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(54) **A PACKAGE OF EXPLOSIVE PRODUCTS WITH IMPROVED RESISTANCE TO THE TRANSMISSION OF DETONATION, A SINGLE PROTECTIVE ELEMENT AND A COLLECTIVE PROTECTIVE ELEMENT FOR THIS PACKAGE**

PACKUNG VON EXPLOSIVEN PRODUKTEN MIT VERBESSERTEM WIDERSTAND GEGEN DIE ÜBERTRAGUNG VON DETONATION, EINZELNES SCHUTZELEMENT UND KOLLEKTIVES SCHUTZELEMENT FÜR DIESE PACKUNG

EMBALLAGE DE PRODUITS EXPLOSIFS AVEC UNE RÉSISTANCE AMÉLIORÉE À LA TRANSMISSION DE LA DÉTONATION, ÉLÉMENT PROTECTEUR INDIVIDUEL ET ÉLÉMENT PROTECTEUR COLLECTIF POUR CET EMBALLAGE

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Description

Field of the Invention

[0001] The invention deals with packing of explosives as e.g. electric, non-electric and laborated detonators, primers or cartridge explosives, namely packing in packages used for transport. In particular, it deals with storing of explosive in protective means the task of which is to prevent transfer of detonation to the adjacent explosives found in this package, thus preventing transfer of detonation not only between explosives packed in the same package, but between individual packages as well.

Background of the Invention

[0002] Electric, non-electric and laborated detonators, primers, cartridge explosives and similar explosive products are packed in transport packages that do not sufficiently prevent transfer of detonation within a package and between adjacent packages. In case of undesired initiation of the explosive in a package the detonating wave or products of the explosive in the package where the explosive is stored produce an effect on adjacent explosives. In such a case a mass explosion of the package and subsequently of the whole load may occur. Although a detonator protector according to WO 95/19539 is known, it does not provide sufficient protection and variability, especially when various dimensions of the whole package is needed.

Summary of the Invention

[0003] The above mentioned disadvantages are substantially reduced and increased resistance against the transfer of detonation in case of accidental initiation of the explosive when more explosive products are stored in one package is achieved, in accordance with the presented invention, with a package of explosive products with improved resistance to transmission of detonation, designed as a system containing at least one packing unit, stored in a protective and/or transport package. According to the invention, each of the packing units consists of at least two protective elements and at least two explosive products where at least some protective elements each contain at least one explosive product while the protective elements are designed as central bushings that are equipped on their outer surface with spacing protrusions that have, at least on their outer parts, a bend and/or extension, and/or are equipped with at least one transversal surface to create and/or maintain air gaps around the central bushings of the protective elements in the packing units in this package and at the same time to shield free propagation of pressure and/or to shield the movement of splinters from the central bushing or between the central bushings towards the other explosive products stored in this package and/or in its vicinity, the central bushing of each protective element being, with

regard to the shape of the explosive product or explosive products, adapted on at least a part of its inner surface in such a way that it tightly fits the explosive product or explosive products, , whereby the protective element on its outer surface is always equipped with at least two spacing protrusions terminated at their free ends with a part of a connecting lock designed for the connection with the corresponding part of the connecting lock of another protective element.

[0004] It is advantageous when the protective element is equipped with at least two spacing protrusions designed as shielding ribs, designed for attenuation of all manifestations of detonation of the impact wave type or the type of kinetic energy of the resulting splinters and for prevention of transmission of detonation to an adjacent explosive product or explosive products. The advantages of this way of packing are manifested most significantly if the explosive products are selected from the range: initiators containing an explosive, primer cartridges and cartridge explosives. The protective elements in this packing are beneficially created as single protective elements and/or collective protective elements. To create the required shape of the packing unit you can combine single and collective protective elements. It is especially advantageous if in each protective element just one explosive product is stored. However, generally it is possible, within the presented design, to select alternatives when in one protective element two and more explosive products are stored that will individually have a lower detonation capacity. You can also select an alternative that in some protective elements no explosive product will be stored, which will increase the distances between the explosive products in the whole package and you will be able to use the same protective elements to create a package with explosive products with a higher detonation capacity. The single protective element is advantageously designed in such a way that the distance protrusions of its central bushing are adapted to maintain a higher mutual distance of the explosive products than the distance corresponding to the possibility of free transmission of detonation. One of alternative beneficial designs is such a design where the central bushing of the single protective element is always equipped with four to eight spacing protrusions designed as shielding ribs, adapted to attenuate all manifestations of detonation of the impact wave type or the type of kinetic energy of the resulting splinters and to prevent the transmission of the detonation to the adjacent explosive product or explosive products where the adaptation for attenuation of detonation manifestations consists in creating transversal surfaces at the ends of the shielding ribs and at the same time the single protective element is reinforced to maintain the mutual distance from the adjacent explosive products is such a way that the ends of all the spacing protrusions are interconnected with a perimeter ring. In another alternative it is advantageous if the central bushing of the single protective element is always equipped with eight spacing protrusions, distributed evenly along the perim-

eter of the central bushing where the first four spacing protrusions are terminated at their free ends with the part of the connecting lock adapted for the connection with the corresponding part of the connecting lock of another protective element and the other four spacing protrusions arranged in the intermediate positions with regard to the first four spacing protrusions are designed as shielding ribs adapted to attenuate all manifestations of detonation of the impact wave type or the type of kinetic energy of the resulting splinters where the adaptation for attenuating detonation manifestations and preventing detonation transmission consists in the creation of transversal surfaces at the ends of these shielding ribs. It may also be advantageous if at least some spacing protrusions of the central bushing of the single protective element are designed as parts of the connecting locks of individual protective elements for connection in higher groups and at the same time as braces resistant to the radial pressure to prevent mutual approximation of the explosive products to the distance that would enable free transmission of detonation. It is further beneficial if an alternative is created where the spacing protrusions terminated at their free ends with a part of the connecting lock adapted from the connection with the corresponding part of the connection lock of another protective element have their free ends adapted as the parts of the connecting lock created at the same time as an extension with the shape of a shield designed to attenuate all manifestations of detonation of the impact wave type or the type of kinetic energy of resulting splinters and to prevent the transmission of detonation to the adjacent explosive product or explosive products. In still another alternative it is advantageous if the spacing protrusions terminated always at their free end with a part of the connecting lock adapted for the connection with the corresponding part of the connecting lock of another protective element have their first free ends adapted as parts of the connecting lock created always on the first protective element as a cylinder and their second free ends created on the second protective element as a cylindrical bushing with an axial cut-out parallel to the extension's longitudinal axis where the axial bushing is adapted for axial insertion of the extension with the cylindrical shape into the above mentioned extension with the shape of a cylindrical bushing of the first free end. This way a simple connecting lock is created for connecting protective elements in groups where one protective element always has the opposite parts of the connecting elements against each other, arranged on the opposite sides with regard to the protective bushing, allowing you to extend the group of protective elements arbitrarily to create packages with various dimensions. In all the alternatives of the single protective element it is advantageous if the inner surface of the central bushing of the protective element is equipped with grooves, namely axially arranged grooves where the area of the cross section of the grooves from the central transversal plane of the bushing towards its open end, adjusted for introducing the explosive product, does not change or

