

DescriptionStore Room

5 The invention relates to an encapsulated store room according to the preamble of claim 1.

Such store rooms are, for instance, used for the safe accommodation of high quality function goods, e.g. land craft, water craft, or aircraft.

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DE 195 05 130 C2 discloses a generic store room in which the good to be stored is accommodated in an underground store room and is adapted to be lifted by means of a kind of lifting ramp from a lowered position through an access opening coverable by a gate. In the known solution, the gate is either designed as a plate adapted to be shifted in lifting direction, or with two pivotable wings, each having a pivot drive assigned thereto. The store room itself is secluded against the gate via a cover, wherein the cover is covered in the closed position of the gate. The walls and gate elements enclosing the store room may, for instance, be manufactured of high-strength, reinforced concrete, so that the store room also acts as a bunker.

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A disadvantage of this known solution is that, if a high force acts on the gate, for instance, due to an explosion or the impact of an object at high speed, high forces are transferred to the gate drive, so that the gate, even if it protected the store room sufficiently from damage, can not be opened anymore due to a damage of the gate drive.

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In contrast to this, it is an object of the invention to provide an encapsulated store room that remains accessible even after an act of violence.

This object is solved by a store room with the features of claim 1.

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Advantageous further developments of the invention are the subject matters of the sub-claims.

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In accordance with the invention, the encapsulated store room comprises a lifting device via which a good to be stored is adapted to be moved out of the store room through an access opening lockable by a gate. This lifting device comprises a cover covering the good to be stored, wherein the gate is adapted to be moved, by means of a gate drive,

between an open position and a closed position in which both the cover and the store room are covered by the gate. In accordance with the invention, the gate drive is mechanically decoupled from the gate in the closed position. The term "mechanically decoupled" means a condition in which the drive is separated both physically and functionally from the gate such that, in the case of damage or deformation of the gate, no or just a strongly weakened interaction with the drive is performed.

By the measure of decoupling the gate drive from the gate in the closed position it is possible to prevent damage of the drive in a reliable manner, so that the store room remains accessible even after a very heavy act of violence, and in particular the lifting device works.

In the closed position or in a decoupled position, respectively, the gate drive may, for instance, be separated from the gate by a gap.

In a particularly preferred embodiment the store room comprises at least one chamber confined by walls which has a respective gate assigned thereto, wherein the cover of the chamber rests on the walls in a sealing manner in the closed position, so that the store room is encapsulated hermetically and no air or gases are able to penetrate into the store room from outside.

This sealing is preferably effected by means of a seal that is formed in the abutment area of the cover on the chamber walls.

For the further decoupling of the chamber from the gate covering same, an air gap may be provided between these components – the store room will then nevertheless remain gas-tight by the encapsulation with the additional cover.

In an embodiment of particularly simple construction, the cover is displaced by the drive of the lifting device.

In an alternative solution, the cover may be assigned with its own primary drive, and the lifting device may be assigned with a separate secondary drive for lifting the good to be stored.

In one variant, the opening of the gate may be performed via the cover or via a lifting device of the cover or of the good to be stored, which seizes the gate after a particular initial lift and takes it along, so that, for instance, the drive assigned to the cover (lifting

device or primary drive) also is the gate drive. In addition, operable coupling elements – in particular hydraulic cylinders – may be provided which are arranged and operable such that the coupling elements abut on the gate in an operated condition and transfer the weight of the gate to the lifting device, while in a non-operated condition of the
5 coupling elements they do not abut on the gate and hence the described gap between the gate and the gate drive is produced. The coupling elements may further be operated or designed such that a horizontal orientation of the gate is ensured.

In an alternative solution the gate is designed with two gate wings that have each assigned a pivot drive thereto. In principle, the gate may, however, also be designed with
10 one gate wing covering the access opening.

Pivoting may, for instance, be performed by means of a Scherzer drive. As a matter of fact, other suitable electrical, mechanical, or hydraulic drives may also be used for the
15 afore-mentioned elements (gate, cover).

In order to improve the support, the gate may be supported in the closed position by further support elements.

20 The decoupling between the gate and the gate drive is particularly effective if the latter is adapted to be shifted to its operating position by a lifting device. This means, in the closed position the gate drive is moved away from the gate by the lifting device, and is taken back to the operating position for opening.

