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(54) **Off-shore construction for harboring vessels and the like**

(57) The invention relates to an off-shore construction for harboring vessels and the like. The construction comprises a seawall, shaped such that it partly encloses an inner mass of water for receiving at least one seaworthy vessel, and substantially prevents the inflow of an outer mass of seawater, except for an entrance in connection with the sea. The construction preferably comprises an inner wall extending substantially within the perimeter of the seawall and shaped such that it partly encloses a part of the inner mass of water, except for an inlet in connection with the entrance. The construction is favorably used for the salvage of vessels in distress, in particular oil containing vessels, and for treating oil to reduce its harm for the environment. Another use includes the temporary storage of people and means for a windmill park.

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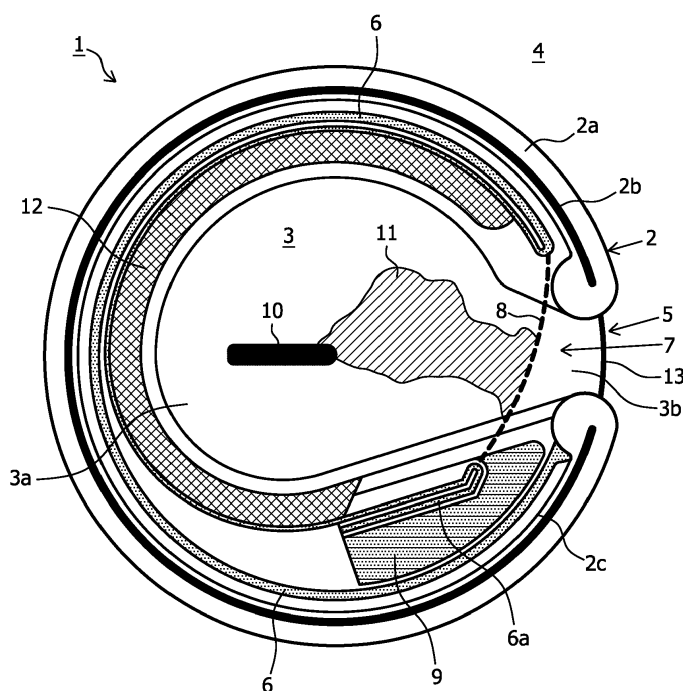


FIG. 1

Description

[0001] The invention relates to a new and inventive off-shore construction for harboring vessels and the like, and optionally for generating power such as electricity from the movement of the sea such as tide. The invention further relates to the use of such an off-shore construction for the salvage of vessels in distress, in particular oil containing vessels, for the treatment of oil to reduce its harm for the environment, and for the temporary storage of people and means for a windmill park.

[0002] Nowadays, with the increase of marine trade and navigation, the risks related to traffic at sea become larger and larger. This risk is further increased by the presence of large constructions at sea, such as wind mill parks for instance, which cover a relatively large area of the sea. Mutual collisions of seaworthy vessels, or collisions with such constructions may represent a disaster for the environment, in particular when oil transport vessels are involved. These vessels, such as VLCC's (very large crude carriers) for instance, have a size typically ranging from 50000 DWT (DWT means dead weight tons) to 200000 DWT and larger. When colliding, huge amounts of oil may contaminate the sea for years.

[0003] It is a purpose of the present invention to provide a solution to the above described problem among others, and/or to provide a useful alternative for solutions already known in the state of the art.

[0004] The invention thereto provides an off-shore construction for harboring vessels and the like, the construction comprising a seawall, shaped such that it partly encloses an inner mass of water for receiving at least one seaworthy vessel, and substantially prevents the inflow of an outer mass of seawater, except for an entrance in connection with the sea. The construction is useful in harboring vessels in distress at sea, and provides a site that is shielded from the sea waves, which among others allows to carry out repair work for instance.

[0005] In a first aspect, the present invention provides an off-shore construction preferably comprising an inner wall extending substantially within the perimeter of the seawall and shaped such that it partly encloses a part of the inner mass of water, except for an inlet in connection with the entrance. Such an embodiment allows to temporarily store vessels and goods that preferably have to be divided off from the environment, for instance because they risk to contaminate the environment.

