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(54) **FINAL DISPOSAL CONTAINER AND METHOD FOR THE PRODUCTION THEREOF**

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(57) **ABSTRACT**

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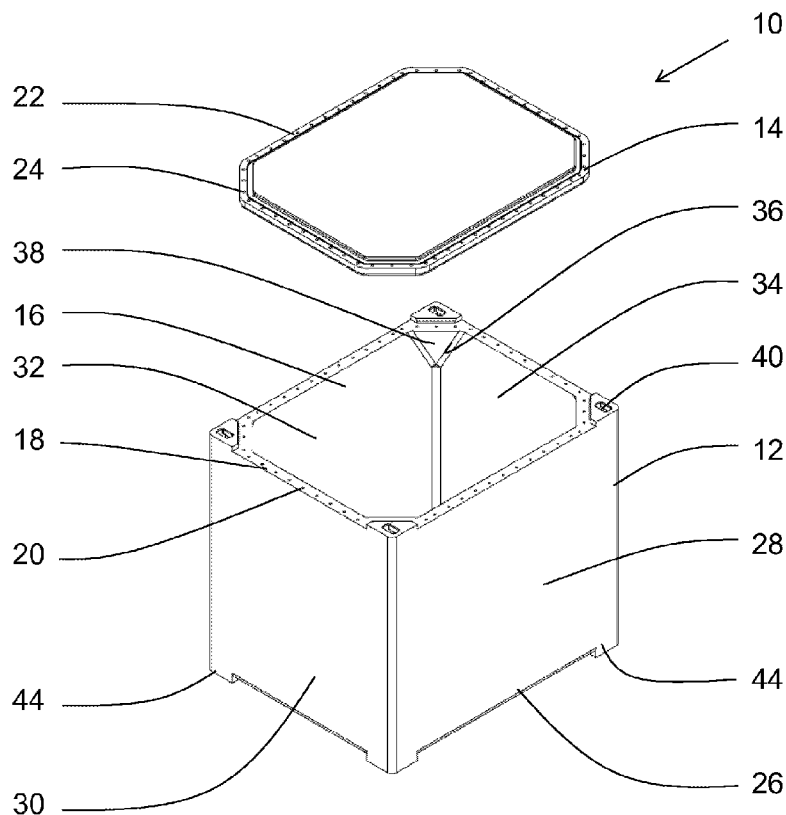
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The present invention relates to a storage container (10), in particular a final disposal container for contaminated materials. So that the storage container can be produced particularly advantageously and substantially without the occurrence of dross, the storage container (10) comprises a container body (12) having a container base (26) and at least one container side wall (28, 30, 32, 34) wherein the container body (12) has a filling opening (16) that can be closed by a container cover (14), wherein the container body (12), at the end of at least one container side wall (28, 30, 32, 34) arranged opposite the container base (26), has a projection (36) that has a wedge-shaped cross section and that is formed on the container inner side, and wherein the wedge-shaped projection (36) thickens due to a slanted portion (38) that extends at an angle in a range from $\geq 10^\circ$ to $\leq 35^\circ$ relative to the orientation of the container side wall (28, 30, 32, 34). The present invention also relates to a method for producing a storage container (10), in particular a final disposal container for contaminated materials.



