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(54) **Floatable oil absorber, its uses, and its method of manufacture**

Schwimmfähiger Ölabsorber, seine Verwendung und Verfahren zur Herstellung

Absorbeur d'huile flottant, ses utilisations et son procédé de fabrication

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Description

[0001] The present invention relates to certain floatable devices for absorbing spilt oil from a surface, in particular a water surface. It also relates to the use of the floatable devices for absorbing spilt oil and to a method of manufacturing such floatable devices.

[0002] It is well known that during marine oil well drilling, oil production, and oil transportation operations the possibility exists for oil to be spilt, which will then float as a film on the water, being subject to drifts and currents which may eventually wash the spilt oil or a less volatile part of it ashore.

[0003] Previous proposals to deal with spilt oil on beach or water surfaces include so-called booms, i.e., floatable tube-like structures having an oil absorbing material disposed near their circumference (e.g., WO 93/04236 A1). Such booms have primarily a barrier effect, in that they separate the contaminated water surface from clean areas; their secondary effect is to absorb oil coming into contact with the booms. In practice, it has become clear that the effectiveness of known booms is unsatisfactory.

[0004] It is also known, in principle at least, to drop hydrophobic mats onto oil contaminated water or other surfaces, and to recollect such mats after some time (e.g., US 6,506,307 B1). Again, in actual practice, it has become clear that it is quite ineffective to deal even with a medium-sized marine oil spill in this manner.

[0005] Patent document US 3,679,058 discloses a water-floatable modular device according to the preamble of claim 1, and in particular an oil absorbing boom comprising an elongated flat tubular sleeve of polymer netting having pouches each enclosing within itself one flat elongated slab or bat of polymer material arrayed end to end, the pouches sufficiently spaced apart to permit accordion folding of the sleeve at fold lines between adjacent bats, with a tension bearing rope or cable being positioned within the tubular sleeve alongside the bats.

[0006] Patent document US 3,904,528 discloses a method of manufacturing a floatable modular device according to the preamble of claim 7, and in particular a process of making an oil absorbing element comprising stitching together and heat sealing three sides of two water impervious sheets to provide a seal against the ingress of water, placing one comb-like absorber inside, and folding double and stitching a fourth side of the sheets to form a seal therealong.

[0007] It is an object of the present invention to suggest a device, its use, and its method of manufacture, with which the detrimental effects of marine oils spills can be reduced in a more effective manner. This is accomplished by the device of claim 1, the method of claim 7, and the uses of claims 8 or 10.

[0008] According to a first aspect, a device for absorbing oil from a surface is modular and floatable, and comprises a generally disk-shaped floatable cage tapering towards the periphery of the cage in a peripheral region thereof, and a water-repellent strip-shaped oil absorbent accommodated in the cage. The cage further comprises at least one connector element configured for joining plural ones of the modular devices together, to form an articulate oil absorber in which the individual cages are oriented in parallel to one another. Polyolefins are useful as water-repellent material.

[0009] In embodiments, the at least one connector element includes connecting structure configured to support the plural ones of the cages in a non-coplanar, face-on manner as a stack, in which stack the peripheral regions of the mutually adjacent cages form a corrugated envelope. In one example, each cage may have a central eye, and all cages are arranged on a common rod or tube passing through the eyes. The cages may be round, or generally polygonal.

[0010] In embodiments, a stack of mutually connected devices results, wherein the stack may include connecting structure configured to connect a top or bottom of the stack to the top or bottom of an adjacent, like stack in an end-on fashion. In this manner, a chain of stacks can be formed, each stack constituting a member of the chain. In some embodiments, a cushion may be interposed between the connected stacks. E.g., a smaller number of disks than the number accommodated in each stack may be arranged between adjacent stacks, to form such a cushion, allowing some relative bending of the connected stacks.

[0011] In another embodiment, there are plural connector elements on each modular device, each configured to be joined with a corresponding connector element of an adjacent, like modular device in a coplanar, edge-on fashion, to form a one- or two-dimensional array, in which array each modular device has a generally polygonal disk shape, such as rectangular or square.

