



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.08.2012 Bulletin 2012/32

(51) Int Cl.:
E02B 15/04 (2006.01)

(21) Application number: **12154505.7**

(22) Date of filing: **08.02.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **08.02.2011 NL 2006165**
23.05.2011 NL 2006831

(71) Applicant: **Allmex B.V.**
4664 RR Lepelstraat (NL)

(72) Inventors:
• **Rombouts, Iroy Petrus Cornelis Johannes**
4664 RR Lepelstraat (NL)
• **Rombouts, Petrus Adrianus**
4664 RR Lepelstraat (NL)

(74) Representative: **Hylarides, Paul Jacques et al**
Arnold & Siedsma
Sweelinckplein 1
2517 GK The Hague (NL)

(54) **Barrier**

(57) The present invention relates to a floating barrier for holding back material, such as a liquid, solids and/or objects, floating on a water mass, the barrier comprising:
- an elongate barrier sheet;
- a number of floating bodies which are arranged at a distance from each other and which are or can be attached to the barrier sheet, wherein the floating bodies are embodied to hold the upper part of the barrier sheet

above the water surface in the floating situation.

The invention also relates to a method for holding back material floating on a water mass, comprising of:
- unrolling a flexible elongate barrier sheet;
- attaching a number of floating bodies at a distance from each other to the barrier sheet;
- placing the barrier sheet with floating bodies in the water mass.

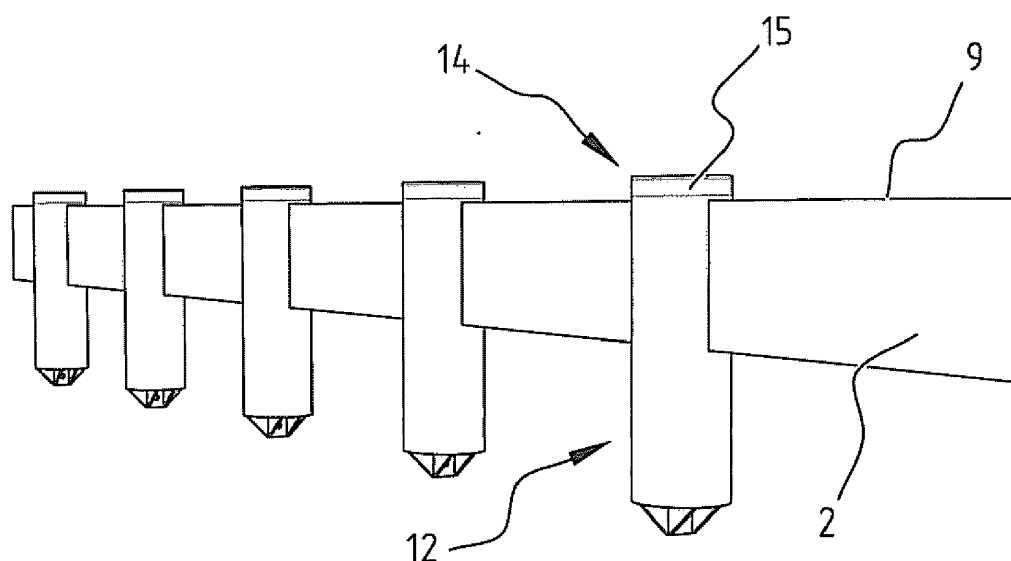


FIG. 4

Description

[0001] The present invention relates to a barrier for holding back material, such as a liquid, solids and/or objects, floating on a water mass. The invention also relates to the use of such a floating barrier and to a method for holding back material floating on a water mass.

[0002] In the light of increasingly more stringent environmental requirements, oil barriers have been developed which, in case of calamities, for instance leakage of oil from an oil tanker, can be arranged in a water mass to enable containment of leaked oil floating on the water mass. Oil barriers are for instance known consisting of an elongate screen which floats in the water while being supported by inflatable or solid floating bodies. The screen itself is manufactured from a fabric, for instance canvas or the like.