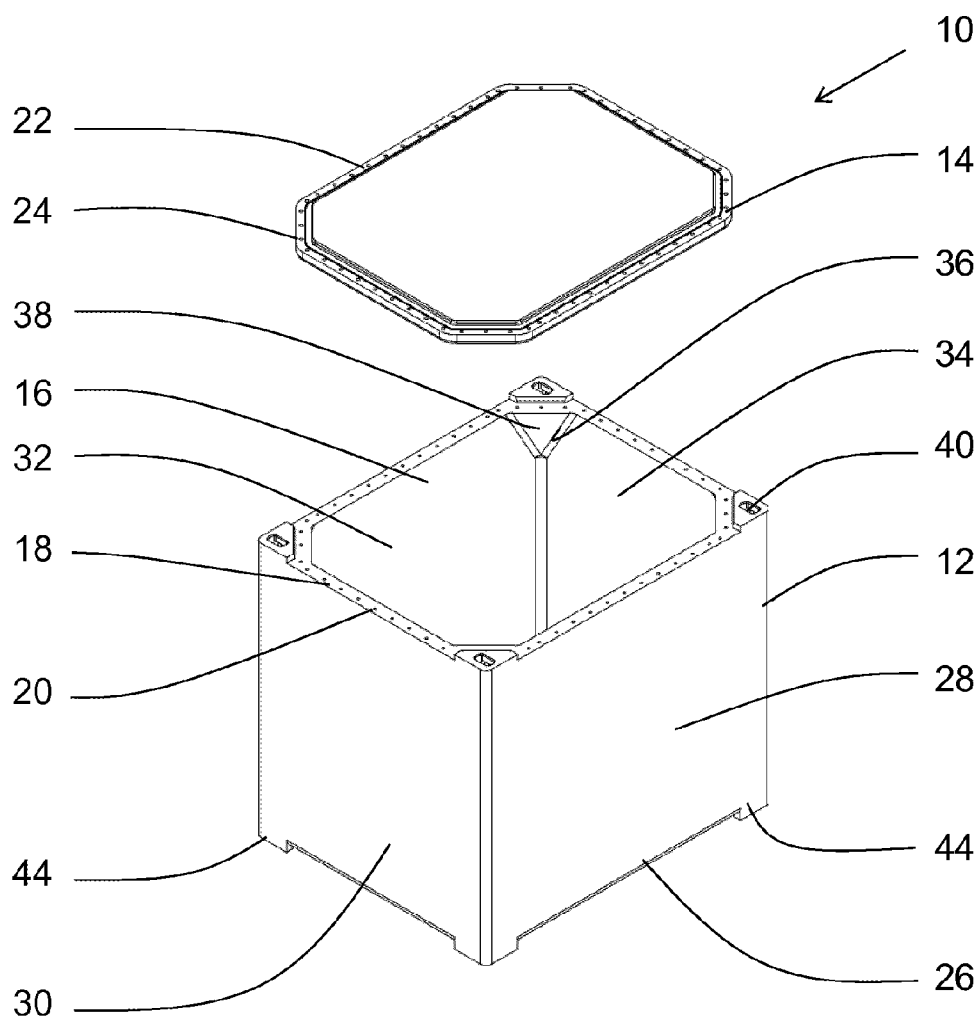


FIG. 1

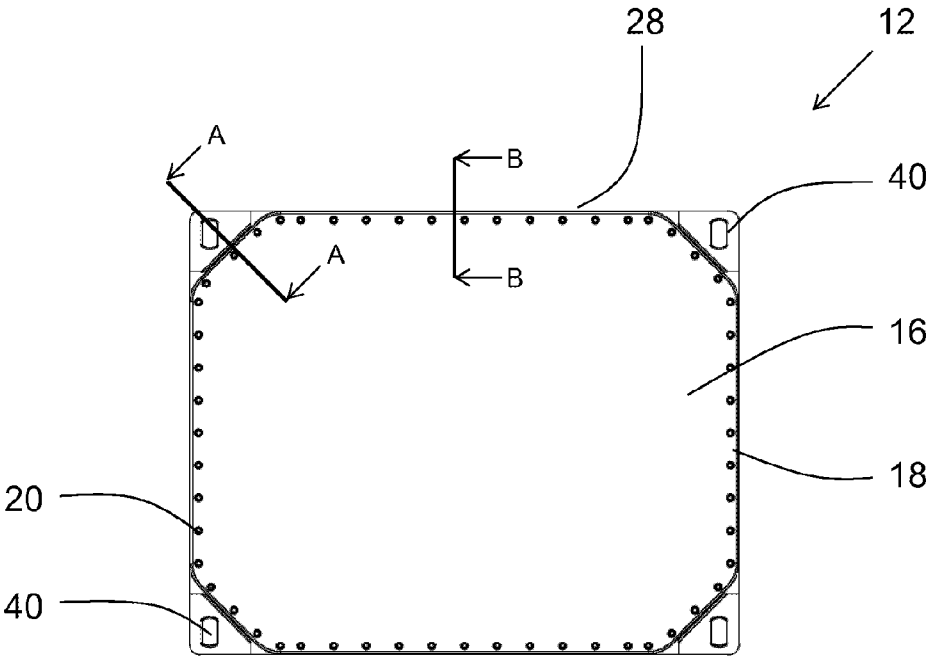


FIG. 2

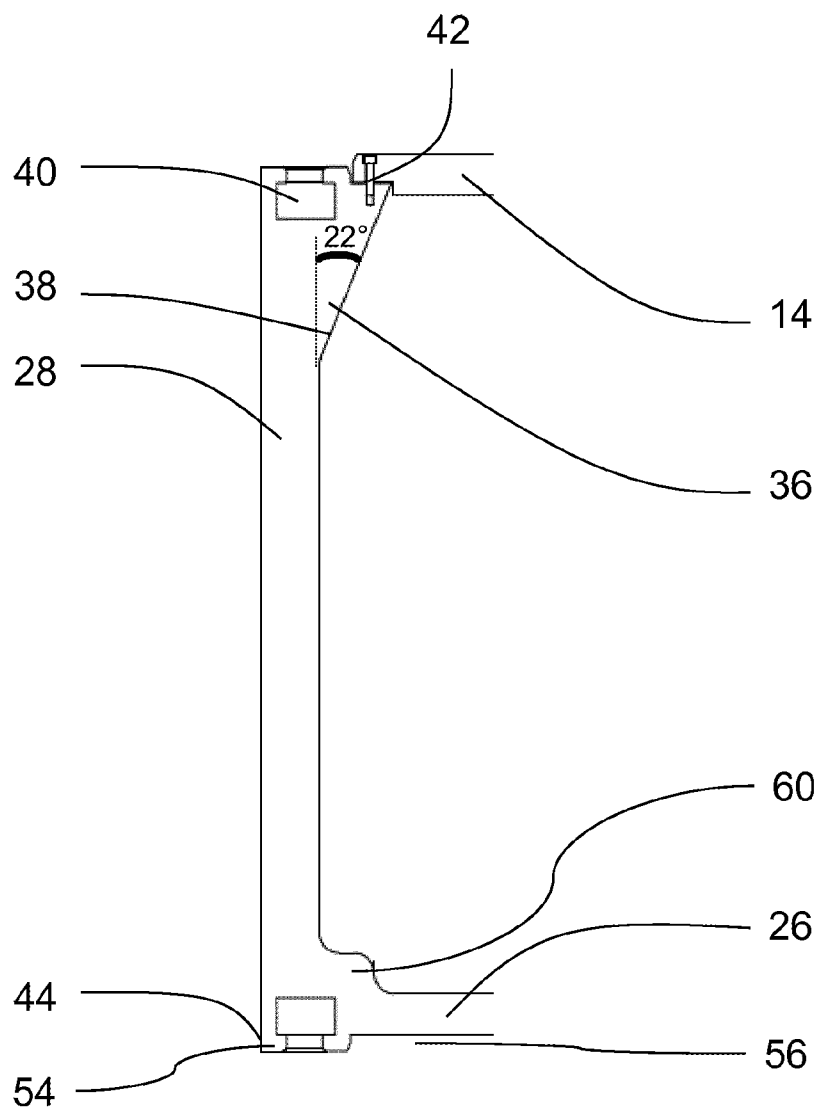


FIG. 3

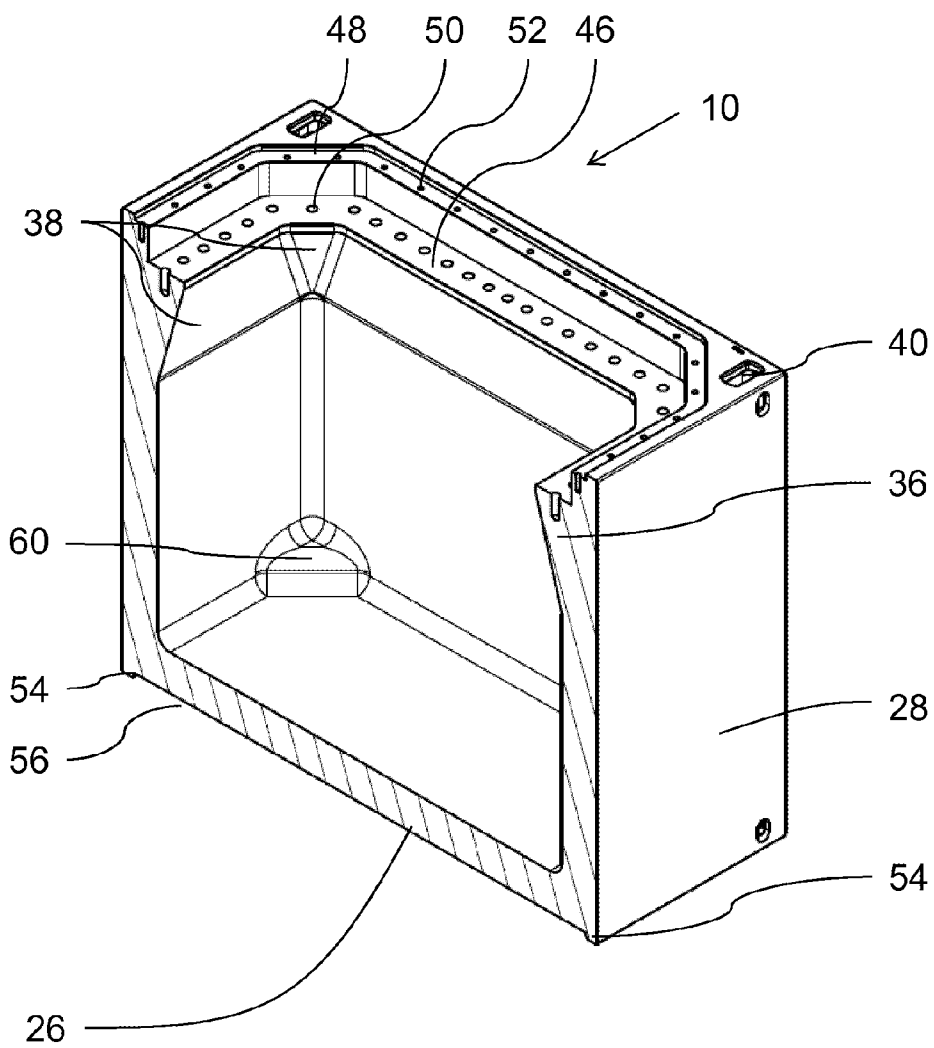


FIG. 4

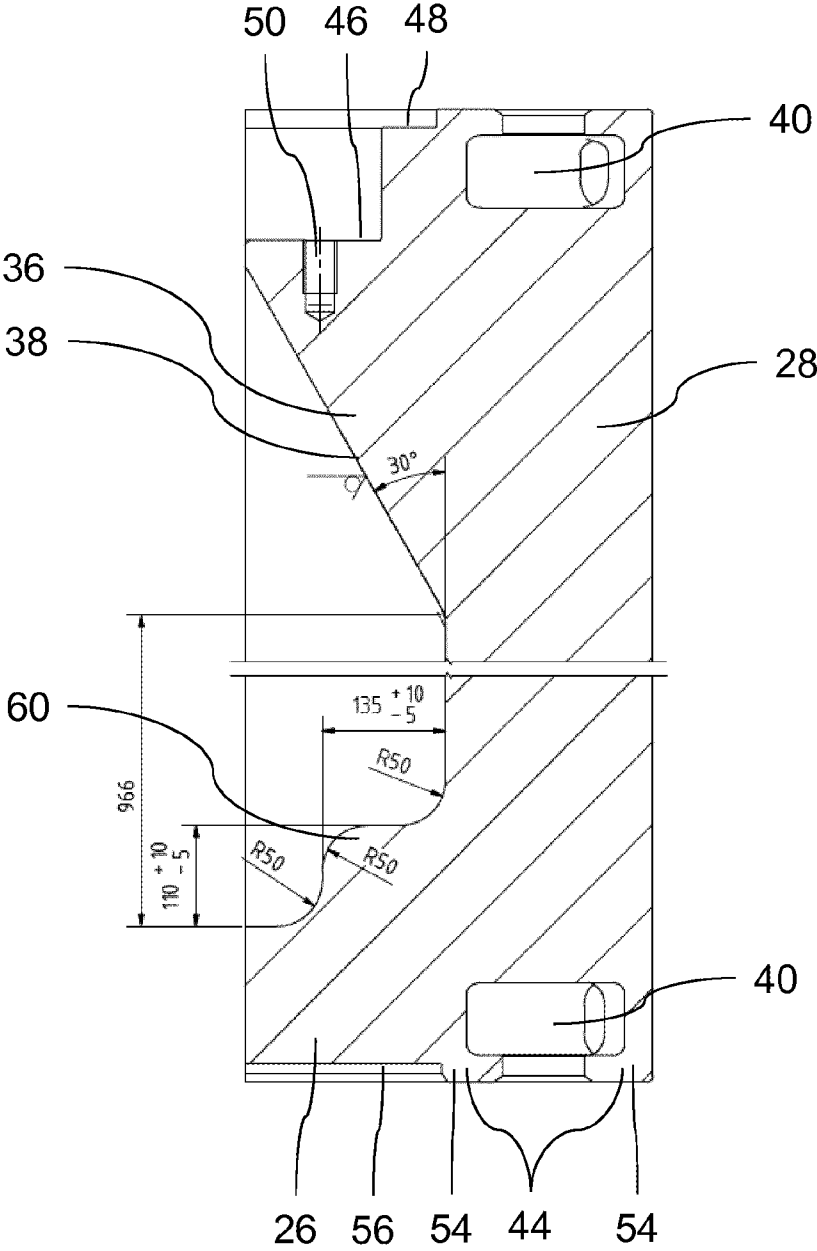


FIG. 5

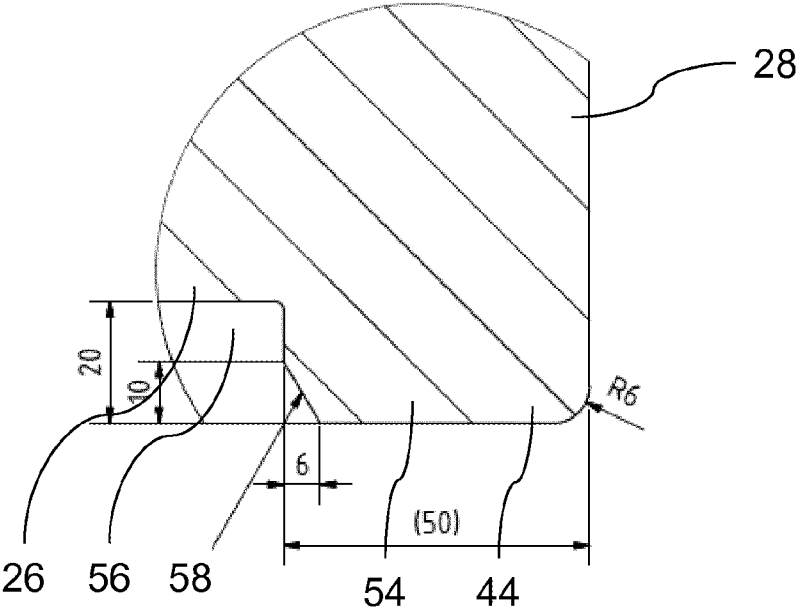


FIG. 6

**FINAL DISPOSAL CONTAINER AND
METHOD FOR THE PRODUCTION
THEREOF**

[0001] The invention relates to a storage container, in particular a final disposal container for contaminated materials, and to a method for producing a storage container, in particular a final disposal container for contaminated materials.

[0002] Contaminated materials, in particular such as residual materials or waste materials, often accumulate and have to be supplied for final disposal in order to avoid further contact with the environment. By way of example, materials of this type can be radioactively, chemically and/or biologically contaminated. So as to be able to supply these materials for example for final disposal, final disposal containers are known, into which the residual materials can be filled for transport or storage.

[0003] A storage container, in particular a final disposal container for radioactive waste, is known from the unexamined patent application DE 101 20 191 A1. A storage container of this type comprises a container base, container side walls and a container cover. Here, the transition region on the container inner side between the container side walls and the container cover in particular can be formed in a rounded manner running around over the inner periphery of the storage container and can have a transition radius of at least 150 mm. A receiving console for the container cover adjoining the container side walls may also be provided.

[0004] Further, a container for holding, transporting and disposing of fission products is known from document DE 7317984 U1. A container of this type is used in particular for the holding and final disposal of radioactively contaminated materials and is formed from cast iron.

[0005] Storage containers of this type are often produced by means of a casting method. A disadvantage with casting methods of this type is the possible occurrence of what is known as dross. Non-metal and in particular oxidic impurities of this type, such as scum, foam and/or slag of the molten metal, can lead to structural defects in the produced component. More specifically, dross defects in the cast shaped part usually form inclusions, for example formed from magnesium oxide, magnesium sulphide, or magnesium aluminium silicate slags. The occurrence of dross defects of this type can reduce the fatigue strength of the shaped component and can also reduce the shielding effect for example with respect to emissions of contaminated materials, for example radioactive radiation. As a result, with the occurrence of dross defects, the shaped component can no longer be used as a storage container for contaminated materials, or can only be used in this way to a limited extent, which leads not infrequently to the rejection of the component exhibiting dross defects. Here, not only can a large number of dross defects inevitably lead to the aforementioned disadvantages, but the merely the occurrence in principle of dross defects can lead to rejection.