increases from the central transversal plane of the bushing towards its open end, adjusted for introducing the explosive product. Such an arrangement supports reliable storage of explosive products in the protective bushings without the axial hole of the central bushing where the explosive product is inserted having to be produced with exceptional preciseness and additionally, this design enables exhaust of combustion products in case of unwanted detonation, namely through direct channels the cross section of which may beneficially increase towards the outlet of the hole of this central bushing, what means towards the open end of the bushing, and moreover these combustion products and the related pressure wave are directed outside the position of the other explosive products in the packing. Further, for all the alternatives of the described single protective elements it is advantageous if these protective elements are made from plastic from the polymer or copolymer group with a high impact strength while from this group plastic substances of the polyethylene, polypropylene, polyamide, polystyrene or acrylonitrile-butadien-styrene type are especially suitable, most advantageously in such a modification where the plastic is selected from the range of plastic materials in an electrostatically conductive version. These materials both allow easy mass production and have good mechanical properties. Mainly using plastic in an electrostatically conductive design reduces the risk of accumulation of electric charge and subsequent discharge that could cause unwanted initiation of the explosive products. Still another principle is a collective protective element created with the use of at least two single protective elements described above where the principle is that each single protective element is equipped with at least one spacing protrusion treated at its end for a fixed non-dismountable connection with the end of a spacing protrusion of another single protective element while the collective protective element is created as a block where the single protective elements are attached with a mutual fixed and non-dismountable connection of the ends of their spacing protrusions. In the case of collective elements it is advantageous if the fixed and non-dismountable connection of two single elements in a collective element is created by gluing or welding or common moulding, e.g. for casting, injection or pressing, of more single protective elements in one piece or in one operation, with the creation of an interconnection bridge, always in the place of the ends of the opposite spacing protrusions of the single protective elements. It is mainly beneficial if the collective protective element is created in such a way that it consists of single protective elements, firmly connected in a direct line where the number of individual protective elements in this direct line is selected from the number of 5, 6, 10, or 12.

[0005] In such arrangements the explosive product is stored in the central bushing of the protective element that is generally beneficially made of a material with a high impact strength and individual protective elements equipped beneficially with spacing protrusions, generally

in the shape of shielding ribs ensure that possible impact wave is attenuated between neighbouring protective elements and possible splinters from the package of the entire explosive product are caught, namely by the creation of suitable deformation and catching zones and by the creation of multiple transitions from an environment to another environment, which prevents, with the selection of adequately dimensioned thicknesses of the walls of the protective elements and adequately dimensioned distances between the central bushing, direct propagation of the impact wave. In other words, the catching and deformation zones of the protective elements consist of structures with the function of shielding ribs, shaped and positioned in such a way as to disperse and attenuate the impact wave to the maximum possible way in case of an explosion in the neighbouring protective element while the mass of the protective element is able eliminate a possible splinter effect. The structures with the shielding rib function may be further formed to the shape of connecting locks, so they can be subsequently used to form larger wholes of these partial protective elements designed as single or collective elements. Their original shielding function is always maintained. The protrusions of the central bushings also fulfil the function of spacing structures, i.e. elements maintaining mutual distances between the above mentioned central bushings ensuring a safe distance for the particular quantity and type of the packed explosive or stored explosive products.

Brief Description of the drawings

[0006] The invention is further described in a more detailed way with the use of sample versions, also with the use of attached drawings where fig. 1 shows the ground plan of a single protective element with a detonator, without connecting locks, fig. 2 presents the side view of the same protective element with a detonator, fig. 3 shows the ground plan of the same single protective element, this time without detonators, namely with the packing unit in a transport package, fig. 4 shows the ground plan of a single protective element with connecting locks in accordance with the invention and without a detonator, fig. 5 presents the same single protective element with connection locks and without a detonator, this time in a side view from the left, fig. 6 similarly shows the simple protective element with connecting locks and without a detonator, this time in a side view from the right while fig. 7 presents a collective protective element with connection locks as a ground plan and fig. 8 shows the ground plan of a collective protective element consisting of three collective protective elements each consisting of five single protective elements connected in a fixed and non-dismountable way.

Description of the Preferred Embodiments

[0007] The package in the sample version is created as a system containing a packing unit 10 stored in a trans-

port package 100 where in this system in the version in accordance with fig. 3 the packing unit 10 consists of twelve single protective elements 1 and of twelve explosive products 4 where each explosive product 4 is inserted in one single protective element 1. To make the description clearer the explosive products 4 for this alternative are only shown in figs. 1 and 2. The single protective elements 1 in this version are designed as individually created and without connecting locks. This protective element (1) is merely an example, not in accordance with the invention. The single protective elements 1 are designed here as central bushings 11 that are equipped on their outer surface with spacing protrusions 12 while the outer parts of the spacing protrusions 12 are equipped with one transversal surface 121 each. Along the perimeter of this single protective element 1 a peripheral ring 123 has been created in addition. The spacing protrusions 12 are designed here as shielding ribs adapted to attenuate all manifestation of detonation of the impact wave type or the type of kinetic energy of resulting splinters and to prevent transmission of the detonation to the adjacent explosive product 4 or explosive products 4 while the shielding effect is achieved mainly thanks to the transversal surfaces 121 at the ends of the spacing protrusions 12 designed as shielding ribs in this case. In the second and third version, in accordance with the invention, with the connection locks 5 shown in figs 4 to 8 the single protective elements 2 as well as the collective protective elements 3 are equipped with a central bushing 21 or 31 and four spacing protrusions 22 or 32 with an extension 2221 and 2222, or 3221 and 3222 on the bushing with the function of a connecting lock 5 and further on the outer parts of the other four spacing protrusions 22 or 32 they always have one transversal surface 221 or 321 as shown in the same sample version, in the alternatives presented in figs. 4 to 8. In all the alternatives these extensions, 2221, 2222, 3221, 3222 or transversally arranged surfaces 121, 221, 321 are situated at the ends of the spacing protrusions 12, 22, 32 to create air gaps around the central bushings 11, 21, 31 of the protective elements 1, 2, 3 in the packing units 10 in this package and at the same time to prevent free propagation of pressure and to hinder the movement of splinters from the central bushing 11, 21, 31 or between the central bushings 11, 21, 31 towards the other explosive products 4 stored in this package or its vicinity. The function of the transversal surfaces 221, 321 in the second and third version is the same as the function of the transversal surface 121 in the first version. In this sample version electric detonators are selected as the explosive products 4. The protective elements in the first and second version are designed as single protective elements 1, 2 as shown in figs. 1 to 6 and in the third version the protective elements are designed as collective protective elements 3 as shown in figs. 7 and 8. To create the required shape of the packing unit 10 you can combine single protective elements 1, 2 and collective protective elements 3 and compose packing units 10 either by freely inserting the