[0006] In another aspect of the present invention, an off-shore construction is provided, wherein the inlet of the inner wall and/or the entrance of the seawall comprise a closing means for temporarily damming off the mass of water enclosed by the inner wall. This embodiment is particularly useful for oil leaking vessels for instance, since such vessels may then be stored inside said part of the inner mass of water (the part enclosed by the inner wall) causing contamination of this part only when closing the closing means. For ease of closing, the closing means may for instance comprise a curtain out of substantially

oil-impermeable material, such as cloth or steel.

[0007] A preferred embodiment of the off-shore construction according to the invention is provided with inner wall closing means and/or seawall closing means comprising a plurality of caissons, that may be sunken down or remain floating.

[0008] In yet another aspect of the invention, the off-shore construction comprises a mass of water between the inner facing side of the seawall and the outer facing side of the inner wall. Such mass of water acts as a buffer between the sea outside of the off-shore construction and the mass of water enclosed by the inner wall, and therefore reduces the risk of contamination of the seawater. It may also be used to moor vessels that do not represent a substantial risk for contamination.

[0009] In yet another preferred embodiment of the invention, the off-shore construction further comprises beaches, preferably of gravel, for bringing vessels to land. The beaches are preferably situated within the perimeter of the inner wall. Depending on the water level within the off-shore construction and/or within the inner wall thereof, it is possible that the beaches are temporarily flooded by a raised water level, and reclaimed by a lower water level. This embodiment therefore allows to conveniently moor a vessel onto a beach by bringing it above said beach, at a water level whereby said beach is (partly) flooded, and then moor the vessel onto said beach when the water level is low enough to at least partly reclaim said beach.

[0010] Another preferred embodiment of the off-shore construction incorporates an entrance of the seawall, comprising a seawall closing means for temporarily damming off the mass of water enclosed by the seawall. This embodiment allows to willfully lower or raise the mean water level within the off-shore construction, which is useful when carrying out the mooring method on a beach, as described above. In order to lower or raise the water level within the off-shore construction, the seawall closing means may for instance comprise openings to let water out or in, depending on the difference in water level between the sea and the water within the off shore construction, in particular the seawall thereof. It is also possible to provide the off-shore construction with pumping means to be able to actively bring in water or, alternatively, pump water out into the surrounding sea.

[0011] Even more preferred, the seawall closing means comprise openings, provided with at least one tide-turbine. Electrical energy can for instance be generated by letting water in inside the seawall at high tide, and by letting water flow out through the turbines in the openings at low tide. The turbine are known per se and comprise a generator to produce electricity. In the context of the present application, a turbine is defined as a device that is able to converse the hydraulic energy of a fluid (a liquid or a gas) into mechanical energy by means of a rotor, i.e. a rotating assembly of blades. The mechanical energy thus produced can be used to drive another machine, or to drive an electrical generator. The turbines

are typically provided with a casing around the rotor. The casing leads the flow in the desired direction, which improves the energy generation efficiency. A hydraulic turbine uses the flow energy of a water mass between two positions differing in height. A generator is a device that can converse mechanical energy, as produced by a rotating shaft, into electrical energy. The conversion is brought about by the movement (rotation) of an electrical conductor through a magnetic field, thereby generating an electrical tension in the conductor. This tension causes an electrical current to flow in a closed circuit.

[0012] A preferred embodiment of the off-shore construction according to the invention is characterized in that the turbines are adapted to pump water from the inner mass of water to the outer mass of water, or vice versa. In this way, the water level of the inner mass of water can be regulated at will. The energy required to pump the water out of the inner mass of water may be provided by the energy, generated by the turbines.

[0013] The amount of turbines in an opening of the seawall is in principle unlimited and typically depends on the available space. A closing means of an off-shore construction according to the invention may for instance have the dimensions of a typical outlet sluice, and may for instance comprise eighty turbines and more. In a typical embodiment, the closing means of the seawall comprise 4 turbines in 20 outlet openings, each turbine having a rotor diameter of about 2 m. The amount of electrical energy that may be produced in such a configuration may be enough to at least partly operate an off-shore construction according to the invention without having to supply additional energy. The amount of turbines is preferably chosen such that a difference in water level inside and outside of the seawall remains more or less constant.