[0012] In this embodiment, each modular device takes the shape of a mat, with plural eyes around its periphery. E.g., the rims may be folded in the region where the eyes are formed to provide enhanced stability. Neighboring mats can then be connected by connecting means such as loops made of a plastic material, to form an array of mats matching e.g. the size of the oil spill.

[0013] In an embodiment, a stack of mutually connected modular devices of this sort is formed before actual use, wherein connected adjacent ones of the generally polygonal modular devices are folded upon one another in a direction transverse to the plane of the modular devices. Usually, the devices are placed horizontally, and stacked vertically.

[0014] According to another aspect, a method of manufacturing a floatable modular device for absorbing oil from a surface comprises providing a first, grid-like sheet made of plastics, positioning a water-repellent strip-shaped oil absorbent on the first grid-like sheet, positioning a second sheet on the oil absorbent, and then welding the first and second sheets together at their peripheries, with the oil absorbent in between, wherein peripheral regions of the first and second sheets are bent towards one

another. Depending on which device is to be manufactured, the sheets may be round (circular or oval) or polygonal (such as square or hexagonal). Both sheets may be grid-like, or else only one of them, the other being oil-impervious, for certain on-shore applications.

[0015] According to a further aspect, the stack of mutually connected modular devices may be used for absorbing oil spilt on a water surface, comprising connecting plural ones of the stacks as a chain and disposing the chain onto a part of the water surface in a vicinity of the part of the water surface on which the oil has been spilt. In embodiments, the oil has a drift direction, and the chain is disposed transverse to the drift direction, wherein the stacks are oriented such that the individual cages are oriented such that their thickness directions extend transverse to the drift direction of the spilt oil. In this manner, the chain may serve as a barrier to the oil, while the water may flow relatively freely through the vertically arranged cages, in this way enhancing the amount of oil absorbed as compared to a structure which also blocks the flow of water. The drift direction may result from a radial motion of the oil away from the source of the spill, and/or a linear motion due to a current or wind action. Usually, near a coastline the drift direction is transverse to the coastline, eventually washing spilt oil ashore.

[0016] According to a yet further aspect, a stack of mats is used for absorbing oil spilt on a water or coastline surface, comprising unfolding the stack and disposing the mats as a one-dimensional or two-dimensional interconnected flat array onto the spilt oil or onto a coastline area to be protected from the spilt oil. In the former case, each modular device may have two cage faces made of grid-like sheets, such that the oil absorber is accessible to the oil from both faces, and the stack is used on a water surface on which oil has been spilt. In this manner, both oil from underneath and oil sprayed on the top surface by wave and wind action can be absorbed. In the latter case, each modular device has one cage face made of a grid-like sheet, the opposing cage face made of an oil-impervious sheet, such that the oil absorber is accessible to the oil from only one face, and the stack is used on a coastline surface on which no oil has yet been spilt, with the oil-impervious face down and the grid-like face up so as to protect the coastline surface from oil to be washed ashore.

[0017] In embodiments, the absorbent material and/or shape and/or the number of cages per stack is selected in dependence of the oil grade. E.g., more viscous oil may call for fewer disks per stack, and/or less absorbent per module, and *vice versa.*

[0018] In further embodiments, the disposed modular devices are later recollected along with the absorbed oil. Furthermore, the modular device may be burnt together with the absorbed oil so as to release thermal energy, and a part of the thermal energy so released may be converted into electrical or mechanical energy.

[0019] The invention will now be described with respect to the accompanying drawings:

Figure 1 shows a stacked-disks module according to a first embodiment;

Figure 2 shows an end-on view of the module of Figure 1; and

Figure 3 shows a mat absorber according to a second embodiment.

[0020] According to the first embodiment of Figure 1, a number of 15-25 individual disks 3 is stacked on a common center rod or tube 5, to form a generally cylindrical module 1. The stack is held together by end grids 7, which end grids are in turn connected by a number of 3-8 outer tubes 17 (in the example, 5 tubes are shown). The end grids 7 may have a star shape as shown (with 5 radial struts 19, one of which is shown dashed).