protective elements 1 into the transport package 100 or by putting the packing unit 10 into the transport package 100 in the form of an interconnected block created with a mutual connection of single protective elements 2 and collective protective elements 3 with the use of connecting locks 5. In these cases the protective elements 1,2,3 are adapted for storing one explosive product 4 each. In each single protective element 1 designed in this first version without connecting locks 5 just one explosive product 4 is inserted, only in fig. 3 the explosive products 4 are not shown. In the second and third version no explosive products 4 are inserted in the protective elements 2 and 3 as shown in figs 4 to 8. The single protective element 1 of the packing unit 10 for the packing of explosive products 4 is designed in such a way here that the central bushing 11 of the single protective elements 1 is, with regard to the shape of the explosive product 4 adapted on its inner surface in such a way that it tightly fits the explosive product 4 as shown in fig. 1. Each single as well as collective protective element 1,2,3 is designed in such a way that the spacing protrusions 12,22,32 of its central bushing 11,21,31 are adapted to maintain a higher mutual distance of the explosive products 4 than the distance corresponding to the possibility of free transmission of detonation. This is a figure that is determined in advance for each explosive product 4 and the corresponding distance is created with the use of the protective elements 4 in accordance with this figure. In the first version of this sample design shown in figs. 1, 2 and 3 there is also an adaptation for reinforcing this single protective element 1 and for maintaining a mutual distance from the adjacent explosive products 4 consisting in the fact that the ends of all the spacing protrusions 12 are interconnected with a perimeter ring 123 as mentioned above. In all the presented versions the spacing protrusions 12,22,32 of the central bushing 11,21,31 of the protective elements 1,2,3 are designed as braces resistant to the axial pressure to prevent mutual approximation of the explosive products 4 to a distance that would allow free transmission of detonation. Protective elements 1,2,3 designed this way keep their shape ensuring a safe mutual distance between the explosive products 4 even in a situation when during insertion of the packing unit 10 in the transport package 100 or removing from the transport package 100 or during transport or even in case of unwanted initiation of the explosive product 4 lateral compression of the protective element 1,2,3 occurs.

[0008] The versions shown in figs. 4 to 8 where the spacing protrusions 22,32 terminated at their free ends with parts of a connecting lock 5 adapted for the connection with the corresponding part of the connection lock 5 of another protective element 2,3 have their free ends adapted as the parts of the connecting lock 5 designed at the same time as an extension 2221,2222,3221,3222, namely in the shape of a shield or working as a shield to attenuate all manifestations of detonation of the impact wave type or the type of kinetic: energy of the resulting splinters and to prevent transmission of detonation to an

adjacent explosive product 4 or explosive products 4. At the same time in these versions the first free ends of the spacing protrusions 22,32 designed as parts of the connection lock 5 are always designed on the first of the relevant couple of the protective elements 2,3 as an extension 2221 or 3221 with the shape of a cylinder, coaxial with the longitudinal axis of the central bushing 21 or 31 while their other ends created on the other of the relevant couple of protective elements 2,3 are always designed as an extension 2222 or 3222 with the shape of a cylindrical bushing equipped with an axial cut-out 22221 or 32221 and adapted for axial insertion of the extension 2221 or 3221 with the cylindrical shape into the above mentioned extension 2222 or 3222 with the shape of a cylindrical bushing. This way a simple structure of connection locks 5 for the connection of the protective elements 2,3 in groups is created where thanks to the installation of opposite parts of the connection locks 5 on one protective element 2,3 against each other on the opposite sides with regard to the central bushing 21 or 31 you can extend the group of protective elements 2,3 arbitrarily and create packages of variable dimensions. In the first version of the single protective element 1 shown in figs 1, 2 and 3 the surface of the hole of the central bushing 11 of the single protective element 1 is equipped with axially arranged grooves 13 where the area of the cross section of the grooves does not change from the central transversal plane of the hole towards the hole outlet. Such an arrangement supports reliable storage of explosive products 4 in the protective elements 1 without the axial hole of the central bushing 11 where the explosive product 4 is inserted having to be produced with exceptional preciseness and additionally, this design enables exhaust of combustion products in case of unwanted detonation, namely through direct channels the cross section of which may beneficially increase towards the outlet of the hole of this central bushing 11 and moreover these combustion products and the related pressure wave are directed outside the position of the other explosive products 4 in the package. Such a design with grooves 13 is generally possible in the second and third version as well, but in this sample design the grooves 13 are only created in the first version and shown in fig. 3 only.

[0009] Further, as the material for the production of all the three displayed versions of the protective elements 1,2,3 plastic from the polymer or copolymer group with a high impact strength has been selected while in this particular case polyethylene in an electrostatically conductive design is used. This material allows easy mass production and has good mechanical properties as well. Mainly using plastic in an electrostatically conductive design reduced the risk of accumulation of electric charge and subsequent occurrence of a discharge, which could cause unwanted initiation of the explosive product. In the third version in fig. 7 a collective protective element 3 is shown that is made with the use of five single protective elements 2 described above. In this case each such sin-

gle protective element 2 has two spacing elements 22 the ends of which are adapted for fixed, non-dismountable connection with the end of the spacing protrusion 22 of another single protective element 2 while the collective protective element 3 is designed as a block where the single protected elements 2 are interconnected with a fixed and non-dismountable connection of the ends of their spacing protrusions 22. In the case of the collective elements 3 the fixed and non-dismountable connection of two single protective elements 2 in the collective element 3 is created by common moulding for the injection production of more single protective elements 2 in one piece or in one operation with the creation of an interconnecting bridge 6 in the place of the ends of the opposite spacing protrusions 22 of the single protective elements 2. The collective protective element 3 is designed in such a way that it consists of individual protective elements 2 firmly connected in a direct line 101 where the selected number of individual protective elements 2 in this direct line 101 is five. In other advantageous alternatives, not shown here, the selected number of individual protective elements 2 in such a direct line 101 may be 6, 10 or 12, which brings a certain advantage when composing the packing unit 10, which may be created with the numbers of the protective elements 2 in multiples of five or ten or alternatively in multiples of six or twelve for regions where packing in dozens or their parts or multiples is common. [0010] The versions described above were tested in the testing facility with the use of the following samples.

Sample 1

[0011] Individual explosive products were designed as electric detonators and were inserted in separate protective elements as shown in figs. 1 and 2 and further they were put in the required quantity of twelve pieces in a standard transport package as shown in fig. 3. The test confirmed that this way transmission of detonation between the detonators in the package was prevented and the package complied with the requirements for classification in the group without the risk of detonation transmission.

Sample 2

[0012] Individual explosive products, designed here as non-electric detonators were inserted, one piece at a time, in a five-part bundle or rather a collective protective element, in particular they were inserted in the central bushings of this five-part collective protective element the design of which is shown in fig. 7. These protective elements were further put in the required quantity in common transport packages. The results of the tests showed in this case as well that the transmission of detonation between the detonators in the package was prevented and the package complied with the requirements for classification in the group without the risk of detonation transmission.

Sample 3

[0013] Explosive products designed here as laborated detonators were inserted, one piece at a time, to one of the central bushings of each of the collective protective elements and these collective elements created as fixed and non-dismountable groups of five individual protective elements were composed by interconnection in the connection locks in a thirty-part block forming the packing unit shown in fig. 8. The whole created this way was put in a common transport package. The test confirmed here that the transmission of detonation between the detonators was prevented here too and that the package as a whole complied with the requirements for classification in the group without the risk of detonation transmission.

Industrial applicability

[0014] The packing based on the presented invention can mainly be used for safe transport of all types of initiators, primers and cartridge explosives that in the case of common packing face the risk of the transmission of detonation in case of accidental ignition with subsequent endangering of property and lives of people. The presented package can be analogously used for other similar explosive products, primarily with similar detonation characteristics.