[0014] The inner wall and/or seawall of the off-shore construction according to the invention may have any shape, as long as the shape is such that an inner mass of water for receiving at least one seaworthy vessel can be enclosed, and that the inflow of an outer mass of seawater is substantially prevented, except for an entrance in connection with the sea. A particularly useful off-shore construction has the inner wall and/or the seawall substantially shaped as a horseshoe. The curved semi-circular shape helps in reflecting the wave energy back towards the sea, and may slow down erosion of the base of the seawall.

[0015] The inner wall and in particular the seawall closing means preferably comprise at least one, and preferably an inner and an outer embankment. The outer embankment may be used to moor vessels and the like at the outer side of the closing means, in particular when these closing means are in their closed position. The embankments may comprise turbines. The inner embankment may also be used as a substantially tide-unaffected mooring place for vessels inside the off-shore construction.

[0016] In another aspect, the off-shore construction according to the invention is characterized in that the

seawall and/or the inner wall comprise a core of quarry run, applied onto the bottom of the sea or onto a suitable foundation of sand or otherwise, and provided with a protective layer of stones, concrete blocks, fibrous open stone asphalt, and/or fibrous dense stone asphalt. A particularly useful protective layer comprises fibrous open stone asphalt and/or fibrous dense stone asphalt. These materials are for instance described in detail in EP 0 344 141 B1, the content of which is explicitly incorporated in its entirety in the present application.

[0017] In a further aspect of the invention, the above described embodiments of the off-shore construction are preferably used for the salvage of vessels in distress, in particular oil containing vessels, for treating oil to reduce its harm for the environment, and for the temporary storage of people and means for a windmill park. A particularly preferred use includes generating power such as electricity from the movement of the sea such as tide.

[0018] The invention will now be explained in more detail with reference to the following figure, without however being limited thereto. In the figure:

- Figure 1 shows a schematic top view of an embodiment of the off-shore construction according to the present invention.

[0019] With reference to figure 1, an off-shore construction 1 according to one embodiment of the invention is shown. The off-shore construction 1 is typically used for harboring vessels 10, in particular oil containing vessels, but may also be used for other purposes, such as to temporarily store materials and/or equipment. In the embodiment shown, construction 1 comprises a substantially semi-circular seawall 2. Seawall 2 may be constructed from a variety of materials, such as reinforced concrete, boulders, steel, gabions (cages, cylinders, or boxes filled with soil or sand) according to well known practices, or may be constructed by dumping large amounts of sand, gravel and the like to create a dike or dam. It is also possible to combine different materials and practices, such as shown in the embodiment of figure 1, where the seawall 2 actually comprises a first foundation part 2a, made by dumping soil material, such as sand and/or gravel, and a second part 2b on top of the first part 2a, which second part 2b is made of reinforced concrete. In some cases, the seawall 2 may comprise a core of quarry run, applied onto the bottom of the sea or onto a suitable foundation of sand or otherwise, and provided with a protective layer of stones, concrete blocks, fibrous open stone asphalt, and/or fibrous dense stone asphalt. Such a seawall 2 is partly porous and dissipates the energy of the incoming waves. The term seawall in the context of this application is thus not limited to hard concrete structures but also refers to earthen banks and the like. Seawall 2 is semi-circular, and in particular shaped as a horseshoe. This shape allows the seawall 2 to at least partly enclose an inner mass of water 3, which is large enough to receive at least one seaworthy vessel 10. Sea-

wall 2 substantially prevents the inflow of an outer mass of seawater 4, except for an entrance 5 in connection with the seawater mass 4 to enable vessels 10 to enter inner water mass 3. The term 'inner' in the context of the present application refers to any object lying within the perimeter of seawall 2, while the term 'outer' refers to any object lying outside the perimeter of the seawall 2. The curved semi-circular shape of the seawall 2 helps in reflecting the wave energy back out to the mass of seawater 4, and slows down erosion of the base of the seawall 2.