[0003] A drawback of the use of such an oil barrier is that the screen at least partially absorbs the oil floating on the water. The screen must therefore be removed from the water immediately after use and then be cleaned or destroyed (i.e. burned in a waste incinerator). Not only does this have an environmental impact, it is moreover also expensive because a new screen must be acquired each time. The situation may further occur that, as a result of absorbing oil, the screen will in the course of time begin to partially release this oil again so that some of the oil will nevertheless find its way back into the environment. The screen cannot therefore remain in the water too long after the calamity.

[0004] Similar drawbacks apply if the oil screen is manufactured from rubber. Rubber is relatively rough and oil residues may remain on the rubber. As a result of the roughness of the surface such screens are moreover often greatly affected by fouling, for instance by algae.

[0005] A further drawback of the known oil barriers is that they only function properly in windless weather and/or when there is little swell or current. As soon as the wind speed, current and/or swell increases, the oil screen can no longer function properly. The waves for instance rise above the top side of the oil screen (so that there is overflow or overtopping), this having the result that oil can still pass over the oil screen.

[0006] Document US 3 807 617 describes an apparatus for arranging an oil barrier in the water. The oil barrier is constructed from an upright flexible partition received in a frame. The frame is provided with a number of arms extending obliquely outward. Floating bodies are attached to the outer ends of these arms. The partition can be rolled onto a reel.

[0007] The construction of the known oil barrier is however vulnerable and complex, for instance as a result of the presence of the oblique arms and/or because the flexible sheet requires a separate frame for mounting of (the arms of) the floating bodies. The floating bodies can further only be coupled at a single position to the flexible sheet, this position not being optimal under all conditions.

[0008] It is an object of the present invention to provide an improved barrier.

[0009] It is a further object to provide a barrier which is relatively robust and is of relatively simple construction.

[0010] It is a further object to provide a barrier material which can be stored relatively compactly and/or which can be deployed easily and quickly.

[0011] It is a further object of the invention to provide a method for containing material floating on a water mass.

[0012] It is also an object to provide a barrier which is also able to hold back material floating on the water mass when the force of the current, wind speed and/or swell are relatively high.

[0013] It is a further object of the invention to provide a barrier of relatively high stability.

[0014] It is a further object of the invention to provide a barrier which can be used successively a number of times without a thorough cleaning being necessary.

[0015] According to a first aspect of the present invention, at least one of the objects is achieved in a floating barrier for holding back material floating on a water mass, the barrier comprising:

- an elongate barrier sheet;
- a number of floating bodies which are arranged at a distance from each other and which are or can be attached to the barrier sheet, wherein in the attached situation each floating body extends relative to both the front side and the rear side of the barrier sheet in order to hold the upper part of the barrier sheet in floating situation in a substantially upright position above the water surface.

[0016] Because a floating body extends outward on both sides of the barrier sheet, at least in the coupled situation, the barrier sheet can be held in a relatively upright position in the water mass.

[0017] The invention is based on the insight, among others, that the stability of the device, and particularly the part protruding above the water surface, is an important factor in good operation of the barrier in severe conditions, such as in the case of strong current, high swell and/or strong wind. According to the invention use is therefore made of a barrier sheet which is held in stable position by the floating bodies. The upper part of the barrier sheet hereby continues to protrude properly above the water surface in substantially all conditions so that it is possible to continue holding back the floating material.

[0018] The outer ends of a floating body preferably extend substantially symmetrically relative to the front and rear

side of the barrier sheet. In other words, the floating body essentially protrudes equally far on either side. In determined embodiments the buoyancy on the front side is more particularly made substantially the same as the buoyancy on the rear side, so that the barrier sheet is held upright even better in the water mass.