Claims

1. Packing unit (10), for use in a package of explosive products with improved resistance to transmission of detonation, consisting of at least two protective elements (2,3) and at least two explosive products (4) where at least some protective elements (2,3) each contain at least one explosive product (4) while the protective elements (2,3) are designed as central bushings (21,31) that are equipped on their outer surface with spacing protrusions (22,32) that have, at least on their outer parts, a bend and/or extension (2221,2222,3221,3222), and/or are equipped with at least one transversal surface (221,321) to create and/or maintain air gaps around the central bushings (21,31) of the protective elements (2, 3) in the packing unit (10) and at the same time to shield free propagation of pressure and/or to shield the movement of splinters from the central bushing (21,31) or between the central bushings (21,31) towards the other explosive products (4) stored in this packing unit (10) and/or in its vicinity, the central bushing (21) of each protective element (2) being, with regard to the shape of the explosive product (4) or explosive products (4), adapted on at least a part of its inner surface in such a way that it tightly fits the explosive product (4) or explosive products (4) **characterized in that** the protective element (2,3) on its outer surface is always equipped with at least two spacing protrusions.

sions (22) terminated at their free ends with a part of a connecting lock (5) designed for the connection with the corresponding part of the connecting lock (5) of another protective element (2).

2. Packing unit according to claim 1, **characterized in that** the protective element (2,3) is equipped with at least two spacing protrusions (22) designed as shielding ribs, designed for attenuation of all manifestations of detonation of the impact wave type or the type of kinetic energy of the resulting splinters and for prevention of transmission of detonation to an adjacent explosive product (4) or explosive products (4).
3. Packing unit according to claim 1 or 2, **characterized in that** the explosive products (4) are selected from the range of initiators containing an explosive, primes, and cartridge explosives.
4. Packing unit according to any of claims 1 to 3, **characterized in that** the protective elements contained in this package are designed as single protective elements (2) or collective protective elements (3).
5. Packing unit according to any of claims 1 to 4, **characterized in that** in each protective element (2, 3) one explosive product (4) is stored.
6. Packing unit according to any of claims 1 to 5, **characterized in that** the distance protrusions (22) of the central bushing (21) are designed to maintain such a mutual distance of the explosive products (4) that is higher than the distance corresponding to the possibility of free transmission of detonation.
7. Packing unit according to claim 6, **characterized in that** the central bushing (21) of the single protective element (2) is always equipped with four to eight spacing protrusions (22) designed as shielding ribs adapted to attenuate all manifestations of detonation of the impact wave type or the type of kinetic energy of the resulting splinters and to prevent the transmission of detonation manifestations to an adjacent explosive product or explosive products where the adaptation for attenuation of detonation manifestations and the prevention of detonation transmission consists in the creation of transversal surfaces (221) at the ends of the shielding ribs and at the same there is an adaptation to reinforce the single protective element (2) and to keep the mutual distance of the adjacent explosive products (4) consisting in the fact that the ends of all the spacing protrusions (22) are interconnected with a perimeter ring (123).
8. Packing unit according to claim 6, **characterized in that** the central bushing (21) of the single protective element (2) is always equipped with eight spacing

protrusions (22), evenly distributed along the perimeter of the central bushing (21) where the first four spacing protrusions (22) are terminated at their free ends with a part of the connecting lock (5) adapted for the connection with the corresponding part of the connecting lock (5) of another protective element (2) and the other spacing protrusions (22) arranged in the intermediate positions with regard to the first four spacing protrusions (22) are designed as shielding ribs adapted to attenuate all manifestations of detonation of the impact wave type or the type of kinetic energy of the resulting splinters and to prevent the transmission of detonation manifestations to an adjacent explosive product (4) or explosive products (4) where the adaptation for attenuation of detonation manifestations and the prevention of detonation transmission consists in the creation of transversal surfaces (221) at the ends of these spacing protrusions (22) designed as shielding ribs.

9. Packing unit according to claim 6, **characterized in that** at least some spacing protrusions (22) of the central bushing (21) of the single protective elements (2) are designed as parts of the connecting locks (5) of the single protective elements (2) for the connection into larger wholes and at the same time act as braces resistant to the radial pressure to prevent mutual approximation of the explosive products (4) to a distance that would allow free transmission of detonation.
10. Packing unit according to claims 7, 8 and 9, **characterized in that** the spacing protrusions (22) terminated at their free ends with parts of the connection lock (5) adapted for the connection with the corresponding part of the connecting lock (5) of another protective element (2) have their free ends adapted as the parts of the connecting lock (5) designed at the same time as extensions with the shape of a shield to attenuate all manifestations of detonation of the impact wave type or the type of kinetic energy of resulting splinters and to prevent transmission of detonation to an adjacent explosive product (4) or explosive products (4).
11. Packing unit according to claims 6, 8 and 9, **characterized in that** the first free ends of the spacing protrusions (22, 32) adapted as parts of the connecting lock (5) are always created on the first of the relevant couple of protective elements (2, 3), namely as an extension (2221), or (3221) with the shape of a cylinder, parallel with the longitudinal axis of the central bushing (21) or (31) while the other free ends created on the other of the relevant couple of the protective elements (2,3) are always designed as an extension (2222) or (3222) with the shape of a cylindrical bushing equipped with an cut-out (22221) or (32221) parallel to the extension's longitudinal ax-

is and adapted for axial insertion of the extension (2221) or (3221) with the cylindrical shape into the above mentioned extension (2222) or (3222) with the shape of a cylindrical bushing.

12. Packing unit according to any of claims 6 to 11, **characterized in that** the inner surface of the central bushing (21) of the single protective element (2) is equipped with grooves (13) of the axial direction where the area of the transversal cross section of the grooves (13) does not change or increases from the central transversal plane of the bushing (21) towards its open end, adjusted for introducing the explosive product.
13. Packing unit according to any of claims 6 to 12, **characterized in that** the protective elements are made of plastic from the polymer or copolymer group with a high impact strength.
14. Packing unit according to claim 13, **characterized in that** the copolymer or polymer is a substance from the plastic group of the polyethylene, polypropylene, polyamide, polystyrene or acrylonitrile-butadienestyrene type.
15. Packing unit according to claim 13 or 14, **characterized in that** the plastic is selected from the range of material in the electrostatically conductive design.
16. Packing unit according to any claims 6-15, **characterized in that** it comprises a collective protective element (3) created with the use of at least two single protective elements (2), whereby at least one spacing protrusion (22) of each single protective element (2) is adapted at its end for fixed and non-dismountable connection with the end of the spacing protrusion (22) of another protective element (2) while the collective protective element (3) is created as a block where the single protective elements (2) are mutually connected in a fixed and non-dismountable way by joining of the ends of their spacing protrusions (22).
17. Packing unit according to claim 16, **characterized in that** the fixed and non-dismountable connection of each two single protective elements (2) in the collective protective element (3) is created by gluing or welding or common moulding of more single protective elements (2) with the creation of an interconnection bridge (6) in the place of the ends of the opposite spacing protrusions (22) of the single protective elements (2).
18. Packing unit according to claim 16 or 17, **characterized in that** the collective protective element (3) consists of single protective elements (2) firmly connected in a direct line (101) where the number of the single protective elements (2) in this direct line (101)

is selected from the number of 5, 6, 10, or 12.

19. A package of explosive products with improved resistance to transmission of detonation, comprising at least one packing unit (10) according to any of claims 1-18, stored in a protective and/or transport package (100).