[0020] The embodiment of the off-shore construction 1 shown in figure 1 further comprises an inner wall 6 that substantially extends within the perimeter of the seawall 2 and has about the same horseshoe shape as the seawall 2. This need not be so as long as, in particular, inner wall 6 is shaped such that it partly encloses a part 3a of the inner mass of water 3, except for an inlet 7. A part 3b of the inner mass of water 3 lies outside of the perimeter of inner wall 6. Inlet 7 enables vessels 10 and other objects to enter part 3 a of the inner water mass 3. Since vessels 10 and other objects enter the seawall 2 through entrance 5, the inlet 7 and the entrance 5 should be connected in the sense that vessels 10 and other objects can be brought from entrance 5 to inlet 7. The size of the inner wall is preferably large enough to at least harbor one vessel and a number of salvage vessels, which should have sufficient room to maneuver around the vessel.

[0021] In the embodiment shown in figure 1, the inlet 7 of the inner wall 6 of off-shore construction 1 is provided with a closing means 8 for temporarily damming off the mass of water 3a, enclosed by inner wall 6. Closing means 8 may comprise a flexible curtain of cloth for instance, or may comprise a 'harmonica' type curtain of a number of metal elements. It is also possible to use concrete or even wooden structures such as doors. The invention is not limited to any specific type of closing means 8. It is preferred however that the closing means 8 are substantially oil proof. When a vessel 10 that is leaking a mass of oil 11, is brought into the water mass 3a, this mass of water can be closed off from the surrounding water by closing the closing means 8, as shown in figure 1. Flow of the oil mass 11 to sea 4, or to other areas of the off-shore construction 1 is hereby substantially prevented.

[0022] It is possible for the off-shore construction 1 to comprise a mass of water 9 between the inner facing side 2c of the seawall 2, and the outer facing side 6a of the inner wall 6. Such water mass 9 can be used to (temporarily) moor vessels or other material that need not be contained within the area 3a of inner wall 6. The off-shore construction 1 shown in figure 1 further comprises gravel beaches 12 for bringing vessels 10 to land temporarily, in order to repair or service these vessels. Beaches 12 are situated within the perimeter of the inner wall 6 to be able to contain moored vessels 10 from the environment.

[0023] The beaches 12 can readily be flooded and or

reclaimed by raising or lowering the water level inside the seawall 2. In order to be able to lower or raise the water level within seawall 2, the seawall 2 is provided with closing means 13, such as doors or a sluice. Closing means 13 comprise closable openings (not shown) to let water out or in, depending on the difference in water level between the sea 4 and the water 3 within the off-shore construction 1. It is also possible to provide the off-shore construction 1 with pumping means (not shown) to be able to actively bring in water or, alternatively, pump water out into the surrounding sea 4. The closable openings of seawall closing means 13 are provided with turbines to generate electricity.

[0024] The inner wall closing means 8 and/or the seawall closing means 13 may comprise an assembly of a number of caissons (or one caisson in case the inlet 7 or entrance 5 is small enough to be able to substantially cover them by one caisson). A caisson may be sunken down or may be floating. The use of caissons is particularly favorable when the inlet 7 or entrance 5 are large. In case the caissons are sunken down, they may be provided with a plurality of turbines as described above. In case the caissons remain floating, they form a very suitable closing means 8 to protect against oil leakage.

[0025] The turbines present in the closable openings of the seawall closing means 13 (and/or inner wall closing means 8) are preferably adapted to generate energy in two directions. For instance, by closing the off-shore construction 1 through shutting closing means 13 for a period of time, and waiting until the water level inside the seawall 2 is higher than the water level outside the seawall 2, electricity is generated by opening the seawall openings so that the ensuing water flow through the openings activates the turbines. When the turbines are adapted to operate in two directions, energy can also be generated when the water level outside the seawall 2 is actually higher than the water level inside the seawall 2. The amount of turbines is preferably chosen such that a difference in water level inside and outside of the seawall 2 remains more or less constant, say 2 m or any other difference in water level. For instance, if the tide rises (lowers) about 1 m per hour, the amount of turbines (or the amount of openings in the closing means 13) should be chosen such that a volume of water flows in (or out of) the off-shore construction corresponding to a water level variation of 1m per hour.