[0006] One object of the present invention is therefore to create a storage container that can be produced easily and with reduced rejection. A further object of the present invention is to create a method for producing a storage container, by means of which method the storage container can be produced easily and with reduced rejection.

[0007] This object is achieved in accordance with the invention by the features of the independent claims. Advantageous developments are specified in the dependent claims

[0008] The object is therefore achieved by a storage container, in particular a final disposal container for contami-

nated materials, comprising a container body having a container base and at least one container side wall, wherein the container body has a filling opening that can be closed by a container cover, wherein the container body, at the end of at least one container side wall arranged opposite the container base, has a projection that has a wedge-shaped cross section and is formed on the container inner side, and wherein the wedge-shaped projection thickens due to a slanted portion that extends at an angle in a range from $\geq 10^\circ$ to $\leq 35^\circ$ relative to the orientation of the container side wall.

[0009] A key point of the invention is thus that, on the container inner side and facing the container upper side or the filling opening, a projection enlarging in the direction of the container upper side is provided, which is preferably formed at each corner facing the filling opening and is configured in the region of the corners in such a way that the projection extends between two container walls. When casting the storage container, the dross in the corner region or in the region of the projection is thus particularly advantageously reduced, which causes an advantageous minimisation of the flaws in a subsequent test step, for example by means of ultrasound. A second key advantage of a projection of this type or of the thus simplified casting process is that transport openings for the fastening of handling devices can be formed much more easily on the receiving console created by the projection in the region of the container upper side, on the one hand by means of a milling processing step or alternatively by the provision of a casting core during casting, however in any case the projection according to the invention results in a reduction of the dross in the region of the projection. The container inner wall preferably extends from the container base initially in the direction of the container upper side, before the projection then "bends" from the container inner wall at an angle from $\geq 10^\circ$ to $\leq 35^\circ$ in the region of the container upper side.

[0010] A storage container of this type can preferably be used in order to hold, to store or to transport chemically, biologically or radioactively contaminated materials and/or to supply said materials for final disposal. The storage container comprises a container body that has a container base and at least one container side wall. By way of example, the at least one container side wall can be arranged substantially at right angles to the container base and/or can be formed in one piece therewith. Here, only one container side wall may be provided, for example when this is cylindrically shaped and the container base for example has a circular cross section. In this embodiment, the diameter of the then cylindrical storage container may lie for example in a range from ≥ 1000 mm to ≤ 1100 mm.

[0011] However, the storage container or the container body preferably has a plurality of container side walls, wherein the container base may have a polygonal shape in plan view. In this embodiment, the container side walls are arranged at a corresponding angle to one another and can also be formed integrally with one another and with the container base.

[0012] So as to be able to fill contaminated materials into the storage container, the container body has a filling opening. The size and shape of this filling opening can be freely selected in principle, but can be adapted to the basic shape of the container base, that is to say in particular to the shape in plan view of the container base. In order to prevent an escape of contaminated materials themselves or an escape of emissions originating from the contaminated materials, the filling opening in particular can be hermetically sealed by a cover.

When the filling opening is closed, the storage container is therefore in particular hermetically tight, such that contaminated materials themselves or emissions originating from the contaminated materials, such as radioactive radiation, cannot escape from the storage container at any point of the container.

[0013] The container body further has, at the end of at least one container side wall arranged opposite the container base, that is to say basically on the upper side of a container side wall or a suitable plurality of container side walls, a projection that has a wedge-shaped cross section, is formed on the container inner side and extends in the direction of the container upper side. A projection that has a wedge-shaped cross section and that is formed on the container inner side may be in particular in the sense of the present invention a projection or thickened portion that is directed in the direction of the container interior and in a cross section is a wedge-shaped thickened portion, that is to say in particular a thickened portion that widens at an angle through a preferably planar plane. However, the projection in plan view may also have a form deviating from a strictly planar form. For example, a structure that is formed on the container inner side in a manner preferably extending in its extension in the direction of the container cover into the interior can be formed.

[0014] Here, the wedge-shaped projection thickens due to a slanted portion that extends at an angle in a range from $\geq 10^\circ$ to $\leq 35^\circ$ relative to the orientation of the container side wall. In other words, the preferably planar plane of the wedge-shaped projection is arranged at an angle from $\geq 10^\circ$ to $\leq 35^\circ$ to the container side wall. Here, with the above-defined angles, manufacturing tolerances in a range for example of $\pm 1^\circ$ outside the defined range can be included by the scope of the invention in a manner comprehensible to a person skilled in the art.

[0015] A storage container formed as specified above provides the advantage of an improved production compared with the storage containers known from the prior art. More specifically, defects, in particular such as dross defects, can be reduced or even completely prevented in particular with the production of the storage container described above by means of casting methods. One explanation for this advantage can be considered in particular in an improved flow behaviour of the molten metal when inserted into a mould, such as a metal permanent mould or a sand mould. In a manner surprising to a person skilled in the art, a projection that has a wedge-shaped cross section and that is formed on the container inner side can thus be provided, wherein the wedge-shaped projection thickens due to a slanted portion that extends at an angle in a range from $\geq 10^\circ$ to $\leq 35^\circ$ relative to the orientation of the container side wall and the flow behaviour of the molten metal in particular in the case of a casting method can be improved in such a way that practically no dross defects occur, in particular in the region of the projection. The long-term stability of storage containers of this type can thus be improved, which is particularly advantageous in particular with a use of the storage container according to the invention as a final disposal container for contaminated materials. In addition, the stacking of the containers above one another is improved by the embodiment according to the invention, such that six or more containers can be reliably stacked above one another, for example.

[0016] Similarly to the long-term stability, storage containers according to the invention can have an improved shielding effect, for example with respect to radioactively radiating

materials. This is because the shielding effect can be reduced by non-metal inclusions, often associated with gas bubbles or scaling, or by the dross defects. In accordance with the invention, contaminated materials, such as radioactively contaminated or radiating materials, can be supplied particularly reliably for example for final disposal or for transport as a result of the reduction or the even complete prevention of dross defects, wherein a particularly good and homogeneous shielding is provided.

[0017] In addition, the rejection with the production of storage containers can be considerably reduced, since the produced storage containers are substantially free from dross defects and the number of storage containers that cannot be used for a desired field of use due to dross defects reduces. The costs of the production of the storage containers are thus considerably reduced.

[0018] Here, due to the production of the storage containers, the wedge-shaped projection is arranged in particular at the end of at least one container side wall arranged opposite the container base. In other words, the wedge-shaped projection or a plurality of wedge-shaped projections is/are arranged on the upper side of the container side wall or the container side walls in such a way that the container wall thickens in the direction of the upper side. The projection or the projections can thus be used in particular to arrange, in this region, transport means reducing the shielding thickness, wherein a sufficient shielding thickness and long-term stability are nevertheless maintained. Besides transport means, further functional means can be arranged in this region, which means are formed from material reducing the shielding.