25 In such a variant, the gate drive is preferably designed with coupling elements via which the gate drive is adapted to be locked or coupled with the gate in the operating position.

In accordance with the invention it is preferred if the gate drive(s) is / are arranged in a machine room that is separated from the chamber and need not necessarily be sealed
30 in an air-tight manner.

The store room may comprise several access openings. In principle, it is also possible to design the store room with a plurality of encapsulated chambers each having a gate or several gates.
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Preferred embodiments of the invention will be explained in detail in the following by means of schematic drawings. There show:

Figure 1 a first embodiment of an encapsulated store room with a gate that is adapted to be lifted by a lifting device;

Figure 2 a variant with a pivoting gate; and

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Figure 3 a gate drive of the store room pursuant to Figure 2.

Figure 1 shows a strongly diagrammed illustration of an encapsulated store room 1 as it is, for instance, used with a bunker. This store room 1 accommodates a good to be
 10 stored 2, for instance, a land craft, aircraft, water craft, or else packaged goods or bulk goods, respectively, which rests on a lifting ramp 4. The lifting ramp 4 is adapted to be lifted upward in the illustration of Figure 1 by a lifting device 6 so as to lift the good to be stored 2 through an access opening 8 of the store room 1. In the illustrated embodiment, the store room 1 is enclosed by a concrete construction with a concrete floor (not
 15 illustrated) and store room walls 10 which are components of an enclosing concrete building 12. The concrete construction is designed of high-strength reinforced concrete that withstands also heavy acts of violence. The main construction constituting the enclosing concrete building 12 is decoupled from the store room 1 – more exactly speaking – the store room walls 10 by an approximately horizontal air gap 14, so that the in-
 20 teractions between the enclosing concrete building 12 and the store room 1 are minimized.

In the illustrated embodiment, the store room 1 is covered at the top in the region of the access opening 8 by a cover 16. This cover 16 may again be a high-strength concrete
 25 or steel construction. In the illustrated closed position, the cover 16 rests on support shoulders of the store room wall 10, wherein circumferential sealing elements 18 are provided in the abutment region, so that the access opening 8 of the store room 1 is encapsulated hermetically at the top by the cover 16.

30 The lifting of the cover 16 is performed by the lifting device 6, wherein a common drive may be provided for the lifting ramp 4 and the cover 16. In principle, it is also possible to lift the cover 16 by a primary drive and the lifting ramp 4 by a secondary drive of the lifting device 6. These drives may be electrical, mechanical, electro-mechanical, or hydraulic drives, for instance, hydraulic cylinders. Such drives are explained in the initially
 35 mentioned state of the art, so that further statements in this regard are superfluous.

In the illustrated embodiment, the store room 1 with the cover 16 is covered by a gate 20 supported at the enclosing concrete building 12. In the embodiment illustrated in

Figure 1, this gate 20 is designed in a plate-shaped manner and extends approximately parallel to the cover 16, wherein a clearance 22 remains between the cover 16 and the gate 20 – i.e. the cover 16 is arranged at a distance to the gate 20. Thus, in this operating position there are no interactions between the gate 20 and the cover 16 or between the gate 20 and the cover 16 and the lifting ramp 4, even if the gate undergoes a massive act of violence.

In the illustrated embodiment, the plate-shaped gate 20 is guided laterally at two conical staggered guiding faces 24, 26 of the enclosing concrete building 12 and is supported on a support face 28 connecting these faces 24, 26. The circumference of the gate 20 is designed in correspondence with the faces 24, 26, 28, so that an exact centering and a planar abutment are ensured, wherein suitable seals may again be provided in the abutment region.

In this variant, the plate-shaped gate 20 is taken to the open position through the cover 16. To this end, the cover 16 is lifted by the assigned primary drive or by the common drive of the lifting device 6 until it seizes, after passing through an initial hub h corresponding to the height of the clearance 22, the plate 20 and then lifts same upward from the support face 28. Subsequently, the lifting ramp 4 is also moved upward by the secondary drive or by the common drive of the lifting ramp 4 and the lifting device 6 until the good to be stored 2 has been lifted through the access opening 8 upward to the level designated with reference number 30 – the good to be stored is then freely accessible and may be used as intended. The closing process is performed correspondingly in the reversed direction, wherein by the lowering of the cover 16 the gate 20 is returned to its closed position, and subsequently the cover 16 is moved further downward until the clearance 22 is produced in which the cover 16 is spaced apart from the gate 20 by the measure h . By this construction in accordance with the invention the store room 1, i.e. the walls 10 and the cover 16, are almost completely decoupled from the enclosing concrete building 12 and also from the gate 20, so that, even if these elements are damaged, the other drives, etc. remain undamaged, so that the opening of the gate is possible even in the damaged condition.