[0019] According to an embodiment of the invention, a floating body is formed by a single rod-like element of buoyant material. Such a floating body can be coupled easily to the barrier, for instance by sliding the floating body into a receiving opening of the barrier sheet. The floating body can be constructed integrally. The rod-like body can here have a substantially round or rectangular cross-section (for instance cylindrical or beam-shaped). Such floating bodies are of simple construction and can withstand severe conditions, for instance at sea.

[0020] In a further embodiment the floating body is coupled directly to the barrier sheet. When the floating body is coupled directly to the barrier sheet, an additional mounting element, such as an intermediate frame, can be omitted.

[0021] In order to increase the buoyancy of the device the barrier sheet itself is also manufactured from buoyant material. In determined embodiments the barrier sheet and the floating body are manufactured from the same or similar material. The barrier sheet and/or the floating bodies are preferably manufactured from plastic, in particular relatively smooth plastic.

[0022] A particularly advantageous plastic is polyethylene, preferably high-density polyethylene, although the use of low-density polyethylene is also possible. This material is exceptionally smooth, so that it is not or little susceptible to fouling. The material further does not absorb the liquid (oil) floating on the water, or hardly so, so that the usual cleaning step can be omitted after use. A further advantage is that a barrier sheet of polyethylene can be embodied such that the sheet has the desired bending properties. Polyethylene further has a reasonably low specific mass so that it continues to float well on the water surface.

[0023] In embodiments of the invention a receiving opening is provided in a floating body for receiving the barrier sheet therein. This makes it possible to mutually couple the floating body and the barrier sheet by sliding the barrier sheet through the receiving opening in the floating body.

[0024] In other embodiments receiving openings are provided in the barrier sheet for receiving respective floating bodies therein. This makes it possible to mutually couple (or uncouple) floating body and barrier sheet by sliding the floating body through said respective receiving openings. When the floating body can be pushed into the opening as one whole in one operation, the floating body can be coupled relatively easily and quickly to the barrier sheet. Uncoupling can take place in reverse manner by sliding the floating body out of the opening.

[0025] The floating bodies can be permanently coupled to the barrier sheet. In other embodiments the floating bodies are attached releasably (for instance detachably) to the barrier sheet and are for instance only attached to the barrier sheet at location (while travelling).

[0026] The floating bodies can allow the barrier sheet to float at a slight incline in the water. In determined embodiments the floating bodies are however embodied and attached to the barrier sheet such that they hold the barrier sheet in a substantially stable, upright position.

[0027] In an embodiment the floating bodies are rigidly coupled to the barrier sheet, or can at least be rigidly coupled thereto. This means that a floating body and barrier sheet undergo no or hardly any relative movement, this enhancing the stability of the barrier in the floating situation.

[0028] The floating bodies can in principle take a random form. In a determined embodiment the floating bodies take an elongate form. They can extend here on at least one side of the barrier sheet.

[0029] In a first group of embodiments, in which the barrier sheet has a substantially flat front side and a substantially flat rear side, one or more of the floating bodies extend transversely of both the rear and front sides of the barrier sheet. The longitudinal direction of an elongate floating body extends for instance substantially perpendicularly of both the front and rear sides of the barrier sheet. In the floating situation this can for instance mean that the floating bodies take a horizontal form (relative to a vertical barrier sheet). Depending of course on the shape and dimensions of the floating bodies, their positioning relative to the barrier sheet and on the barrier sheet itself, a particularly stable support of the barrier sheet can be realized in this group of embodiments. It has been found that, when the floating bodies for instance extend on either side relative to the barrier sheet over a lateral distance (a) which is greater than the overall height (h) of the barrier sheet, a stable positioning of the barrier sheet can be realized.

[0030] In a determined embodiment receiving openings are provided in the barrier sheet for receiving respective floating bodies therein. An outer end of a floating body can for instance be simply pushed into an opening and secured therein.