[0019] In accordance with an advantageous embodiment, the container bodies are formed from cast iron, preferably from ductile cast iron, or what is known as spheroidal graphite iron. In particular with a formation from cast iron and therefore an enabled casting method, the storage container can be produced particularly easily and in a defined manner. Here, the wedge-shaped projections serve in particular in a casting method with use of cast iron to reduce or completely prevent structural defects, in particular such as dross defects. Here, in the sense of the present invention, in particular an iron alloy with a high proportion of carbon, for example $\geq 2\%$, and silicon, such as $\geq 1.5\%$, can be understood to be cast iron. Further constituents, such as manganese, chromium or nickel can be contained in the cast iron. Furthermore, in the method according to the invention by casting, the produced storage container can be formed in particular from what is known as black cast iron. In this form, the cast iron may further comprise carbon in the form of graphite, in particular such as spheroidal graphite. In particular with ductile cast iron, which is particularly suitable as material for storage containers for contaminated material, there is an increased risk of dross formation. In this regard, the method according to the invention can reduce the risk of dross defects, in particular in the case of a casting method as described above. An embodiment of the container cover made from cast iron can provide a good shielding that is uniform over the entire storage container, which is particularly advantageous in the case of the final disposal of contaminated materials.

[0020] In accordance with a further advantageous embodiment, the storage container, on its upper side and in the region of at least one projection, preferably in the projection, has at least one transport opening for transporting the storage container. In particular, transport openings serve as standardised means, for example ISO openings, in order to transport the

storage container using standardised methods. Here, the shielding thickness is clearly reduced by a transport opening. However, since the transport opening is arranged in the region of the projection, a sufficient wall thickness or shielding thickness can be obtained on the whole. The storage container advantageously comprises a plurality of transport openings. For the case of a cylindrical storage container, the transport openings can be distributed here uniformly over the periphery of the cylindrical side wall. For the case of a polygonal basis shape, the transport openings can be arranged at the corners, for example.

[0021] In accordance with a further advantageous embodiment, the storage container is cuboidal and has a square or rectangular cross section. In this embodiment, a multiplicity of storage containers can be combined in particular for the purpose of final disposal with low spatial requirement. In addition, storage containers of this type in particular can be transported by standardised methods and supplied for final disposal, which makes the handling of storage containers of this type particularly easy. Cuboidal storage containers can also be produced particularly easily and in a defined manner, for example by means of casting methods.

[0022] In this embodiment, the dimensions of the storage containers are for example in the range of conventional standardised ISO containers. By way of example, the height and width may lie in a range from ≥ 1200 mm to ≤ 2000 mm, wherein the length may lie in a range from ≥ 1600 mm to ≤ 3000 mm.

[0023] In accordance with a further advantageous embodiment, the wedge-shaped projection is arranged in a locally delimited manner at a corner of the container body and a wedge-shaped projection is preferably arranged at each corner facing the filling opening. The projections are preferably arranged only at the corners of the container body associated with or facing the container cover and not the container base. In this embodiment, the extension of the projection can thus be limited to the regions where they are required, for example due to the arrangement of transport openings at the upper corner regions of a cuboidal storage container. The middle regions of the corresponding container side walls may have inner and outer walls that are completely parallel to one another in a manner known per se and may have no wedge-shaped projection. In this embodiment, a plurality of projections therefore are not interconnected, for example.

[0024] In accordance with a further advantageous embodiment, the wedge-shaped projection is formed as a projection running around on the container periphery or running around on the periphery of the filling opening. The projection preferably runs around on all container walls on the container inner side and is preferably adjacent to the container upper side. Here, within the scope of the application, the expression "container upper side" means the side of the container facing away from the container base. In this embodiment, a particularly free selection of the arrangement of functional elements, such as transport openings, is possible. In addition, a plurality of containers can be produced in a standardised manner and the number and positioning for example of transport openings or other transport elements can then be freely selected, in particular in the region of the peripheral projection, and can also be changed in the case of existing storage containers. A multiplicity of differently formed storage containers can thus be produced in a particularly cost-effective manner.

[0025] In accordance with a further advantageous embodiment, the wedge-shaped projection is formed as a receiving

console for at least partly receiving the container cover. The projection most preferably extends on the container inner side between two container side walls, such that a triangular receiving console facing the filling opening can thus be created. A seat for handling elements can then be milled into this receiving console in a simple manner, for example for what are known as twistlocks. As a result of this embodiment, a receiving console known per se for at least partly supporting the container cover can thus be produced particularly advantageously, in particular without the occurrence of dross. Here, as already discussed, merely projections at corner regions can be provided, in which case only part of the cover is received by the projections. The further periphery of the cover can be supported for example on a corresponding seat arranged directly on the container side walls or on a peripheral collar. For the case of a projection running around the entire periphery of the filling opening, the cover can rest completely on the projection or can be supported thereby. In this embodiment, it is particularly advantageous when the container cover is adapted in terms of shape and size to the basic shape and size of the storage container or corresponds thereto.

[0026] In accordance with a further advantageous embodiment, the wedge-shaped projection thickens due to a slanted portion that extends at an angle in a range from $\geq 20^\circ$ to $\leq 25^\circ$, in particular 22° , relative to the orientation of the container side wall. In particular with an embodiment of this type of the projection, the flow behaviour of a molten metal during a casting method can be improved in such a way that the formation of dross defects in the produced storage container is particularly effectively prevented or reduced. Here, in the case of the above-defined angles, manufacturing tolerances in a range for example of $\pm 1^\circ$ outside the defined range are again considered as belonging to the invention in a manner comprehensible to a person skilled in the art.

[0027] In accordance with a further advantageous embodiment, the storage container closed with a container cover has a thickness at any position of ≥ 50 mm, in particular in a range from ≥ 50 mm to ≤ 200 mm, for example ≥ 90 mm to ≤ 120 mm, most preferably 100 mm. Thicknesses of this type in particular with a storage container produced by a casting method provide a reliable and dependable shielding with respect to contaminated materials arranged in the storage container or emissions of said materials. Thicknesses or shielding thicknesses of this type can be produced without difficulty both in the region of the base, the side walls and the cover, but also by projections formed in the region of transport openings arranged on the upper side of the storage container. The entire storage container is most preferably produced in a single casting method and in this regard has no weld seams, for example caused by joining together the container side wall and container base.

[0028] In accordance with a further advantageous embodiment, the container cover can be screwed to the container body. In this embodiment, a particularly simple and reliable connection between the container body and container cover can be produced. In addition, a particularly reliable hermetic sealing of the storage container can be produced. Here, the container cover can be screwed to the container body in a single row or in two rows. Single-row screwing provides the advantage of a simple, cost-effective and space-saving structure, whereas two-rowed screwing enables a particularly reliable, rigid and stable screwing of container cover and storage body. In terms of the screwed connection, threads for example

can be arranged in the storage body, or threaded bolts can protrude from the surface of the storage body.

[0029] Further, it is preferable to provide a single container cover, wherein the container cover can be screwed to the container body, or for two container covers to be provided, wherein the second container cover overlaps the first container cover. Two rows of threads would therefore also be preferable, wherein the first cover would be fastenable by means of the first row of threads and the second cover would be fastenable by means of the second row of threads. In addition, the cover may have a seal or also two seals, for example made of elastomer, foam rubber and/or metal.