Alternatively, predominantly vertically oriented hydraulic cylinders may be arranged at the lifting device 6 or at the cover 16 as operable coupling elements that are adapted to be extended due to an actuation with pressurizing agents. In the closed condition of the gate 20 the hydraulic cylinders would be left in the retracted state so as to provide in the clearance 22 a gap between the gate drive – here the lifting device 6 or the cover 16 – and the gate 20. If the gate 20 is to be lifted, the hydraulic cylinders are first of all ex-

tended by the measure h until they produce a mechanical connection between the gate 20 and the lifting device 6 or the cover 16, respectively, which is adapted to be stressed at least with the weight of the gate 20. Additionally, the hydraulic cylinders may be controlled such that they ensure a horizontal position of the gate 20 due to their length in the extended condition. Then, the lifting device 6 is lifted and directly also lifts the gate 20.

Figure 2 shows a variant in which no plate-shaped gate is used, but a two-wing pivotable gate with two gate wings 20a, 20b. These are indicated with dots and dashes in the illustration of Figure 2 and will be explained in detail by means of Figure 3 further below.

Similar to the afore-described embodiment, the store room 1 is enclosed by store room walls 10 that are constructionally decoupled from the – not illustrated – enclosing concrete building 12. The covering of the store room 1 at the top is again performed by a cover 16 that is shown in the open position in Figure 2. The good to be stored 2 is supported on a lifting ramp 4 that is, for instance, designed as a framework construction and is connected with the lifting device 6 by means of support struts 40. This may, for instance, be a spindle drive or else – as in the embodiment – be designed by hydraulic cylinders arranged at both sides, wherein it is preferred in this case if the piston rods 32 thereof are supported stationary via consoles 34 at the walls 10 while the cylinders 36 are connected with the support struts 40 via cylinder consoles 38. By the supply of pressurizing agent to a piston rod-side pressure chamber of the cylinders 36, the latter are then shifted on the respective piston rod 32, so that the lifting ramp 4 correspondingly performs an upward lift (view pursuant to Figure 2). This lifting position is illustrated in Figure 2. As explained before, in this lifting or access position, the good to be stored 2 is oriented through the access opening 8 with respect to the level 30. For this purpose, several hydraulic cylinders that are staggered with respect to each other both in the drawing plane and perpendicular to the drawing plane are used, so that an exact guiding of the lifting ramp 4 is ensured. In the afore-described construction, the piston rods 32 are advantageously tensioned.

As indicated in Figure 2, the cover is connected with the drive of the lifting ramp 4, in the instant case with the struts 40 and the cylinders 36, for instance via supports 42. In principle, the lifting of the cover 16 may, however, also be effected by an own primary drive that is not shown in the illustration of Figure 2. To improve the bearing capacity, the cover 16 may be supported by further inclined struts 44 that are arranged in a framework manner and that are in turn in contact with the vertically extending struts 42.

This may be a physical framework construction in a similar manner as it may also be implemented with the lifting ramp 4.

5 As in the afore-described embodiment, the cover 16 rests in the closed position on a shoulder 46 of the wall 10, wherein in the closed position a hermetical encapsulation of the store room 1 is again ensured by the circumferential seal 18.

10 The gate drive for the gate wings 20a, 20b which is not illustrated in Figure 2 is positioned in a machine room 48 enclosing the store room 1. This gate drive 55 will be explained by means of Figure 3. At the left top of Figure 3 there is illustrated part of the cover 16 which is in the closed position and which rests, via the circumferential seal 18, on the wall 10 enclosing the store room 1. This machine room 48 is part of the enclosing concrete building 12 and is also preferably decoupled thereof. In the illustrated embodiment, this decoupling is effected by a further decoupling gap 50 decoupling a wall
15 portion 52 that is connected with the enclosing concrete building 12 from a floor portion 54 that is connected with the store room wall 10.