[0026] The invention is not limited to the embodiment described above, and many other embodiments may be envisaged within the scope of the appended claims.

Claims

1. An off-shore construction for harboring vessels and the like, the construction comprising a seawall, shaped such that it partly encloses an inner mass of water for receiving at least one seaworthy vessel, and substantially prevents the inflow of an outer

mass of seawater, except for an entrance in connection with the sea.

2. Off-shore construction according to claim 1, comprising an inner wall extending substantially within the perimeter of the seawall and shaped such that it partly encloses a part of the inner mass of water, except for an inlet in connection with the entrance. 5
3. Off-shore construction according to claim 2, wherein the inlet of the inner wall and/or the entrance of the seawall comprise a closing means for temporarily damming off the mass of water enclosed by the inner wall and/or the seawall. 10
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4. Off-shore construction according to claim 2 or 3, comprising a mass of water between the inner facing side of the seawall and the outer facing side of the inner wall. 20
5. Off-shore construction according to any one of the preceding claims, comprising beaches, preferably of gravel, for bringing vessels to land.
6. Off-shore construction according to claim 5, the beaches being situated within the perimeter of the inner wall. 25
7. Off-shore construction according to any one of the preceding claims, wherein the inner wall and/or the seawall are substantially shaped as a horseshoe. 30
8. Off-shore construction according to any one of the preceding claims, wherein the seawall and/or the inner wall comprise a core of quarry run, applied onto the bottom of the sea or onto a suitable foundation of sand or otherwise, and provided with a protective layer of stones, concrete blocks, fibrous open stone asphalt, and/or fibrous dense stone asphalt. 35
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9. Off-shore construction according to any one of claims 3 - 8, wherein the inner wall closing means and/or the seawall closing means comprise a plurality of caissons. 45
10. Off-shore construction according to claim 9, wherein the inner wall closing means and/or the seawall closing means comprise openings, provided with at least one tide-turbine. 50
11. Use of an off-shore construction according to any one of claims 1 - 10 for the salvage of vessels in distress, in particular oil containing vessels.
12. Use according to claim 11, wherein the oil is treated in the off-shore construction to reduce its harm for the environment. 55

13. Use of an off-shore construction according to any one of claims 1 - 10 for the temporary storage of people and means for a windmill park.