[0030] In this context, the storage container preferably has two container covers, an inner seal for sealing the container cover associated with the container interior and an outer seal for sealing the container cover associated with the container exterior, wherein the inner seal comprises an elastomer that is designed to seal the container interior with respect to thermal influences and/or radioactivity and the outer seal comprises an elastomer that is designed to seal the container interior with respect to moisture. An embodiment of this type is advantageous since a material that is more cost effective can be used for the outer seal compared with the inner seal, such that a second costly seal for the outer seal, or what is known as the sacrificial seal, can be spared. The elastomers used for the inner seal and for the outer seal preferably have different material characteristics.

[0031] The container cover can also be formed in such a way that the container cover in the closed state bears at least against the longitudinal sides of the container, that is to say has a substantially equal extension compared with the container on its upper side, wherein the container cover, at its corners, preferably has recesses, which correspond to the transport openings. The container, on its upper side, may also have a greater extension than the container cover, such that the container forms a peripheral collar, into which the container cover can be inserted in order to close the container. Lastly, a test connection can also be formed on the container cover. The container cover is preferably formed from cast iron or steel.

[0032] In accordance with a further preferred embodiment, the container cover and the container body are formed in such a way that the container cover fastened on the container body or on the filling opening protrudes beyond the container body in a direction away from the container interior by preferably at least 10 mm. A positive contour is thus created, which enables an improved stacking of the container. It is further preferable for the filling opening and/or the container cover to be as large as possible with respect to the extension of the container on its container upper side, such that a particularly easy loading of the container is made possible. In other words, this means that the "edge" between the filling opening and container upper side is as small as possible. In principle, the filling opening and/or the container cover may have any shape, for example can be circular, wherein the filling opening and/or the container cover are preferably rectangular or octagonal.

[0033] It is also preferable for the container body, on its container base, to have at least one container foot, which faces away from the container interior and which protrudes beyond the container base in a direction away from the container interior by preferably at least 20 mm, or for the container body, on its container base, to have a peripheral base bead, which faces away from the container interior and which

adjoins the container wall preferably seamlessly. Due to guide elements of this type, such as container feet and/or a base bead, an improvement of the stackability and simultaneous centering of the containers to be arranged on top of one another is achieved, wherein the strength characteristics of the container are thus also improved, for example in the case of external loads, such as drop tests, crash scenarios, etc. This is because, by providing container feet and/or a base bead, an improved damping can be achieved when the container falls and lands on the container feet or on the base bead. Due to the embodiment, six or more containers can be reliably stacked on one another. This is because, by providing the projections preferably in the corners and by providing container feet, the force flux at the corners can be optimised, which is particularly advantageous in the case of the aforementioned stacking.

[0034] The base bead further preferably protrudes with respect to the container base by ≥ 5 mm, ≥ 10 mm, ≥ 20 mm, ≥ 30 mm or ≥ 40 mm, such that a recess is provided in the region of the container base. When the container is arranged with the peripheral base bead contacting a substrate, a gap is preferably created between the container base and the substrate due to the recess and is delimited on all sides by the peripheral base bead. It is also preferable for the base bead to have a width of ≥ 25 mm, ≥ 50 mm, ≥ 100 mm, ≥ 150 mm or ≥ 200 mm and/or for the base bead to slope on its side facing the container base in a direction of the container interior via a canted portion. Here, the width of the base bead preferably extends parallel to the extension of the container base. The canted portion further preferably slopes at an angle of 30° , 45° or 60° with respect to the extension of the container base. The base bead further has a rectangular or a substantially rectangular profile, wherein the corners facing away from the container interior are rounded and/or have the aforementioned canted portion.

[0035] Due to a base bead of this type, damage to the container or to the content in the container interior can be avoided when the container is dropped from a height onto a substrate, since the base bead, as a buffer zone or spring zone, decelerates the impact between the container and the substrate.

[0036] In accordance with a further preferred embodiment, the cuboidal container body, on the container inner side, has a thickened portion adjoining two adjacent container side walls and the container base and extending into the container interior. The thickened portion is thus arranged at a corner associated with the container base, wherein a thickened portion is preferably arranged at each corner. The thickened portion further preferably has a circular and/or spherical profile with a radius of 40 mm, 50 mm, 60 mm or 70 mm. The thickened portion also preferably extends from the container side walls and the container base by at least 110 mm, preferably by at least 135 mm, into the container interior. Due to the thickened portion, similarly to the base bead, the strength characteristics of the container are improved, that is to say in the case of external loads, such as drop tests, crash scenarios, etc.

[0037] In view of further advantages and technical features of the storage container according to the invention, reference is hereby made to the explanations in conjunction with the method according to the invention, the figures, and to the description of the figures.

[0038] The present invention also relates to a method for producing a storage container according to the invention, in

particular a final disposal container for contaminated materials, wherein the storage container is produced by means of a casting method, and wherein a casting mould is used that is configured in such a way that a container body having at least one container side wall is shaped, wherein the container body has a filling opening that can be closed by a container cover, wherein the container body, at the end of at least one container side wall arranged opposite the container base, has a projection that has a wedge-shaped cross section and is formed on the container inner side, and wherein the wedge-shaped projection thickens due to a slanted portion that extends at an angle in a range from $\geq 10^\circ$ to $\leq 35^\circ$ relative to the orientation of the container side wall.

[0039] Here, the mould for example may have a suitable casting core or mould core and a suitable external shape. The mould may also be formed in such a way that the head region of the storage container to be shaped corresponds to the base region of the mould, and that the base region of the storage container to be shaped corresponds accordingly to the head region of the mould. In this embodiment, cast iron can be conveyed from a storage container into the base region of the mould and can then rise from bottom to top into the head region of the mould. The storage container is thus shaped upside-down from top to bottom. In particular, the storage container is shaped from cast iron. Due to the method, the dross during casting can be reduced particularly advantageously in the region of the projection, which particularly advantageously results in a minimisation of imperfections.

[0040] In accordance with an advantageous embodiment, at least one transport opening is formed in the upper side of the storage container and in the region of at least one projection, in particular by means of a machining step. A suitable number of transport openings can thus be formed in a particularly simple manner, whereby the storage container is also particularly well suited for the transport of the contaminated material. A transport opening of this type can also be provided on the underside of the storage container. The transport opening is most preferably provided at a corner of the storage container. Here, a machining process may include in particular drilling, milling or the like. However, in the context of the present invention, it is not ruled out in principle to use a casting core that shapes the transport opening in the casting method in order to thus form at least one transport opening.

[0041] Lastly, the container body produced by the casting method preferably has, on its container base, at least one container foot that faces away from the container interior and that protrudes beyond the container base in a direction away from the container interior by preferably at least 20 mm, or the container body, on its container base, preferably has a peripheral base bead facing away from the container interior.

[0042] With regard to further advantages and technical features of the method according to the invention, reference is hereby made explicitly to the explanations in conjunction with the storage container according to the invention, the figures, and the description of the figures.

[0043] Further advantages and advantageous embodiments of the objects according to the invention will be illustrated by the drawings and explained in the following description. Here, it should be noted that the drawings are merely descriptive in nature and are not intended to limit the invention in any way.