[0021] With respect to Figure 2, each individual disk 3 is round in shape and doughnut-shaped in cross section, having an outer peripheral region in which the thickness gradually tapers towards the rim. Each disk has faces made of grid-like polyethylene sheets, and an interior made up of polypropylene strips. The polyethylene sheets may have a weight of 300-400 g/m^2, with openings of 7-10 mm mean size. The strips may be 70-120 mm in length, 3-5 mm in width, and 0.5-2 mm in thickness. Generally, the width/thickness ratio is in the range 1.5-10, with 3-5 preferred. While the size D of the disks depends on the intended use, it has been found that 30-100 cm is most useful, with 40-70 cm preferred. The overall diameter D' of the module will be slightly larger, by about 5 to 10 cm. The strip-shaped absorber material (250-350 g for a 50-60 cm sized disk) allows for a loose packing avoiding dense clots. Therefore, water may pass relatively unrestrictedly through the bulk of the module, the created turbulence carrying the oil to the absorber.

[0022] The method of manufacturing the individual disks includes placing a proper amount of the oil absorbent polypropylene strips onto a lower grid-like polyethylene sheet, then placing a like sheet on top, and welding the sheets together at their peripheral rims 21.

[0023] In the embodiment shown in Figure 1, 25 disks are housed inside each module 1, with 5 further disks 15 mounted on an outward extension of the center rod 5, held by an end disk 9 of the rod.

[0024] Two cables 11 (polypropylene) with hooks 13 are led through two (non-adjacent ones) of the 5 outer tubes 17, for connecting adjacent modules 1 to one another. In the connected state, the 5 external disks 15 fill the space between adjacent modules 1. In this manner, a chain of modules 1 can be disposed transverse to the expected drift of spilt oil, the oil everywhere encountering an oil absorbing module 1. A typical size of a module would be 0.5 m to 1 m in length L including the 10-20 cm extension L" for the outer disks 15 (length of main body L'=L-L"). Each module of this type can absorb more than 100 and up to 150 l of oil, e.g. 110-120 liters for a module 60 cm in diameter and 75 cm in length, weighing only 12

kg dry.

[0025] It may be noted that on account of the density of the plastic material of 950-965 kg/m^3 the inventive structures have sufficient buoyancy to float even in fresh water, more so in salt water. The bulk of the structures will, however, sink below sea level and therefore is able to absorb oil from the water passing through it. At the same time, no oil can pass through underneath the modules.

[0026] In the second embodiment of Figure 3, a generally rectangular or square mat 10 is shown, with top and bottom sheets of the same grid-like polyethylene material as described above, and also the same filling of oil absorbing polypropylene strips. In this case, the rims of the pillow are folded (indicated by dashed lines), and eyes 22 (circular or oval as shown) formed therethrough to provide connectability. Welding the rims may be dispensible where the eyes are configured to secure the rims against unintended reopening.

[0027] Such mats 10, the size of which may vary e.g. between 50 cm and 100 cm side length, can easily be interconnected to form a two-dimensional array of in principle unlimited size. In one approach, such interconnected mats are folded atop one another in the shape of a stack, ready to be unfolded when used. In this manner, it is possible to quickly dispose large numbers of mats onto an oil-contaminated water surface or beach area, while still being able to later recollect the oil-filled mats as easily. Each mat of this type (~2 kg/m^2 of absorber) may absorb more than 10 and up to 20 l of oil, e.g. 16 l per square meter.

[0028] It is also contemplated to use mats of this type together with the modules, in order to absorb the spilt oil when it has accumulated upwind (or upstream) of a chain of the modules of the invention.

[0029] In a variant, one of the two faces of each mat is not grid-shaped, but is made of an oil-impervious sheet. In this embodiment, mats can be placed e.g. on a beach or other coastal area which is not yet contaminated. When spilt oil is later washed ashore by wave and wind action, it will be absorbed by such mats covering the beach, and will not contaminate the beach.

[0030] The oil-filled modules or mats can be recollected and removed from the water surface, significantly reducing the amount of oil present on the water. The modules or mats may be burnt together with the oil, in order to use the thermal energy so released. In order to provide for clean burning, no halogenated polymer should be used in the manufacturing of the modules and mats, although the use of polyolefins as explained above is not strictly necessary.

[0031] Further modifications or variations will be readily contemplated by the skilled person, without departing from the scope of present invention as set out in the appended claims.