10 Patentansprüche

1. Verpackungseinheit (10) zur Verwendung in einer Packung mit explosionsgefährlichen Produkten mit verbessertem Widerstand gegen die Detonationsübertragung, bestehend aus mindestens zwei Schutzelementen (2, 3) und mindestens zwei explosionsgefährlichen Produkten (4), wobei mindestens ein Schutzelement (2, 3) jeweils mindestens ein explosionsgefährliches Produkt (4) enthalten, während die Schutzelemente (2, 3) als Mittelbuchsen (21, 31) bestimmt sind, die auf ihrer Außenfläche mit abstandshaltenden Vorsprüngen (22, 32) versehen sind, die, zumindest auf ihren Außenteilen, eine Biegung und/oder Ausweitung besitzen (2221, 2222, 3221, 3222) und/oder mit mindestens einer transversalen Fläche (221, 321) ausgestattet sind, um Luftspalten um die Mittelbuchsen (21, 31) der Schutzelemente (2, 3) in der Verpackungseinheit (10) herum zu bilden und/oder zu halten und gleichzeitig die freie Ausbreitung von Druck abzuschirmen und/oder die Bewegung von Splittern von der Mittelbuchse (21, 31) oder zwischen den Mittelbuchsen (21, 31) zu den anderen explosionsgefährlichen Produkten (4), die in dieser Verpackungseinheit (10) oder deren Nähe untergebracht sind, abzuschirmen, wobei die Mittelbuchse (21) jedes Schutzelements (2) hinsichtlich der Form des explosionsgefährlichen Produkts (4) oder explosionsgefährlicher Produkte (4) auf mindestens einem Teil seiner Innenfläche so angepasst ist, dass sie eng an dem explosionsgefährlichen Produkt (4) oder explosionsgefährlichen Produkten (4) anliegt, **dadurch gekennzeichnet, dass** das Schutzelement (2, 3) auf seiner Außenfläche immer mit mindestens zwei abstandshaltenden Vorsprüngen (22) ausgestattet ist, die an ihren freien Enden mit einem Teil eines Verbindungsschlusses (5) begrenzt sind, das für die Verbindung mit dem zugehörigen Teil des Verbindungsschlusses (5) eines anderen Schutzelements (2) bestimmt ist.
2. Verpackungseinheit nach Anspruch 1, **dadurch gekennzeichnet, dass** das Schutzelement (2, 3) mit mindestens zwei abstandshaltenden Vorsprüngen (22) versehen ist, die als abschirmende Rippen bestimmt sind, die zur Abschwächung aller Erscheinungsformen von Detonation der jeweiligen Art der Welleneinwirkung oder der Art der kinetischen Energie der daraus hervorgehenden Splitter und zur

- Verhinderung der Detonationsübertragung auf ein angrenzendes explosionsgefährliches Produkt (4) oder explosionsgefährliche Produkte (4) bestimmt sind.
3. Verpackungseinheit nach den Ansprüchen 1 oder 2, **dadurch gekennzeichnet, dass** die explosionsgefährlichen Produkte (4) aus dem Bereich der Sprengkapseln gewählt werden, die einen Sprengstoff, Primes und patronierte Sprengstoffe enthalten. 5
 4. Verpackungseinheit nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die in diesem Packung enthaltenen Schutzelemente als einzelne Schutzelemente (2) oder als kollektive Schutzelemente (3) bestimmt sind. 10
 5. Verpackungseinheit nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** in jedem Schutzelement (2, 3) ein explosionsgefährliches Produkt gelagert ist. 15
 6. Verpackungseinheit nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** die abstandshaltenden Vorsprünge (22) der Mittelbuchse (21) zum Halten eines beiderseitigen Abstands zwischen den explosionsgefährlichen Produkte (4) bestimmt sind, der größer ist als der Abstand, der der Möglichkeit der freien Detonationsübertragung entspricht. 20
 7. Verpackungseinheit nach Anspruch 6, **dadurch gekennzeichnet, dass** die Mittelbuchse (21) des einzelnen Schutzelements (2) immer mit vier bis 8 abstandshaltenden Vorsprüngen (22) versehen ist, die als abschirmende Rippen bestimmt sind, die angepasst sind, um alle Erscheinungsformen von Detonation der jeweiligen Art der Welleneinwirkung oder der Art der kinetischen Energie der daraus hervorgehenden Splitter abzuschwächen und die Übertragung von Erscheinungsformen von Detonation auf ein angrenzendes explosionsgefährliches Produkt oder explosionsgefährliche Produkte zu verhindern, wobei die Anpassung für die Abschwächung von Erscheinungsformen der Detonation und die Verhinderung der Detonationsübertragung in der Bildung von transversalen Flächen (221) an den Enden der abschirmenden Rippen besteht und gleichzeitig eine Anpassung zur Verstärkung des einzelnen Schutzelements (2) und zum Halten des beidseitigen Abstands der angrenzenden explosionsgefährlichen Produkte (4) vorliegt, die in der Tatsache besteht, dass die Enden aller abstandshaltenden Vorsprünge (22) durch einen umfassenden Ring (123) miteinander verbunden sind. 25
 8. Verpackungseinheit nach Anspruch 6, **dadurch gekennzeichnet, dass** die Mittelbuchse (21) des einzelnen Schutzelements (2) immer mit acht abstandshaltenden Vorsprüngen (22) ausgestattet ist, die gleichmäßig entlang dem Umfang der Mittelbuchse (21) verteilt sind, wobei die ersten vier abstandshaltenden Vorsprünge (22) an ihren freien Enden mit einem Teil des Verbindungsschlusses (5) begrenzt sind, das für die Verbindung mit dem zugehörigen Teil des Verbindungsschlusses (5) eines anderen Schutzelements (2) angepasst ist und die anderen abstandshaltenden Vorsprünge (22), die in den Zwischenpositionen mit Bezug auf die ersten vier abstandshaltenden Vorsprünge (22) angeordnet sind, als abschirmende Rippen bestimmt sind, die angepasst sind, um alle Erscheinungsformen von Detonation der jeweiligen Art der Welleneinwirkung oder der Art der kinetischen Energie der daraus hervorgehenden Splitter abzuschwächen und die Übertragung von Erscheinungsformen von Detonation auf ein angrenzendes explosionsgefährliches Produkt (4) oder explosionsgefährliche Produkte (4) zu verhindern, wobei die Anpassung für die Abschwächung von Erscheinungsformen der Detonation und die Verhinderung der Detonationsübertragung in der Bildung von transversalen Flächen (221) an den Enden dieser abstandshaltenden Vorsprünge besteht, die als abschirmende Rippen bestimmt sind. 30
 9. Verpackungseinheit nach Anspruch 6, **dadurch gekennzeichnet, dass** mindestens einige abstandshaltenden Vorsprünge (22) der Mittelbuchse (21) der einzelnen Schutzelemente (2) als Teile der Verbindungsschlösser (5) der einzelnen Schutzelemente (2) für die Verbindung in größere Ganze bestimmt sind und gleichzeitig als Klammern funktionieren, die belastbar gegenüber dem Radialdruck sind, um beidseitige Näherung der explosionsgefährlichen Produkte (4) bis zu einer Entfernung verhindern, die die freie Übertragung von Detonation ermöglichen würde. 35
 10. Verpackungseinheit nach den Ansprüchen 7, 8 und 9, **dadurch gekennzeichnet, dass** die an ihren freien Enden mit Teilen des Verbindungsschlusses (5) beendeten abstandshaltenden Vorsprünge (22), die für die Verbindung mit dem zugehörigen Teil des Verbindungsschlusses (5) eines anderen Schutzelements (2) angepasst sind, ihre freien Enden als die Teile des Verbindungsschlusses (5) angepasst haben, die gleichzeitig als Verlängerungen mit der Form eines Schilds zur Abschwächung aller Erscheinungsformen von Detonation der jeweiligen Art der Welleneinwirkung oder der Art der kinetischen Energie der daraus hervorgehenden Splitter und zur Verhinderung der Übertragung von Detonation auf ein angrenzendes explosionsgefährliches Produkt (4) oder explosionsgefährliche Produkte (4) bestimmt sind. 40

