minimum thickness parallel to the direction of travel of the bullets of 6.5mm to 25mm.

173. Use according to any one of claims 170 to 172, wherein the woven fabric has a thickness of up to 15mm.

174. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of flat-headed bullets having a soft core made of lead and a solid jacket made of copper with a weight of up to 15.6g and a bullet velocity of up to 440m/s wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4mm to 40mm.

175. Use according to claim 174, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5.5mm to 30mm.

176. Use according to claim 174 to 175, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets 7.5mm to 25mm.

177. Use according to any one of claims 174 to 176, wherein the woven fabric has a thickness of up to 15mm.

178. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the

composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 942.9J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 2mm to 30mm.

179. Use according to claim 178, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 2.5mm to 25mm.

180. Use according to claim 178 or claim 179, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4mm to 20mm.

181. Use according to any one of claims 178 to 180, wherein the woven fabric has a thickness of up to 15mm.

182. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 942.9J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 2.4mm to 30mm.

183. Use according to claim 182, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3.5mm to 25mm.

184. Use according to claim 182 or claim 183, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5mm to 20mm.

185. Use according to any one of claims 182 to 184, wherein the woven fabric has a thickness of up to 15mm.

186. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of bullets having a kinetic energy of up to 942.9J, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3.2mm to 30mm.

187. Use according to claim 186, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4.5mm to 25mm.

188. Use according to claim 186 or claim 187, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 20mm.

189. Use according to any one of claims 186 to 188, wherein the woven fabric has a thickness of up to 15mm.

190. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 65 to 75wt% silicon carbide, 15 to 25wt% carbon and 5 to 15wt% silicon with respect to the total weight of the composite material, with the fibre portion of the

composite material being 10 to 20wt% of the total weight, the average fibre length of the reinforcing fibres 1 to 2mm, and the fibres being coated with at least three layers of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a weight of up to 10.2g and a bullet velocity of up to 430m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 2mm to 30mm.

191. Use according to claim 190, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 2.5mm to 25mm.

192. Use according to claim 190 or claim 191, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4mm to 20mm.

193. Use according to any one of claims 190 to 192, wherein the woven fabric has a thickness of up to 15mm.

194. Use of a composite of an element made of a carbon fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 55 to 80wt% silicon carbide, 10 to 40wt% carbon and 2 to 20wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 8 to 30wt% of the total weight, the average fibre length of the reinforcing fibres 0.5 to 5mm, and the fibres being coated with at least one layer of graphitised carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a weight of up to 10.2g and a bullet velocity of up to 430m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 2.4mm to 30mm.

195. Use according to claim 194, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3.5mm to 25mm.

196. Use according to claim 194 or claim 195, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 5mm to 20mm.

197. Use according to any one of claims 194 to 196, wherein the woven fabric has a thickness of up to 15mm.

198. Use of a composite of an element made of a carbon-fibre and/or graphite-fibre-reinforced composite material with ceramic matrix, containing 40 to 85wt% silicon carbide, 5 to 55wt% carbon and 0 to 30wt% silicon with respect to the total weight of the composite material, with the fibre portion of the composite material being 5 to 40wt% of the total weight, the average fibre length of the reinforcing fibres 0.2 to 15mm, and the fibres being coated with at least one layer of carbon, with a woven fabric of reinforcing fibres, which element and which woven fabric are connected to each other with an adhesive, for complete absorption of cone point-head bullets having a soft core made of lead and a solid jacket made of steel with a weight of up to 10.2g and a bullet velocity of up to 430m/s, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 3.2mm to 30mm.

199. Use according to claim 198, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 4.5mm to 25mm.

200. Use according to claim 198 or claim 199, wherein the elements of the composite have a minimum thickness parallel to the direction of impact of the bullets of 6mm to 20mm.

201. Use according to any one of claims 198 to 200, wherein the woven fabric has a thickness of up to 15mm.

202. Use of elements or composites in accordance with any one of claims 28 to 201, wherein the loading takes place by means of projectiles of any kind.

203. Use of elements or composites in accordance with any one of claims 28 to 201, wherein the elements or composites are used as armour plates.

204. Use of elements or composites in accordance with any one of claims 28 to 201, wherein the elements or composites are in the form of a structural component.

205. Use of elements or composites in accordance with any one of claims 203 or claim 204, for armouring in the construction of vehicles.

206. Use of elements or composites in accordance with any one of claims 203 or claim 204, for armouring in civil and military vehicles construction.

207. Use of elements or composites in accordance with any one of claims 204 to 206, for armouring of automobiles, military vehicles, aeroplanes, helicopters, ships, railway vehicles or stationary objects.

208. Use according to claim 207, wherein the military vehicle is a tank.

209. Use according to claim 207, wherein the stationary objects are buildings or safes.

210. Use of elements or composites in accordance with any one of claims 28 to 201, in protective vests.

211. Use of elements in accordance with any one of claims 28 to 201, for the protection of spacecraft against projectiles of any kind.

212. Use of composites in accordance with any one of claims 28 to 211, the backing consisting of woven fabrics made of fibres, or metal plates.

213. Use according to claim 212, wherein the fibres are aramide fibre.

214. Use of elements as composites for partial or complete absorption of at least one impact-like load focussed at a point, substantially as hereinbefore described with reference to any one of the examples.

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