The gate drive 55 is accommodated in this machine room 48 that is adapted to be walked in, and it is designed as a hydraulically operated Scherzer drive in the illustrated
20 embodiment. By means of this gate drive, the door wing 20a illustrated in Figure 3 may be pivoted upward, wherein the swivel axis of the gate wing 20a is continuously adjusted in the case of such a Scherzer drive. Such drives have in particular been used in bridge building in the past years and are, for instance, also explained in the initially described state of the art, so that only the components necessary for understanding the
25 invention will be described here.

In the embodiment illustrated in Figure 3, the Scherzer drive is implemented at an opening module 56 that is in turn guided to be adjusted in the vertical direction via two
30 vertical guides 58, 60. The vertical guide 60 positioned at the right in Figure 3 is supported at a guide wall 62 that is connected with the floor portion 54, while the other vertical guide 58 is arranged at the wall 10 of the store room 1. The height adjustment of this opening module 56 is performed via lifting means 64 that is designed as a hydraulic lifting cylinder 64 in the illustrated embodiment.

35 The opening module 56 comprises at the top end portion in Figure 3 a toothed rack 66 of the Scherzer drive which combs with a toothed segment 68. This is connected with a locking module 70 extending over same approximately in radial direction and projecting beyond the toothed segment 68 in radial direction. At the projecting end portion of the

locking module 70, a piston rod of a pivoting cylinder 72 engages, the cylinder of which is supported at the opening module 56. In the illustration of Figure 3 the pivoting cylinder 72 is in the extended position. By retracting the pivoting cylinder 72, the locking module 70 and hence the toothed segment 68 may be pivoted, wherein the latter combs on the toothed rack 66.

In the illustrated embodiment, the locking module 70 is, in the closed position of the gate wing 20a, spaced apart therefrom, so that no operative connection exists. In the case of a heavy act of violence on the gate wing 20a, a damage of the Scherzer drive or of the opening module 56, respectively, is thus almost excluded. For establishing the operative connection, the lifting means 64 is triggered, so that the opening module 56 moves upward in the illustration of Figure 3, and the locking module 70 moves into a receiving chamber 74 of the gate wing 20a.

The locking module 70 is designed with two locking cylinders 76, 78 that are supported at the locking module 70 and that are adapted to be brought, when the locking module 70 immerses into the receiving chamber 74, into locking engagement with two locking blocks 80, 82 arranged in the gate wing 20a, so that the opening module 56 is coupled mechanically and functionally with the gate wing 20a. Accordingly, the toothed segment 68 and hence the gate wing 20a are pivoted as the pivoting cylinder 72 retracts, wherein the toothed segment 68 combs on the toothed rack 66 and hence the center of rotation of the gate wing 20a is correspondingly moved along. The end portion of the gate wing 20a which is visible in Figure 3 then pivots downward, so that the access opening 8 (see Figure 2) is released. In the embodiment illustrated in Figure 3, the faces 24, 26, 28 explained by means of Figure 1 are designed in kinematic reversal, so that the circumferential wall of the enclosing concrete building 12 enlarges toward the bottom. The end portion of the gate wing 20a is then correspondingly supported at the horizontally extending support face 28 from the bottom.

In the closed position, this end portion of the gate wing 20a is supported via an additional support 84 that is mounted pivotally at the wall portion 52 and biases the gate wing 20a in the direction of the closed position thereof or supports the gate wing 20a also from acts of violence from outside in the closed position thereof, respectively.

In the afore-described embodiments, hydraulic drives were used for displacing the gate 20 or the cover 16. As a matter of fact, other drives, for instance, pneumatic, mechanical, electro-mechanical, or electric drives may also be used. The same applies correspondingly also to the lifting means 64. The displacement of the cover may – as men-

tioned – be performed by means of an own primary drive or by a common drive of the lifting device 6 for displacing the lifting ramp 4.

5 The store room 1 described need not be positioned underground, but may also be confined by a kind of bunker or shelter above ground, so that the access opening 8 correspondingly may not be opened upward, but also laterally or downward so as to gain access to the store room 1.