11. Verpackungseinheit nach den Ansprüchen 6, 8 und 9, **dadurch gekennzeichnet, dass** die ersten freien Enden der abstandshaltenden Vorsprünge (22, 32), die als Teile des Verbindungsschlusses (5) angepasst sind, immer am ersten relevanten Paar von Schutzelementen (2, 3) gebildet sind, namentlich als eine Verlängerung (2221) oder (3221) mit der Form eines Zylinders, parallel zur Längsachse der Mittelbuchse (21) oder (31), während die anderen, an einem der anderen relevanten Paar der Schutzelemente (2, 3) gebildeten freien Enden immer als eine Verlängerung (2222) oder (3222) mit der Form einer mit einem Ausschnitt (22221) versehenen zylinderförmigen Buchse oder (32221) parallel zu der Längsachse der Verlängerung bestimmt und für die axiale Einfügung der Verlängerung (2221) oder (3221) mit der zylindrischen Form in die oben erwähnte Verlängerung (2222) oder (3222) mit der Form einer zylinderförmigen Buchse angepasst sind.
12. Verpackungseinheit nach einem der Ansprüche 6 bis 11, **dadurch gekennzeichnet, dass** die Innenfläche der Mittelbuchse (21) des einzelnen Schutzelements (2) mit Nuten (13) der Axialrichtung ausgestattet ist, wobei der Bereich des transversalen Querprofils der Nuten (13) sich von der mittleren Querebene der Buchse (21) sich in Richtung ihres offenen Endes, das für die Einführung des explosionsgefährlichen Produkts eingestellt ist, nicht verändert oder vergrößert.
13. Verpackungseinheit nach einem der Ansprüche 6 bis 12, **dadurch gekennzeichnet, dass** die Schutzelemente aus Kunststoff der Polymer- oder Copolymer-Gruppe mit einer hohen Kerbschlagfestigkeit hergestellt sind.
14. Verpackungseinheit nach Anspruch 13, **dadurch gekennzeichnet, dass** das Copolymer oder Polymer eine Substanz aus der Kunststoffgruppe des Typs Polyethylen, Polypropylen, Polyamid, Polystyrol oder Acrylnitril-Butadien-Styrol ist.
15. Verpackungseinheit nach Anspruch 13 oder 14, **dadurch gekennzeichnet, dass** der Kunststoff aus dem Materialbereich der elektrostatischen, leitfähigen Ausführung ausgewählt ist.
16. Verpackungseinheit nach einem der Ansprüche 6-15, **dadurch gekennzeichnet, dass** sie ein kollektives Schutzelement (3) enthält, das unter Verwendung von mindestens zwei einzelnen Schutzelementen (2) gebildet wurde, wobei mindestens ein abstandshaltender Vorsprung (22) jedes einzelnen Schutzelements (2) an seinem Ende für die feste und nicht-zerlegbare Verbindung mit dem Ende des abstandshaltenden Vorsprungs (22) eines anderen Schutzelements (2) angepasst ist, während das kol-

lektive Schutzelement (3) als ein Block gebildet ist, worin die einzelnen Schutzelemente (2) beiderseitig fest und nicht-zerlegbar durch Verbinden der Enden ihrer abstandshaltenden Vorsprünge (22) beiderseitig verbunden sind.

17. Verpackungseinheit nach Anspruch 16, **dadurch gekennzeichnet, dass** die feste und nicht-zerlegbare Verbindung von jeweils zwei einzelnen Schutzelementen (2) in dem kollektiven Schutzelement (3) durch Kleben oder Löten oder gängiges Formen weiterer einzelner Schutzelemente (2) mit der Erstellung einer Verbindungsbrücke (6) an der Stelle der Enden der gegenüberliegenden abstandshaltenden Vorsprünge (22) der einzelnen Schutzelemente (2) geschaffen wird.
18. Verpackungseinheit nach Anspruch 16 oder 17, **dadurch gekennzeichnet, dass** das kollektive Schutzelement (3) aus einzelnen Schutzelementen (2) besteht, die in Direktleitung (101) fest miteinander verbunden sind, wobei die Anzahl der einzelnen Schutzelemente (2) in dieser Direktleitung (101) aus der Anzahl von 5, 6, 10 oder 12 gewählt wird.
19. Eine Packung explosionsgefährlicher Produkte mit verbessertem Widerstand gegen die Detonationsübertragung, die mindestens eine Verpackungseinheit (10) nach einem der Ansprüche 1 - 18 enthält, die in einer Schutz- und/oder Transportverpackung (100) untergebracht ist.

Revendications

1. L'unité d'emballage (10) destinée à l'usage dans un paquet de produits explosifs avec une résistance accrue à la transmission de la détonation, consistant d'au moins deux éléments protecteurs (2,3) et d'au moins deux produits explosifs (4), où au moins certains éléments protecteurs (2,3) contiennent chacun au moins un produit explosif (4), les éléments protecteurs (2,3) étant conçus comme douilles centrales (21,31) équipées à leur surface extérieure de saillies d'espacement (22,32) munies, au moins sur leur parties extérieures, d'un pli et/ou d'une extension (2221,2222,3221,3222), et/ou équipées d'au moins une surface transversale (221,321) pour créer et/ou maintenir des poches d'air autour des douilles centrales (21,31) des éléments protecteurs (2,3) à l'intérieur de l'unité d'emballage (10) et d'empêcher en même temps la libre propagation de la pression et/ou le mouvement d'éclats depuis la douille centrale (21,31) ou entre les douilles centrales (21,31) en direction des autres produits explosifs (4) stockés dans cette unité d'emballage (10) et/ou dans ses environs, sachant que la douille centrale (21) de chaque élément protecteur (2) est adaptée, pour ce qui

est de la forme du produit explosif (4) ou des produits explosifs (4), sur au moins une partie de sa surface intérieure de sorte à être directement collée au produit explosif (4) ou aux produits explosifs (4) caractérisé par le fait que l'élément protecteur (2,3) est toujours muni sur sa surface extérieure d'au moins deux saillies d'espacement (22) avec, à leur extrémités libres, une partie du verrou de liaison (5) conçue pour être connectée avec la partie correspondante du verrou de liaison (5) d'un autre élément protecteur (2).