[0031] In determined embodiments a floating body is attached out of the centre of the barrier sheet. If the floating body is arranged away from the centre line along the barrier sheet, for instance at some distance below the centre line, the upper edge of the barrier sheet can be placed at a correct position, for instance relatively high in the case the floating body is placed below the centre line, so that the chance of overtopping of the barrier sheet is reduced. In other embodiments a floating body is attached substantially in the centre of the barrier sheet.

[0032] In another group of embodiments the elongate floating body can extend substantially parallel to the barrier sheet. The floating body can be in an upright or inclining position here. In a determined embodiment the elongate floating

body extends substantially transversely of the longitudinal direction of the barrier sheet and is thus normally upright in the floating situation. In order to maintain this upright position it may be necessary in determined cases to provide the floating body with a counterweight. In other cases the stability is already sufficient to allow the counterweight to be dispensed with.

[0033] The floating bodies can be attached in numerous different ways to the barrier sheet. In a determined embodiment the barrier comprises a number of floating bodies attached alternately to the barrier sheet. In other embodiments the device comprises a number of floating bodies attached on either side of the barrier sheet, while in yet other embodiments the floating bodies are attached on only a single side of the barrier sheet. Each of the embodiments has a specific containing action relative to the current and wind load.

[0034] The barrier sheet is preferably manufactured from flexible material. This has the advantage, among others, that the barrier sheet can be laid in a random curve (or straight) in the water, for instance in order to enclose a source of pollution or to urge the floating material to a determined area. The flexibility is here such that the barrier sheet can be bent to a radius of curvature (R) of less than $(10 \cdot L/2\pi)$, wherein L is the overall length of the barrier sheet.

[0035] In determined embodiments the flexible material is suitable for rolling up of the barrier sheet. This makes it possible for instance to transport the barrier sheet rolled up onto a reel and to only unroll it from the reel at location. The floating bodies need only be attached to the barrier sheet during unrolling. The barrier sheet can likewise be rolled up again after use. In these embodiments the barrier thus takes up little space during transport.

[0036] The floating bodies are usually attached at substantially regular intermediate distances to the barrier sheet. They herein hold the upper edge of the barrier sheet at least 10 cm above the water surface, even in case of high swell. The device further takes such a light form that it can follow the wave motion almost entirely and without delay. This reduces the chance of flow over the barrier sheet.

[0037] In determined embodiments the floating body comprises fixing means for fixing an anchoring to the floating body, for instance in the form of an anchor chain or similar provision. The fixing means can also be adapted for fixing of a partially water-permeable sheet (root barrier) thereto. This sheet can be used to contain not only the material floating on the water, but also the material possibly sinking downward, such as for instance suctioned-up ground material in dredging applications. In determined embodiments the sheet is weighted on the underside and the underside rests on the bottom so that an area of the water mass can be fully closed off.

[0038] The floating bodies are substantially cylindrical. This embodiment is relatively stable and the chance of the floating body freezing is small (the floater depth is less than half the cylinder diameter). Cylindrical floating bodies can further withstand external and/or internal pressure particularly well.

[0039] The invention also relates to the use of the barrier defined herein.

[0040] According to another aspect of the invention, a method is provided for containing material such as a liquid, solids and/or objects floating on a water mass, wherein the method comprises of:

- coupling a number of floating bodies to the barrier sheet by sliding at least one floating body through a receiving opening in the barrier sheet and/or by sliding the barrier sheet through a receiving opening in at least one of the floating bodies;
- placing the barrier sheet with floating bodies in the water mass.