Claims

1. A water-floatable modular device (1; 10) for absorbing oil from a surface, comprising:

   a generally disk-shaped floatable cage (3) or floating mat (10) generally shaped as a polygon tapering towards the periphery of the cage (3) or mat (10) in a peripheral region thereof; and
   a water-repellent oil absorbent accommodated in the cage (3) or mat (10),
   wherein the cage (3) or mat (10) further comprises at least one connector element (5;22) configured for joining plural ones of the modular devices (1; 10) together, to form an articulate oil absorber in which the individual cages (3) or mats (10) are oriented in parallel to one another,
   characterized by
   the water-repellent oil absorbent being in the shape of loosely packed strips and accommodated in the individual cage (3) or mat (10) so as to allow water passing through the bulk of the module to carry the oil to the absorbent strips.

2. The device of claim 1, wherein the at least one connector element includes connecting structure configured to support the plural ones of the cages in a non-coplanar, face-on manner as a stack, in which stack the peripheral regions of the mutually adjacent cages form a corrugated envelope.

3. A stack of mutually connected devices of claim 2, wherein the stack includes connecting structure configured to connect a top or bottom of the stack to the top or bottom of an adjacent, like stack in an end-on fashion.

4. The stack of claim 3, connected to a like stack in an end-on fashion by a cushion interposed side-on between the stacks.

5. The modular device of claim 1, wherein there are plural connector elements each configured to be joined with a corresponding connector element of an adjacent, like modular device in a coplanar, edge-on fashion, to form a one- or two-dimensional array, in which array each modular device has a generally polygonal disk shape.

6. A stack of mutually connected modular devices of claim 5, wherein connected adjacent ones of the generally polygonal modular devices before use are folded upon one another in a direction transverse to the plane of the modular devices.

7. A method of manufacturing a water-floatable modular device (1; 10) for absorbing oil from a surface, in particular the device of claim 1, 2 or 5, comprising:

providing a first sheet made of plastics,
positioning a water-repellent oil absorbent on the first sheet,
positioning a second sheet on the oil absorbent, and
welding the first and second sheets together at their peripheries (21), with the oil absorbent in between, wherein peripheral regions of the first and second sheets are bent towards one another,
characterized by
the water-repellent oil absorbent being in the shape of loosely packed strips, and by the first sheet being grid-like for allowing water to pass through the bulk of the module for carrying the oil to the absorbent strips.

8. Use of the stack of mutually connected modular devices of claim 3 or 4 for absorbing oil spilt on a water surface, comprising connecting plural ones of the stacks as a chain and disposing the chain onto a part of the water surface in a vicinity of the part of the water surface on which the oil has been spilt.

9. The use of claim 8, wherein the oil has a drift direction, and wherein the chain is disposed transverse to the drift direction, wherein the stacks are oriented such that the individual cages are oriented such that their thickness directions extend transverse to the drift direction of the spilt oil.

10. Use of the stack of claim 6 for absorbing oil spilt on a water or coastline surface, comprising unfolding the stack and disposing the modular devices as a two-dimensionally interconnected flat array onto the spilt oil or onto a coastal area to be protected from the spilt oil.

11. The use of claim 10, wherein each modular device has two cage faces made of grid-like sheets, such that the oil absorber is accessible to the oil from both faces, and the stack is used on a water surface on which oil has been spilt.

12. The use of claim 10, wherein each modular device has one cage face made of a grid-like sheet, the opposing cage face made of an oil-impervious sheet, such that the oil absorber is accessible to the oil from only one face, and the stack is used on a coastline surface on which no oil has yet been spilt, with the oil-impervious face down and the grid-like face up so as to protect the coastline surface from oil to be washed ashore.

13. The use of one of claims 8 to 12, wherein the absorbent material and/or shape or the number of cages per stack is selected in dependence of the oil grade.

14. The use of one of claims 8 to 13, further comprising then recollecting the disposed modular devices along with the absorbed oil.

15. The use of claim 14, further comprising burning the modular device together with the absorbed oil so as to release thermal energy, and optionally converting a part of the thermal energy so released into electrical or mechanical energy.