[0044] In the drawings:

[0045] FIG. 1 shows a schematic illustration diagonally from above of an embodiment of a storage container according to the invention,

[0046] FIG. 2 shows a schematic plan view of the embodiment from FIG. 1,

[0047] FIG. 3 shows a schematic sectional view through part of the embodiment from FIG. 1,

[0048] FIG. 4 shows a schematic sectional view diagonally from above of a further embodiment of the storage container according to the invention,

[0049] FIG. 5 shows a schematic sectional view of a side wall of the storage container according to the invention, and

[0050] FIG. 6 shows a schematic sectional view of a foot with base bead of the storage container according to the invention.

[0051] An embodiment of a storage container 10 according to the invention is shown in FIG. 1. A storage container 10 of this type can be used for holding, transporting and for final disposal of contaminated materials, such as radioactively contaminated or irradiating materials.

[0052] The storage container 10 comprises a container body 12 and a container cover 14. The container body 12 and the container cover 14 can be produced in particular by means of a casting method and can be formed from cast iron. Furthermore, the container cover 14 can close a filling opening 16 of the container body 12 in a hermetically tight manner. To this end, the container body 12 can be screwed to the container cover 14, for example in one row or in two rows.

[0053] According to FIG. 1, the container body 12 can be screwed to the container cover 14 in one row. To this end, the container body 12 has a row 18 of threads 20. Accordingly, the container cover 14 has a row 22 of threads 24. The thread 20 of the container body 12 and the thread 24 of the container cover 14 overlap when the container cover 14 is inserted, such that the container cover 14 can hermetically seal the container body 12 by screwing in bolts. To this end, a suitable seal, in particular such as an elastomer seal, foam rubber seal or metal seal, can be arranged between the container body 12 and the container cover 14. Furthermore, the container cover 14 can be formed as a single cover system and can be formed substantially from a shielding cover. Alternatively, the container cover 14 can be formed as a double cover system comprising a shielding cover and a protective plate.

[0054] An embodiment of this type with double seal system is shown in FIG. 5, wherein different elastomers are used for the inner seal 46 and the outer seal 48. The peripheral elastomer ring seal used for the outer seal 48 seals the closed storage container with respect to the infiltration of moisture and is formed by a single, cost-effective elastomer ("sacrificial seal"). The inner ring seal used for the inner seal 46 constitutes the actual functional seal and is formed by an elastomer of higher quality, which is configured to seal with respect to thermal influences, radioactivity and further comparable sealing demands. Accordingly, inner threads 50 and outer threads 52 are provided for fastening an inner and outer container cover 14 respectively (not shown). Whereas the inner threads 50 are formed only in the projection 36, the outer threads 52 are formed only in the container side wall 28, 30, 32, 34. Accordingly, the inner container cover 14 rests only on the projection, whereas the outer container cover rests only on the container side wall 28, 30, 32, 34.

[0055] In particular due to the illustrated screw connection, but also due to other connection mechanisms between the

container body 12 and container cover 14, the container cover 14 can be permanently connected to the container body 12 and can thus permanently close the filling opening 16 of the container body 12 and reliably prevent an escape of the filled contaminated materials or emissions thereof. To this end, the shielding wall thickness of the container cover 14 may correspond to that of the container body 12. By way of example, the container body 12 closed by the container cover 14 can have a thickness or shielding thickness at any position of ≥ 50 mm, in particular in a range from ≥ 50 mm to ≤ 200 mm, for example ≥ 90 mm to ≤ 120 mm.

[0056] The container body 12, in accordance with FIG. 1, further has a container base 26 and at least one container side wall 28. By way of example, the container body 12 or the storage container 10 can be cuboidal and may have a square or rectangular cross section. In this embodiment, the container body 12 may have four container side walls 28, 30, 32, 34. Here, in accordance with the cuboidal embodiment, two container side walls 28, 32, 30, 34 are in each case parallel to one another. In particular in this embodiment, the storage container 10 can be formed in the manner of a standardised container, for example what is known as an ISO container.

[0057] FIG. 1 further shows that the container body 12, at the end of at least one container side wall 28, 30, 32, 34 arranged opposite the container base 26, has a projection 36 that has a wedge-shaped cross section and is formed on the container inner side. Here, the wedge-shaped projection 36 thickens due to a slanted portion 38 that extends at an angle in a range from $\geq 10^\circ$ to $\leq 35^\circ$, for example at an angle from a range from $\geq 20^\circ$ to $\leq 25^\circ$, in particular at an angle of 22° , relative to the orientation of the container side wall 28, 30, 32, 34.

[0058] By way of example, as can be seen in FIG. 1, the projection 36 can be arranged in a locally delimited manner at the corners of the container body 12. In this case, for example for the embodiment as a cuboidal storage container 10 having a quadrangular cross section, a projection 36 can be provided at each of the four corners. It can be seen in FIG. 1 that the projections in a triangular manner can reach into the container side walls, becoming thicker upwardly. Alternatively, the projection 36 can be formed as a projection 36 running around on the container periphery and/or the periphery of the filling opening 16.

[0059] Furthermore, the wedge-shaped projection 36 can be formed as a receiving console for at least partly receiving the container cover 14. In other words, the container cover 14 can be supported at least in part on the projection 36.

[0060] In particular in the region of the projection 36 or the projection 36, the storage container 10, on its upper side, may have a transport opening or advantageously a plurality of transport openings 40 for transporting the storage container 10. These openings can be formed, for example after the shaping of the container body 12, by means of a machining step or also during the shaping process with use of a casting core. The transport openings 40 can be formed in particular as what is known as a twistlock or as what is known as an ISO corner. This means that a transport element is inserted into the transport opening 40 and is fixed in the opening 40 by means of a rotation. By turning the transport element back in the opposite direction, the transport element can be removed again from the opening 40. The storage container 10 can thus be handled without difficulty by standardised methods.

[0061] The embodiment of the projection 36 or the plurality of projections 36 will be detailed further in FIGS. 2 and 3.

FIG. 2 shows a plan view of a storage container 10 or container body 12. The cross sections along lines A-A and B-B are shown purely by way of example, in which the projection 36 or the projections 36 in particular has/have a wedge-shaped embodiment.

[0062] A sectional view according to cross section A-A is also shown in FIG. 3. In FIG. 3, it can be seen that the projection 36 in particular has a planar slanted portion 38. As a result of this, the projection 36 thickens in the direction of the upper side of the storage container 12 due to a slanted portion 38 that extends at an angle in a range from $\geq 10^\circ$ to $\leq 35^\circ$ relative to the orientation of the container side wall 28, 30, 32, 34. The angle is denoted in FIG. 3 purely by way of example by 22° . Furthermore, the transport opening 40 and a bolt 42 fastening the container cover 14 to the container body 12 can be seen.

[0063] Referring back again to FIG. 1, it can be seen that the storage container 10, on its base region, has four feet 44 by way of example. Alternatively and/or additionally, a peripheral base bead 54 can be provided instead of the feet 44. The feet 44 and/or the base bead 54 serve as a standing surface of the surface container 10. Furthermore, the feet 44 or the peripheral base bead 54 provide improved stackability.