[0041] Further advantages, features and details of the present invention will be elucidated on the basis of the following description of several embodiments thereof. Reference is made in the description to the accompanying figures, in which:

Figure 1 is a perspective view of a first embodiment of the invention;

Figures 2A and 2B show respectively a side view and a top view of the embodiment of figure 1;

Figures 3A and 3B show respectively a side view and a top view of a second embodiment of the present invention;

Figure 4 is a perspective view of a third embodiment of the present invention;

Figures 5A and 5B show respectively a side view and a top view of the third embodiment of figure 4;

Figures 6 and 7 show respectively a view in longitudinal direction of the barrier sheet and a view transversely of the longitudinal direction of an individual floating body according to an embodiment of the invention;

Figures 8A and 8B show respectively a side view and a top view of a fourth embodiment of the invention;

Figures 9A and 9B show respectively a side view and a top view of a fifth embodiment of the invention;

Figures 10A and 10B show respectively a side view and a top view of a sixth embodiment of the invention;

Figure 11 shows an overview of the different test setups;

Figure 12 shows an example of an application of an embodiment of the invention on a jetty for mooring oil tankers; and

Figure 13 shows a further example of the application of an embodiment of the invention in a river.

[0042] Figure 1 shows an embodiment of a barrier 1 according to the invention. Barrier 1 is constructed from an elongate sheet-like barrier sheet 2. Barrier sheet 2 is provided at regular intermediate distances with openings 3. The

length (L) of the shown barrier sheet amounts to between 10 and 100 m, the height (H) amounts to between 80 cm and 150 cm, the thickness amounts to between 0.5 and 3 cm and the distance (a) amounts to between 4 and 5 metres. These dimensions are only given by way of example, and it is wholly within the reach of the skilled person to embody the barrier with different dimensions.

[0043] Elongate floating bodies 4 are pushed into openings 3 and subsequently attached to barrier sheet 2. Attaching of floating bodies 4 to barrier sheet 2 can take place in diverse ways, for instance by bolting them fixedly to the barrier sheet. In other embodiments (not specifically shown) there is a simple releasable attachment of floating body 4 to barrier sheet 2 so that the floating bodies can be removed in simple manner from said openings 3 of barrier sheet 2 after use.

[0044] In the shown embodiment barrier sheets 2 and floating bodies 4 are manufactured from a lightweight plastic such as polyethylene. This material has such a low specific mass that the whole continues to float well on the water. This material further has no or hardly any impact on the environment.

[0045] In the embodiment shown in figures 1 and 2A, 2B floating bodies 4 each extend transversely of the longitudinal direction (R_L) of the barrier sheet. In use this means that floating bodies 4 extend horizontally while barrier sheet 2 is positioned substantially vertically in the water. Outer ends 5, 6 of each floating body 4 protrude over a distance (l_1, l_2) relative to the side of barrier sheet 2. The length over which the two outer ends 5, 6 extend varies subject to for instance the dimensions of barrier sheet 2 and/or the expected characteristics of the water mass in which the barrier has to function. In the shown embodiment the floating bodies are arranged symmetrically in barrier sheet 2, wherein each of the outer ends protrudes over a distance of about 1 m relative to barrier sheet 2 (i.e. $l_1 = l_2 = 1$ m). A stable positioning of barrier sheet 2 in the water can hereby be achieved in many situations.

[0046] In the shown embodiment openings 3 are arranged in barrier sheet 3 roughly at the height of the centre line (m) (shown in broken lines in figure 1) so that the height of the barrier sheet above floating bodies 4 and the height below floating bodies 4 is roughly equal. This means that the barrier can be arranged in random manner in the water. In another embodiment, for instance in the embodiment as shown in figures 3A and 3B, floating bodies 4 are not arranged at the position of the centre line (m) but slightly above or below it. The height above and below floating bodies 4 can in this way be adapted to the conditions.

[0047] The length of floating bodies 4 can be varied subject to the desired measure of stability. It has however been found that if length l_1 and l_2 of outer ends 5, 6 of floating bodies 4 is greater than the height (H, see figure 1) a reasonably stable barrier can already be obtained.

[0048] As already stated above, barrier sheets 2 and/or floating bodies 4 are manufactured in an advantageous embodiment from plastic, in particular polypropylene. This material has the property of being relatively smooth. This means that there is little fouling on the device, even if the device lies in the water for a relatively long time. This also means that practically no cleaning of the device need take place after use. A further advantage is that the plastic does not absorb any oil or similar liquid. This is another reason why the device needs no or hardly any cleaning after use.