Patentansprüche

1. Wasser-schwimmfähiges modulares Gerät (1; 10) zum Aufnehmen von Öl von einer Oberfläche, aufweisend:

einen allgemein scheibenförmigen schwimmfähigen Käfig (3) oder eine allgemein als Polygon geformte schwimmende Matte (10), der bzw. die sich in einem Umfangsbereich zu einem Umfang des Käfigs (3) bzw. der Matte (10) hin verjüngt; und
ein wasserabweisendes Ölaufnahmemittel, das in dem Käfig (3) bzw. der Matte (10) beherbergt ist,
wobei der Käfig (3) bzw. die Matte (10) ferner wenigstens ein Verbinderelement (5;22) aufweist, welches dazu ausgebildet ist, mehrere der modularen Geräte (1; 10) miteinander zu verbinden, um einen gegliederten Ölaufnehmer zu bilden, in welchem die einzelnen Käfige (3) bzw. Matten (10) parallel zueinander ausgerichtet sind,
dadurch gekennzeichnet, dass
das wasserabweisende Ölaufnahmemittel in Form lose gepackter Streifen vorliegt und so in dem einzelnen Käfig (3) bzw. der Matte (10) angeordnet ist, dass Wasser durch das Innere des Käfigs treten und das Öl zu den Aufnehmerstreifen spülen kann.

2. Gerät nach Anspruch 1, wobei das wenigstens eine Verbinderelement eine Verbinderstruktur aufweist, die dazu ausgebildet ist, die mehreren Käfige in einer nicht-komplanaren Seite-an-Seite-Weise als Stapel zu haltern, in welchem Stapel die Umfangsbereiche der zueinander benachbarten Käfige eine gefältelte Umhüllung bilden.

3. Stapel der miteinander verbundenen Geräte nach Anspruch 2, wobei der Stapel eine Verbinderstruktur aufweist, die dazu ausgebildet ist, einen Deckel oder Boden des Stapels mit dem Deckel oder Boden eines benachbarten gleichartigen Stapels in einer Ende-an-Ende-Weise zu verbinden.

4. Stapel nach Anspruch 3, der mit einem gleichartigen

Stapel in einer Ende-an-Ende-Weise verbunden ist, wobei zwischen den Stapeln ein Kissen Seite-an-Seite angeordnet ist.

5. Modulares Gerät nach Anspruch 1, wobei mehrere Verbinderelemente vorhanden sind, deren jedes dazu ausgebildet ist, mit einem entsprechenden Verbinderelement eines benachbarten, gleichartigen modularen Geräts in einer komplanaren Kante-an-Kante-Weise verbunden zu werden, um eine ein- oder zwei-dimensionale Anordnung zu bilden, in welcher Anordnung jedes der modularen Geräte eine allgemein polygonale Scheibenform aufweist.

6. Stapel von miteinander verbundenen modularen Geräten nach Anspruch 5, wobei benachbarte, miteinander verbundene der allgemein polygonalen modularen Geräte vor der Verwendung in einer Richtung aufeinander gestapelt sind, die quer zu der Ebene der modularen Geräte ist.

7. Verfahren zum Herstellen eines Wasser-schwimmfähigen modularen Geräts (1; 10) zum Aufnehmen von Öl von einer Oberfläche, insbesondere des Geräts nach Anspruch 1, 2 oder 5, beinhaltend:

Bereitstellen einer ersten Lage aus Kunststoff,
Platzieren eines Wasser-abweisenden Ölaufnehmers auf der ersten Lage,
Platzieren einer zweiten Lage auf dem Ölaufnehmer, und
Verschweißen der ersten und der zweiten Lage miteinander an ihren Umfängen (21), mit dem Ölaufnehmer dazwischen, wobei Umfangsbereiche der ersten und der zweiten Lage zueinander hin gekrümmt sind,
dadurch gekennzeichnet, dass
der Wasser-abweisende Ölaufnehmer in Form von lose gepackten Streifen vorliegt, und dass die erste Lage gitterartig ist, um Wasser zu gestatten, durch das Innere des Moduls zu treten, um das Öl zu den Aufnehmerstreifen zu spülen.