[0064] In accordance with FIGS. 3 to 5, the cuboidal container body 12, on the container inner side, has a thickened portion 60 that adjoins two adjacent container side walls 28, 30, 32, 34 and the container base 26, that is to say adjoins each corner associated with the container base, and that extends into the container interior. The thickened portion 60 has a spherical profile with a radius 50 mm and extends from the container side walls 28, 30, 32, 34 by 135 mm+10 mm/-5 mm and from the container base 26 by 110 mm+10 mm/-5 mm into the container interior.

[0065] As can be seen in detail from FIG. 6, the base bead 54 protrudes with respect to the container base 26 by 20 mm, such that a recess 56 is created in the region of the container base 26 between the container base 26 and the substrate (not shown). Since the container is cuboidal, the recess 56 has a substantially rectangular shape. The base bead 54, along its extension running around the base area of the container, has the same height of 20 mm, such that there is no gap between the base bead 54 and flat substrate, and on the other hand the recess 56 has a depth also of 20 mm.

[0066] The base bead 54 has a width of 50 mm, wherein the base bead 54 slopes linearly in the direction of the container base 26 toward the recess 56 via a canted portion 58.

LIST OF REFERENCE SIGNS

- [0067] storage container 10
- [0068] container body 12
- [0069] container cover 14
- [0070] filling opening 16
- [0071] row 18, 22
- [0072] thread 20, 24
- [0073] container base 26
- [0074] container side wall 28, 30, 32, 34
- [0075] projection 36
- [0076] slanted portion 38
- [0077] transport opening 40
- [0078] bolt 42
- [0079] foot 44
- [0080] inner seal 46
- [0081] outer seal 48
- [0082] inner thread 50

- [0083] outer thread 52
- [0084] base bead 54
- [0085] recess 56
- [0086] canted portion 58
- [0087] thickened portion 60

1. A storage container, in particular a final disposal container for contaminated materials, comprising a container body (12) having a container base (26) and at least one container side wall (28, 30, 32, 34) wherein the container body (12) has a filling opening (16) that can be closed by a container cover (14), wherein the container body (12), at the end of at least one container side wall (28, 30, 32, 34) arranged opposite the container base (26), has a projection (36) that has a wedge-shaped cross section and that is formed on the container inner side, and wherein the wedge-shaped projection (36) thickens due to a slanted portion (38) that extends at an angle in a range from $\geq 10^\circ$ to $\leq 35^\circ$ relative to the orientation of the container side wall (28, 30, 32, 34).

2. The storage container according to claim 1, wherein the container body (12) is formed from cast iron, preferably from ductile cast iron.

3. The storage container according to claim 1, wherein the storage container (10), on its upper side and in the region of at least one projection (36), has at least one transport opening (40) for transporting the storage container (10).

4. The storage container according to claim 1, wherein the storage container (10), is cuboidal and has a square or rectangular cross section.

5. The storage container according to claim 4, wherein the wedge-shaped projection (36) is arranged in a locally delimited manner at a corner of the container body (12) and a wedge-shaped projection (36) is preferably arranged at each corner facing the filling opening (16).

6. The storage container according to claim 1, wherein the wedge-shaped projection (36) is formed as a projection (36) running around on the container periphery and/or as a projection (36) running around on the periphery of the filling opening (16).

7. The storage container according to claim 1, wherein the wedge-shaped projection (36) is formed as a receiving console for at least partly receiving the container cover (14).

8. The storage container according to claim 1, wherein the wedge-shaped projection (36) thickens due to a slanted portion (38) that extends at an angle in a range from $\geq 20^\circ$ to $\leq 25^\circ$, in particular 22° , relative to the orientation of the container side wall (28, 30, 32, 34).

9. The storage container according to claim 1, wherein the storage container (10) closed by means of a container cover (14) has a thickness at any position of ≥ 50 mm, in particular in a range from ≥ 50 mm to ≤ 200 mm, for example ≥ 90 mm to ≤ 120 mm, most preferably 100 mm.

10. The storage container according to claim 1, comprising a container cover (14), wherein the container cover (14) can be screwed to the container body (12), or comprising two container covers (14), wherein the second container cover (14) overlaps the first container cover (14).

11. The storage container according to claim 10, comprising two container covers (14), an inner seal (46) for sealing the container cover (14) associated with the container interior and an outer seal (48) for sealing the container cover (14) associated with the container exterior, wherein the inner seal (46) comprises an elastomer that is designed to seal the container interior with respect to thermal influences and/or radio-

activity and the outer seal (48) comprises an elastomer that is designed to seal the container interior with respect to the moisture.

12. The storage container according to claim 9, wherein the container cover (14) and the container body (12) are formed in such a way that the container cover (14) fastened on the container body (12) protrudes beyond the container body (12) in a direction away from the container interior by preferably at least 10 mm.

13. The storage container according to claim 1, wherein the container body (12), on its container base (26), has at least one container foot (44), which faces away from the container interior and protrudes beyond the container base in a direction away from the container interior by preferably at least 20 mm, or the container body (12), on its container base (26), has a peripheral base bead (54) facing away from the container interior.

14. The storage container according to claim 13, comprising the peripheral base bead (54) facing away from the container interior, wherein the base bead (54) protrudes with respect to the container base (26) by at least 10 mm, preferably at least 20 mm, such that a recess (56) is formed in the region of the container base (26), the base bead (54) has a width of at least 50 mm, preferably at least 100 mm, and/or the base bead (54) slopes in the direction of the container interior via a canted portion (58).

15. The storage container according to claim 1, wherein the container body (12) is cuboidal and, on the container inner side, has a thickened portion, which adjoins two adjacent container side walls (28, 30, 32, 34) and the container base (26) and extends into the container interior.

16. The storage container according to claim 15, wherein the thickened portion has a circular and/or spherical profile and/or the thickened portion extends from the container side walls (28, 30, 32, 34) and the container base (26) by at least 110 mm, preferably by at least 135 mm, into the container interior.

17. A method for producing a storage container (10), in particular a final disposal container for contaminated materials according to one of the preceding claims, wherein the storage container (10) is produced by a casting method, and wherein a casting mould is used that is formed in such a way that a container body (12) having at least one container side wall (28, 30, 32, 34) is shaped, wherein the container body (12) has a filling opening (16) that can be closed by a container cover (14), wherein the container body (12), at the end of at least one container side wall (28, 30, 32, 34) arranged opposite the container base (26), has a projection (36) that has a wedge-shaped cross section and is formed on the container inner side, and wherein the wedge-shaped projection (36) thickens due to a slanted portion (38) extending at an angle in a range from $\geq 10^\circ$ to $\leq 35^\circ$ relative to the orientation of the container side wall (28, 30, 32, 34).

18. The method according to claim 17, wherein at least one transport opening (40) is formed in the upper side of the storage container (10) and in the region of at least one projection (36), in particular by means of a machining step.

19. The method according to claim 17, wherein, during the casting method, a casting core is used to form at least one transport opening (40).

20. The method according to claim 17, wherein a casting mould is used that is formed in such a way that at least one container foot (44) is formed on the container base (26), the container foot facing away from the container interior and

protruding beyond the container base in a direction away from the container interior by preferably at least 20 mm, or a peripheral base bead is formed on the container base (26), the base bead facing away from the container interior.

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