2. L'unité d'emballage correspondant à la revendication 1 **caractérisée par le fait que** l'élément protecteur (2,3) est équipé d'au moins deux saillies d'espacement (22) conçues comme des nervures de blindage servant à atténuer toute manifestation de la détonation liée à l'onde de choc ou à l'énergie cinétique des éclats créés et à empêcher la transmission de la détonation à un produit explosif (4) ou des produits explosifs (4) adjacents.
3. L'unité d'emballage correspondant aux revendications 1 ou 2 **caractérisée par le fait que** les produits explosifs (4) sont choisis dans une gamme d'initiateurs contenant un explosif, des amorces et des explosifs en cartouche.
4. L'unité d'emballage correspondant à l'une quelconque des revendications 1 à 3 **caractérisée par le fait que** les éléments protecteurs contenus dans cet emballage sont conçus comme des éléments protecteurs individuels (2) ou des éléments protecteurs collectifs (3).
5. L'unité d'emballage correspondant à l'une quelconque des revendications 1 à 4 **caractérisée par le fait que** chaque élément protecteur (2,3) permet de stocker un produit explosif (4).
6. L'unité d'emballage correspondant à l'une quelconque des revendications 1 à 5 **caractérisée par le fait que** les saillies d'écartement (22) de la douille centrale (21) sont conçues de façon à maintenir une distance entre les produits explosifs (4) supérieure à la distance permettant la libre transmission de la détonation.
7. L'unité d'emballage correspondant à la revendication 6 **caractérisée par le fait que** la douille centrale (21) d'un élément protecteur individuel (2) est toujours équipée de 4 à 8 saillies d'espacement (22) conçues comme des nervures de blindage servant à atténuer toute manifestation de la détonation liée à l'onde de choc ou à l'énergie cinétique des éclats créés et à empêcher la transmission des manifestations de la détonation à un produit explosif ou des produits explosifs adjacents, où l'adaptation visant à atténuer les manifestations de la détonation et à em-

pêcher la transmission de la détonation consiste en la création de surfaces transversales (221) aux extrémités des nervures de blindage et en même temps une adaptation est réalisée visant à renforcer l'élément protecteur individuel (2) et à maintenir la distance entre les produits explosifs adjacents (4) qui consiste en **le fait que** les extrémités de toutes les saillies d'espacement (22) sont jointes par un anneau périphérique (123).

8. L'unité d'emballage correspondant à la revendication 6 **caractérisée par le fait que** la douille centrale (21) de l'élément protecteur individuel (2) est toujours équipée de huit saillies d'espacement (22), réparties de façon régulière sur le périmètre de la douille centrale (21), les quatre premières saillies d'espacement (22) étant terminées à leurs extrémités libres avec une partie du verrou de liaison (5) permettant la connexion avec la partie correspondante du verrou de liaison (5) d'un autre élément protecteur (2) et les autres saillies d'espacement (22) placées en positions intermédiaires vis-à-vis des quatre premières saillies d'espacement étant conçues comme des nervures de blindage servant à atténuer toute manifestation de la détonation liée à l'onde de choc ou à l'énergie cinétique des éclats créés et à empêcher la transmission des manifestations de la détonation à un produit explosif (4) ou des produits explosifs (4) adjacents, où l'adaptation visant à atténuer les manifestations de la détonation et à empêcher la transmission de la détonation consiste en la création de surfaces transversales (221) aux extrémités de ces saillies d'espacement (22) conçues comme des nervures de blindage.
9. L'unité d'emballage correspondant à la revendication 6 **caractérisée par le fait qu'** au moins certaines saillies d'espacement (22) de la douille centrale (21) des éléments protecteurs individuels (2) sont conçues comme faisant partie des verrous de liaison (5) des éléments protecteurs individuels (2) permettant leur connexion pour créer des ensembles plus larges et fonctionnent en même temps comme des renforts pour augmenter la résistance à la pression radiale afin d'empêcher le rapprochement mutuel des produits explosifs (4) à une distance permettant une transmission libre de la détonation.
10. L'unité d'emballage correspondant aux revendications 7, 8 et 9 **caractérisée par le fait que** les extrémités libres des saillies d'espacement (22) munies d'une partie du verrou de liaison (5) permettant la connexion avec la partie correspondante du verrou de liaison (5) d'un autre élément protecteur, sont adaptées comme des parties d'un verrou de liaison (5) conçues en même temps comme des extensions dont la forme est celle d'un bouclier permettant d'atténuer toute manifestation de la détonation liée à

l'onde de choc ou à l'énergie cinétique des éclats créés et d'empêcher la transmission de la détonation à un produit explosif (4) ou des produits explosifs (4) adjacents.

11. L'unité d'emballage correspondant aux revendications 7, 8 et 9 **caractérisée par le fait que** les premières extrémités libres des saillies d'espacement (22, 32) adaptées comme faisant partie d'un verrou de liaison (5) sont toujours présentes sur le premier du couple concerné d'éléments protecteurs (2, 3), plus concrètement comme une extension (2221) ou (3221) d'une forme d'un cylindre parallèle à l'axe longitudinal de la douille centrale (21) ou (31), alors que les autres extrémités libres de l'autre élément protecteur (2, 3) de la paire concernée sont toujours conçues comme une extension (2222) ou (3222) d'une forme d'une douille cylindrique munie d'une encoche (22221) ou (32221) parallèle à l'axe longitudinal de l'extension et permettant une insertion axiale de l'extension (2221) ou (3221) de forme cylindrique dans l'extension (2222) ou (3222) de forme d'une douille cylindrique mentionnée ci-dessus.

12. L'unité d'emballage correspondant aux revendications 6 à 11, **caractérisée par le fait que** la surface intérieure de la douille centrale (21) de l'élément protecteur individuel (2) est équipée de rainures (13) d'une direction axiale où la section transversale des rainures ne varie pas ou augmente depuis le plan transversal central de la douille (21) dans le sens de son extrémité ouverte, permettant ainsi d'introduire le produit explosif.

13. L'unité d'emballage correspondant aux revendications 6 à 12, **caractérisée par le fait que** les éléments protecteurs sont faits en plastique du groupe polymère ou copolymère avec une résistance au choc élevée.

14. L'unité d'emballage correspondant à la revendication 13, **caractérisée par le fait qu'un** copolymère ou polymère est une substance du groupe des plastiques du type polyéthylène, polypropylène, polystyrène ou acrylonitrile-butadiène-styrène.

15. L'unité d'emballage correspondant aux revendications 13 ou 14 **caractérisée par le fait que** le plastique est sélectionné dans une gamme de matériaux **caractérisés par** leur conductivité électrostatique.

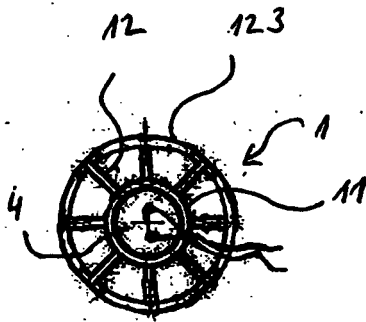
16. L'unité d'emballage correspondant aux revendications 6 à 15 **caractérisée par** le fait de comprendre un élément protecteur collectif (3) constitué d'au moins deux éléments protecteurs individuels (2), où au moins une saillie d'espacement (22) de chaque élément protecteur individuel (2) est adaptée à son extrémité pour une connexion fixe et indémontable

avec l'extrémité d'une saillie d'espacement (22) d'un autre élément protecteur (2), alors que l'élément protecteur collectif (3) est constitué comme un bloc où les éléments protecteurs individuels (2) sont interconnectés de façon fixe et indémontable par une jonction des extrémités de leur saillies d'espacement (22).