8. Verwendung des Stapels miteinander verbundener modularer Geräte nach Anspruch 3 oder 4 zum Aufnehmen von auf eine Wasseroberfläche ausgetretenem Öl, beinhaltend Verbinden mehrerer der Stapel zu einer Kette und Ausbringen der Kette auf einem Bereich der Wasseroberfläche in der Umgebung des Bereichs der Wasseroberfläche, auf den das Öl ausgetreten ist.

9. Verwendung nach Anspruch 8, wobei das Öl eine Driftrichtung aufweist, und wobei die Kette quer zu der Driftrichtung ausgebracht wird, wobei die Stapel so ausgerichtet sind, dass die einzelnen Käfige so ausgerichtet sind, dass ihre Dickenrichtungen sich quer zur Driftrichtung des ausgetretenen Öls erstrecken.

10. Verwendung des Stapels nach Anspruch 6 zum Aufnehmen von auf eine Wasser- oder Küstenoberfläche ausgetretenem Öl, beinhaltend Entfalten des Stapels und Ausbringen der modularen Geräte als eine zwei-dimensionale, zusammenhängende Anordnung auf dem ausgetretenen Öl oder auf einem Küstenbereich, der vor dem ausgetretenen Öl geschützt werden soll.

11. Verwendung nach Anspruch 10, wobei jedes modulare Gerät zwei Käfigseiten aus gitterartigen Lagen aufweist, so dass der Ölaufnehmer dem Öl von beiden Seiten zugänglich ist, und wobei der Stapel auf einer Wasseroberfläche eingesetzt wird, auf die Öl ausgetreten ist.

12. Verwendung nach Anspruch 10, wobei jedes modulare Gerät eine Käfigseite aus seiner gitterartigen Lage aufweist, und die gegenüberliegende Käfigseite aus einer Öl-undurchlässigen Lage gebildet ist, so dass der Ölaufnehmer dem Öl nur von einer Seite aus zugänglich ist, und der Stapel auf einem Küstenbereich eingesetzt wird, auf dem noch kein Öl ausgetreten ist, mit der Öl-undurchlässigen Lage nach unten und der gitterartigen Lage nach oben, um so die Küstenoberfläche vor angespültem Öl zu schützen.

13. Verwendung nach einem der Ansprüche 8 bis 12, wobei das Aufnehmermaterial und/oder die Form oder die Anzahl der Käfige pro Stapel in Abhängigkeit von der Ölsorte ausgewählt wird.

14. Verwendung nach einem der Ansprüche 8 bis 13, ferner beinhaltend das Wiedereinsammeln der ausgebrachten modularen Geräte zusammen mit dem aufgenommenen Öl.

15. Verwendung nach Anspruch 14, ferner beinhaltend das Verbrennen der modularen Geräte zusammen mit dem aufgenommenen Öl, um thermische Energie freizusetzen, und optional Umwandeln eines Teils der so freigesetzten thermischen Energie in elektrische oder mechanische Energie.

Revendications

1. Dispositif modulaire flottable sur l'eau (1 ; 10) pour absorber du pétrole à partir d'une surface, comprenant :

une cage flottable, généralement en forme de disque (3) ou un tapis flottant (10) généralement formé comme un polygone s'amincissant vers la périphérie de la cage (3) ou du tapis (10) dans

une région périphérique de celui-ci ; et
un absorbant de pétrole hydrofuge reçu dans la cage (3) ou le tapis (10),
dans lequel la cage (3) ou le tapis (10) comprend en outre au moins un élément de liaison (5 ; 22) configuré pour réunir ensemble une pluralité des dispositifs modulaires (1 ; 10), pour former un absorbeur de pétrole articulé dans lequel les cages (3) ou les tapis (10) individuels sont orientés parallèlement les uns aux autres,
caractérisé en ce que
l'absorbant de pétrole hydrofuge est sous la forme de bandes tassées de manière lâche et reçues dans la cage (3) ou le tapis (10) individuel de manière à permettre à l'eau de passer à travers la masse du module pour transporter le pétrole jusqu'aux bandes d'absorbant.

2. Dispositif selon la revendication 1, dans lequel le au moins un élément de liaison inclut une structure de liaison configurée pour supporter la pluralité des cages d'une manière non coplanaire, par les faces comme une pile, pile dans laquelle les régions périphériques des cages mutuellement adjacentes forment une enveloppe ondulée.