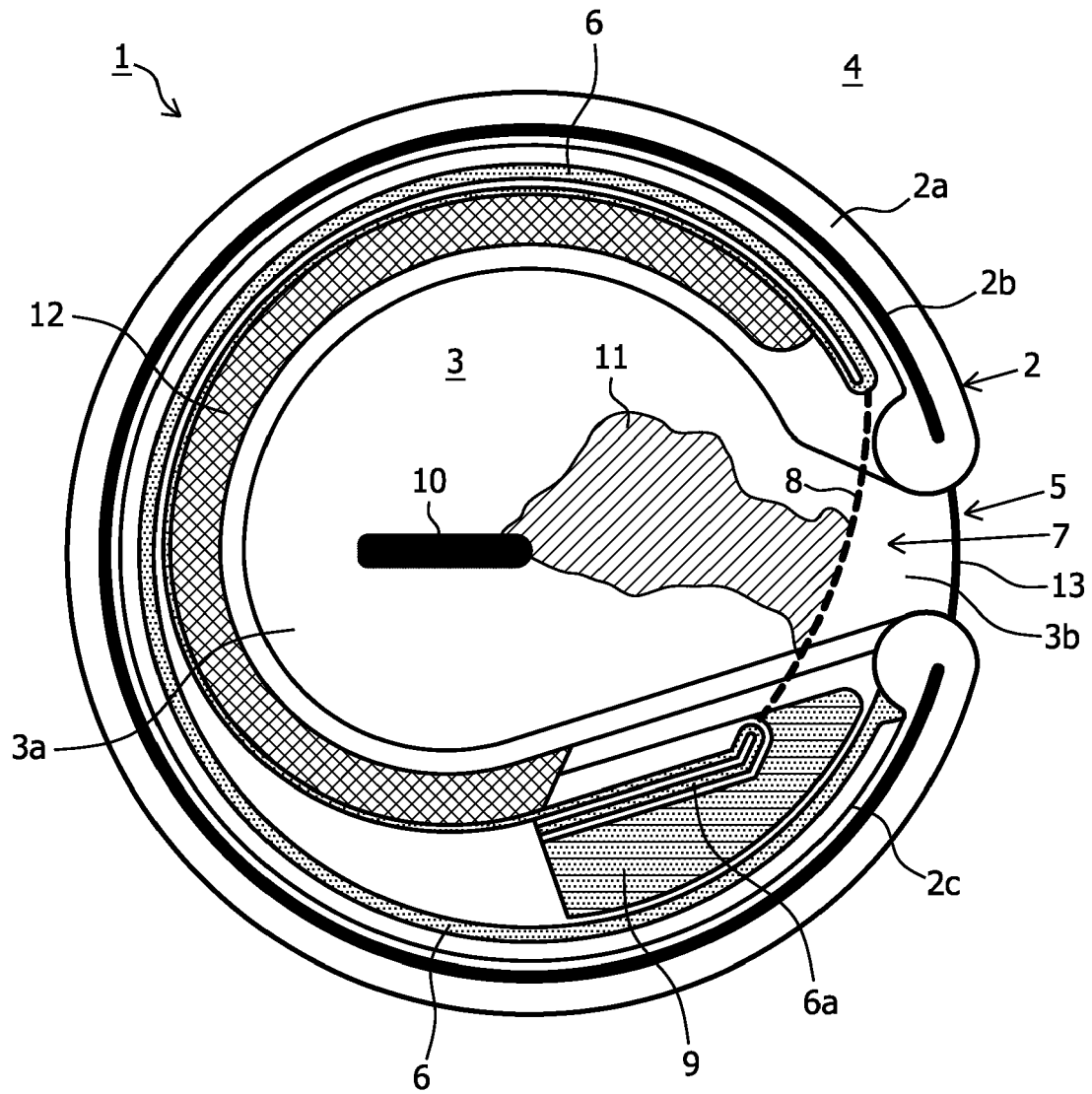


FIG. 1



EUROPEAN SEARCH REPORT

Application Number
EP 09 17 4248

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2002/131823 A1 (SHERMAN MARTIN [GB]) 19 September 2002 (2002-09-19)	1-3,5,6, 10	INV. E02B3/06
A	* paragraphs [0026], [0043]; figures 1,2 *	8,13	
X	DE 43 03 977 A1 (GUHLMANN PETER DIPL ING [DE]) 11 August 1994 (1994-08-11)	1,4,5, 11,13	
A	* column 1, lines 47-53; figure 1 * * column 2, lines 41-44; claims 6,7 *	2,10	
X	US 2 044 795 A (KNIGHT HERBERT M) 23 June 1936 (1936-06-23)	1,2,4, 11,13	
A	JP 03 221608 A (KAIYO KENSETSU KK) 30 September 1991 (1991-09-30)		
A	DE 27 32 134 A1 (HEILMANN & LITTMANN BAU AG) 25 January 1979 (1979-01-25)	8	TECHNICAL FIELDS SEARCHED (IPC)
	* the whole document *		E02B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 12 February 2010	Examiner Leher, Valentina
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 17 4248

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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12-02-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002131823 A1	19-09-2002	US 2004022584 A1	05-02-2004
DE 4303977 A1	11-08-1994	NONE	
US 2044795 A	23-06-1936	NONE	
JP 3221608 A	30-09-1991	NONE	
DE 2732134 A1	25-01-1979	NONE	

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0344141 B1 [0016]