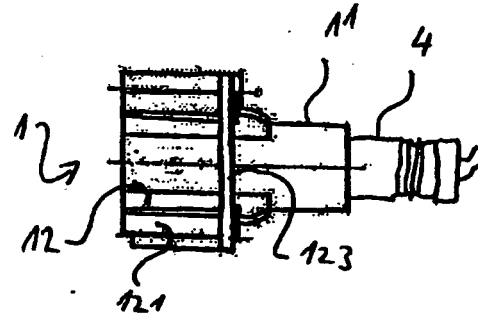
17. L'unité d'emballage correspondant à la revendication 16, **caractérisée par le fait que** la connexion fixe et indémontable de chaque couple d'éléments protecteurs individuels (2) constituant l'élément protecteur collectif (3) est réalisée par collage ou soudage ou moulage commun de plusieurs éléments protecteurs individuels (2) où un pont de liaison (6) sera créé à la place des extrémités des saillies d'espacement (22) opposées des éléments protecteurs individuels (2).

18. L'unité d'emballage correspondant aux revendications 16 et 17 **caractérisée par le fait que** l'élément protecteur collectif (3) est constitué d'éléments protecteurs individuels (2) fermement reliés dans une ligne directe (101), sachant que le nombre d'éléments protecteurs individuels (2) placés dans cette ligne directe (101) est sélectionné parmi les nombres de 5, 6, 10 ou 12.

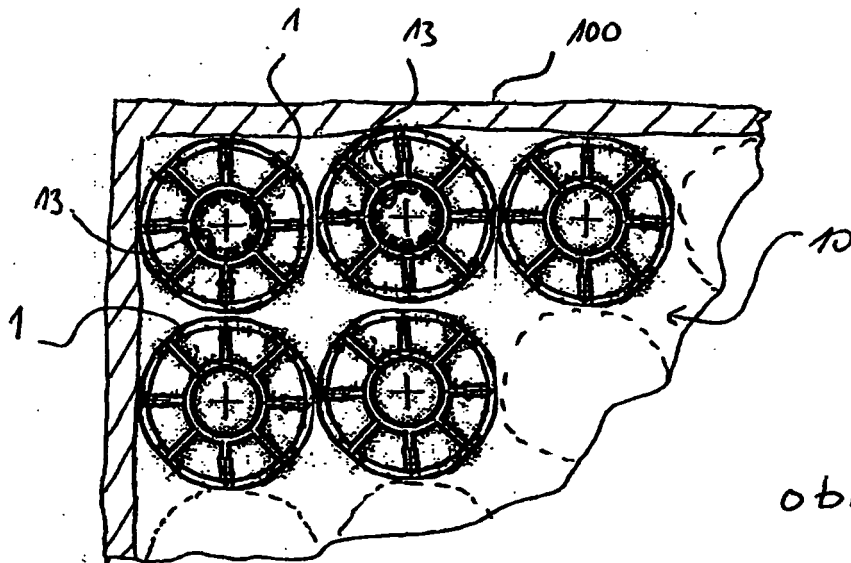
19. Un emballage de produits explosifs avec une résistance améliorée à la transmission de la détonation, constitué d'au moins une unité d'emballage (10) correspondant à l'une quelconque des revendications 1 à 18, stocké dans un emballage protecteur et/ou de transport (100).



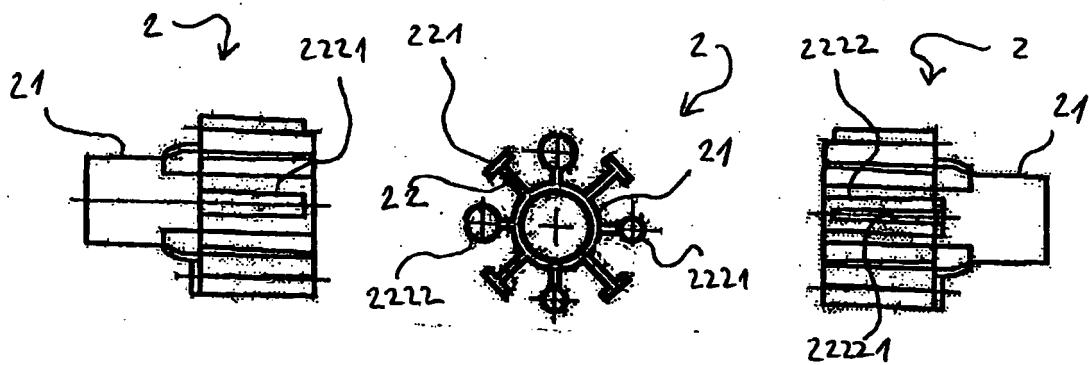
obh. 1



obh. 2



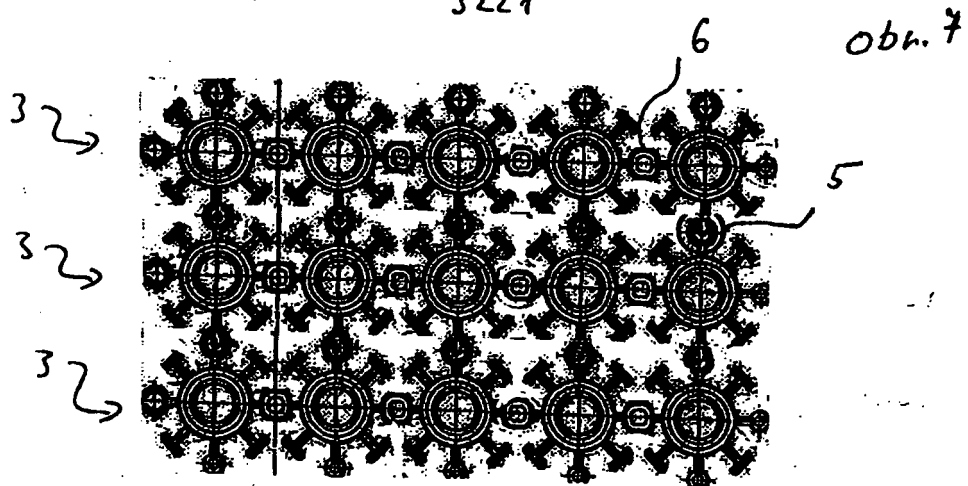
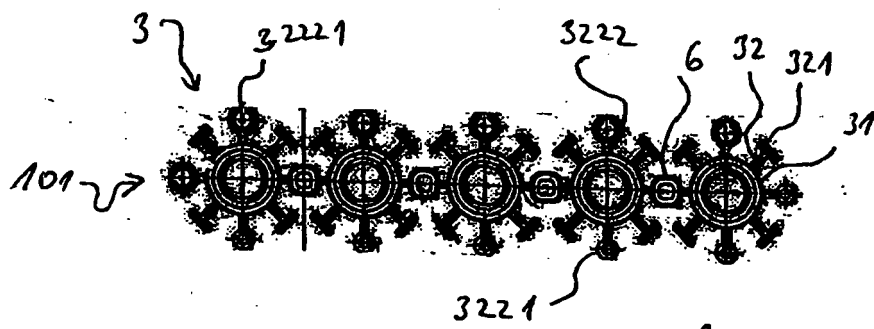
obh. 3



obv. 6

obv. 4

obv. 5



obv. 7

obv. 8

REFERENCES CITED IN THE DESCRIPTION

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