3. Pile de dispositifs mutuellement reliés selon la revendication 2, dans laquelle la pile inclut une structure de liaison configurée pour relier une partie supérieure ou inférieure de la pile à la partie supérieure ou inférieure d'une pile analogue, adjacente, d'une façon par les extrémités.

4. Pile selon la revendication 3, reliée à une pile analogue, d'une façon par les extrémités, par un coussin interposé sur les côtés entre les piles.

5. Dispositif modulaire selon la revendication 1, dans lequel il existe une pluralité d'éléments de liaison, chacun étant configuré pour être assemblé avec un élément de liaison correspondant d'un dispositif modulaire analogue, adjacent, d'une façon coplanaire, par les bords, pour former un réseau uni- ou bi-dimensionnel, réseau dans lequel chaque dispositif modulaire a une forme de disque généralement polygonal.

6. Pile de dispositifs modulaires mutuellement reliés selon la revendication 5, dans laquelle des dispositifs adjacents reliés parmi les dispositifs modulaires généralement polygonaux avant utilisation sont pliés les uns sur les autres dans une direction transversale au plan des dispositifs modulaires.

7. Procédé de fabrication d'un dispositif modulaire flottable sur l'eau (1 ; 10) pour absorber du pétrole à partir d'une surface, en particulier le dispositif selon la revendication 1, 2 ou 5, comprenant :

fournir une première feuille en matière plastique,
positionner un absorbant de pétrole hydrofuge sur la première feuille,
positionner une seconde feuille sur l'absorbant de pétrole, et
souder les première et seconde feuilles ensemble sur leurs périphéries (21), avec l'absorbant de pétrole entre celles-ci, dans lequel des régions périphériques des première et seconde feuilles sont pliées l'une vers l'autre,
caractérisé en ce que
l'absorbant de pétrole hydrofuge est sous la forme de bandes tassés de manière lâche et **en ce que** la première feuille est analogue à une grille pour permettre à l'eau de passer à travers la masse du module pour transporter le pétrole jusqu'aux bandes d'absorbant.

8. Utilisation de la pile de dispositifs modulaires mutuellement reliés selon la revendication 3 ou 4 pour absorber du pétrole déversé sur une surface d'eau, comprenant la liaison d'une pluralité des piles sous la forme d'une chaîne et le positionnement de la chaîne sur une partie de la surface d'eau au voisinage de la partie de la surface d'eau sur laquelle le pétrole s'est déversé.

9. Utilisation selon la revendication 8, dans laquelle le pétrole a une direction de dérive, et dans laquelle la chaîne est disposée transversale à la direction de dérive, dans laquelle les piles sont orientées de telle sorte que les cages individuelles sont orientées de telle sorte que leurs directions d'épaisseur s'étendent transversales à la direction de dérive du pétrole versé.

10. Utilisation de la pile selon la revendication 6 pour absorber du pétrole déversé sur une surface d'eau ou de ligne de côte, comprenant le dépliage de la pile et le positionnement des dispositifs modulaires sous la forme d'un réseau plat à liaison bidimensionnelle sur le pétrole versé ou sur une zone côtière à protéger du pétrole versé.

11. Utilisation selon la revendication 10, dans laquelle chaque dispositif modulaire a deux faces de cage faites de feuilles analogues à des grilles, de telle sorte que l'absorbeur de pétrole est accessible au pétrole à partir des deux faces, et la pile est utilisée sur une surface d'eau sur laquelle du pétrole a été versé.

12. Utilisation selon la revendication 10, dans laquelle chaque dispositif modulaire a une face de cage faite d'une feuille analogue à une grille, la face de cage opposée étant faite d'une feuille imperméable au pétrole, de telle sorte que l'absorbeur de pétrole est accessible au pétrole à partir d'une seule face, et la

pile est utilisée sur une surface de ligne de côte sur laquelle aucun pétrole n'a encore été versé, avec la face imperméable au pétrole vers le bas et la face analogue à une grille vers le haut de manière à protéger la surface de ligne de côte du pétrole devant être lavé à terre.