10 Disclosed is an encapsulated store room for accommodating a good to be stored, comprising a gate the gate drive of which is adapted to be mechanically released from the gate in the closed position.

List of reference signs

	1	store room
5	2	good to be stored
	4	lifting ramp
	6	lifting device
	8	access opening
	10	wall
10	12	enclosing concrete building
	14	air gap
	16	cover
	18	seal
	20	gate
15	22	clearance
	24	guide face
	26	guide face
	28	support face
	30	level
20	32	piston rod
	34	console
	36	cylinder
	38	cylinder console
	40	support strut
25	42	support
	44	inclined strut
	46	shoulder
	48	machine room
	50	decoupling gap
30	52	wall portion
	54	floor portion
	55	gate drive
	56	opening module
	58	vertical guide
35	60	vertical guide
	62	guide wall
	64	lifting means
	66	toothed rack

	68	toothed segment
	70	locking module
	72	pivoting cylinder
	74	receiving chamber
5	76	locking cylinder
	78	locking cylinder
	80	locking block
	82	locking block
	84	support
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Claims

1. A store room for accommodating a good to be stored (2), comprising a lifting device (6) by means of which the good to be stored (2) is adapted to be moved out of the store room (1) through an access opening (8) closable by a gate (20), wherein a cover (16) covering the good to be stored (2) is assigned to the lifting device (6) and the gate (20) is movable between an open position and a closed position by means of a gate drive (55), characterized in that said gate drive (55) is mechanically decoupled or released from said gate (20) in the closed position.
2. The store room according to claim 1, wherein it comprises at least one chamber confined by a wall (10) on which said cover (16) sealingly rests in the closed position.
3. The store room according to claim 2, comprising a seal (18) in the abutment region between said cover (16) and said wall (10).
4. The store room according to any of the preceding claims, wherein said cover (16) and said gate (20) are spaced apart from each other.
5. The store room according to any of claims 2 to 4, comprising an air gap (14) between said wall (10) and a concrete building (12) enclosing same.
6. The store room according to any of the preceding claims, wherein said gate (20) is adapted to be moved between an open and a closed position by means of said lifting device (6) – in particular via said cover (16).
7. The store room according to claim 6, wherein said gate (20) and said cover (16) are designed approximately plate-shaped, and wherein said cover (16), after a lift (h), seizes said gate (20) and takes it along.
8. The store room according to claims 6 or 7, wherein damping elements are positioned at said cover (16) and/or at said lifting device (6), said damping elements damping an impact of said cover (16) or said lifting device (6), respectively, on said gate (20).
9. The store room according to claim 6, wherein operable coupling elements – in particular hydraulic cylinders – are arranged at said lifting device (6) and/or at said cover (16), said coupling elements being arranged and operable such that the coupling

elements abut on said gate (20) in an operated condition and transfer the weight of said gate (20) to said lifting device (6).

10. The store room according to any of the preceding claims, wherein said gate (20)
5 has two pivotable gate wings (20a, 20b).

11. The store room according to claim 10, wherein said gate drive (55) is designed as a Scherzer drive.

10 12. The store room according to any of the preceding claims, comprising support elements (84) for the additional supporting of said gate (20) in the closed position.

13. The store room according to any of the preceding claims, wherein said gate drive (55) is adapted to be taken from the decoupled position to an operating position by lifting means (64).
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14. The store room according to any of the preceding claims, comprising coupling elements (76, 78, 80, 82) – in particular locking means – for coupling said gate drive (55) with said gate (20) in the closed position.
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15. The store room according to any of claims 2 to 14, wherein said gate drive (55) is positioned in a machine room (48) that is separated from the chamber.

16. The store room according to any of the preceding claims, wherein said lifting device (6) has a primary drive assigned to said cover (16) and a secondary drive for a lifting ramp (4) carrying said good to be stored (2).
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17. The store room according to any of claims 1 to 15, comprising a common drive for said lifting device (6) and said cover (16).
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18. The store room according to any of the preceding claims, wherein said store room is designed with a plurality of gates (20) and covers (16) in the afore-defined construction.

19. The store room according to any of the preceding claims, wherein a floor portion (54) of said store room (1) and/or a foundation of said gate drive (55) are / is mechani-
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cally decoupled from an enclosing concrete building (12) or form a side wall (52), respectively, by a gap (50).