13. Utilisation selon l'une des revendications 8 à 12, dans laquelle le matériau absorbant et/ou la forme ou le nombre de cages par pile est choisi en fonction de la qualité de pétrole.

14. Utilisation selon l'une des revendications 8 à 13, comprenant en outre ensuite la recollecte des dispositifs modulaires disposés ainsi que du pétrole absorbé.

15. Utilisation selon la revendication 14, comprenant en outre la combustion du dispositif modulaire ainsi que du pétrole absorbé de manière à libérer de l'énergie thermique, et facultativement la conversion d'une partie de l'énergie thermique ainsi libérée en énergie électrique ou mécanique.

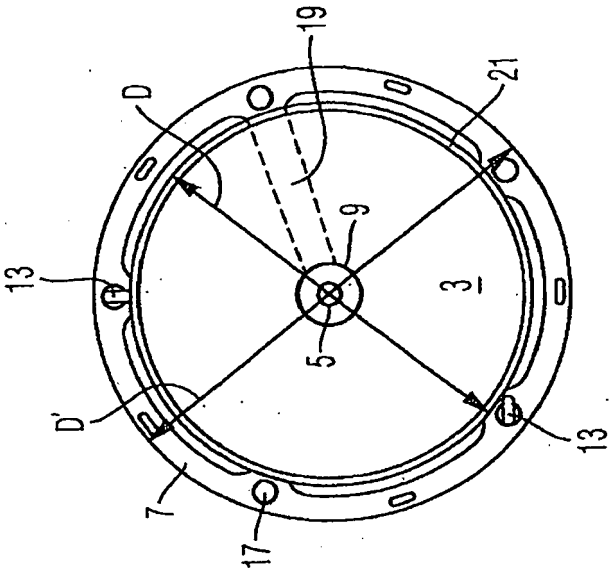

Fig. 2

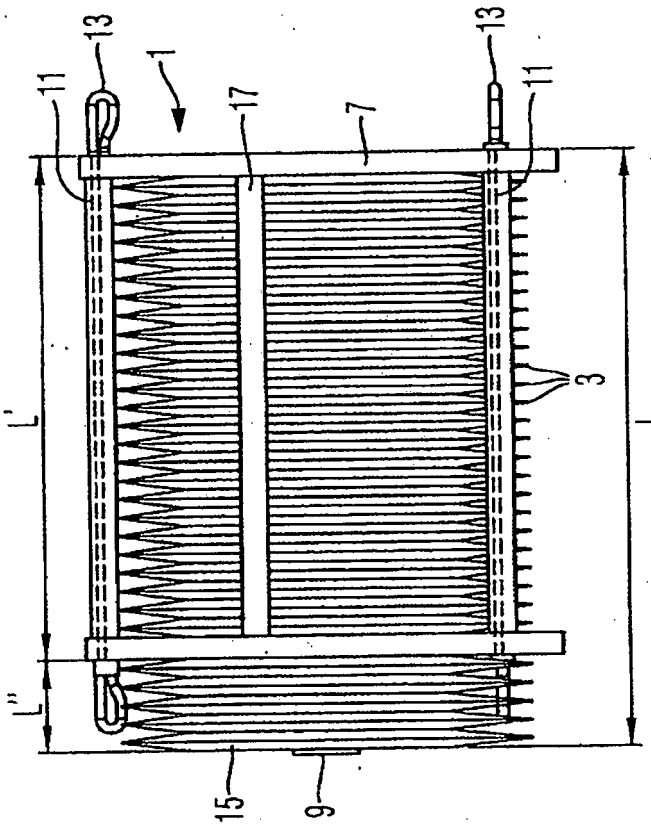

Fig. 1

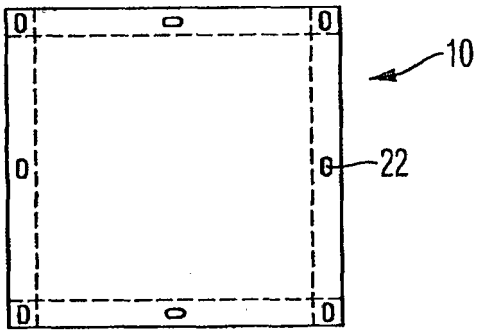

Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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