[0049] Barrier sheet 2 preferably takes a flexible form so that it can extend in any desired straight or curved position. In a further advantageous embodiment the barrier sheet 2 takes a flexible form such that it can be carried onto a roll. This makes transport of barrier sheet 2 relatively easy. Only when barrier 1 has to be used, i.e. when the barrier sheet and the floating bodies have been taken to a desired position, is barrier sheet 2 unrolled from the roll and the floating bodies pushed into the above stated openings 3 and then attached to barrier sheet 2. The barrier can likewise be carried onto a roll once again after use, of course after floating bodies 4 have first been removed from said openings.

[0050] Figures 4 to 8B show a further embodiment of the invention.

[0051] In this embodiment a number of vertical (instead of horizontal) floating bodies 12 are attached to upright sheet 2. In the shown embodiment, see for instance figure 6, there is provided in the centre of a floating body 12 a recess 13 into which barrier sheet 2 can be pushed. The floating body can then be fixed in a manner not shown relative to barrier sheet 2. At the top the floating body protrudes above upper edge 9 of barrier sheet 2. The upper outer end 14 is provided in the shown embodiment with a reflector 15 in order to make it more readily visible. At the bottom the vertical floating body 12 protrudes below the barrier sheet. A counterweight 17 can be arranged on the underside of the lower outer end 16 so as to ensure that floating body 12 will move as far as possible into upright position. On the underside of counterweight 17 fastening means can be provided for fastening an anchor chain with which the barrier can be anchored to a bottom. Provided in the shown embodiment is a flange 18 in which an eye 19 is arranged. An anchor 13 (not shown) can be fastened to this eye.

[0052] In the embodiment shown in figures 4 to 7 the vertical floating body 12 extends on either side of barrier sheet 2 (the barrier sheet is after all trained through an opening 13 in the centre of the floating body). Floating bodies 12 moreover protrude on both the upper side and underside relative to barrier sheet 2. In other embodiments it is possible that floating body 2 does not extend on the upper side above barrier wall 2. It is also possible to attach the floating bodies on only one side of barrier wall 2, this embodiment being shown in figures 8A and 8B.

[0053] In another embodiment, as shown in figures 9A and 9B, two floating bodies 12, 12' are arranged, for instance alternately, on different sides of barrier sheet 2. Figures 10A and 10B show the situation in which use is made of both vertical floating bodies 12 and horizontal floating bodies 4. A stable positioning of the barrier sheet in the water can also

be realized in this embodiment.

[0054] Several tests performed using a scale model show that the above stated embodiment of the invention produces very good containment results. The barrier was a vertical sheet with a number of floating bodies attached thereto. The vertical sheet had a length of 9 m, a thickness of 6 mm and a height of 0.25 m. Seven cylindrical floating bodies were attached to the vertical sheet, this in a manner such that the floating bodies protruded an equal distance relative to the vertical sheet on either side. The length of each floating body was 0.25 m on each side. The cross-sectional centre of each of the floating bodies was positioned at a distance of about 75 mm from upper edge 9 of the vertical sheet. The centre-to-centre distance between the floating bodies was about 1.1 m and the diameter of the floating bodies was 75 mm. Both the vertical sheet and the floating bodies were manufactured from polyethylene (in particular HDPE).

[0055] Figure 11 shows schematically the geometric test setups in which the scale model of the barrier was tested. Four geometric variations were applied:

- A. An oil screen perpendicularly of the wave/current direction, wherein the oil screen was curved.
- B. Oil screen parallel to the wave/current direction.
- C. Oil screen at an angle of about 45 degrees relative to the wave/current direction; and
- D. Oil screen perpendicularly of the wave/current direction, wherein the oil screen was not curved.

[0056] The tests were performed with different water depths (d), different average speeds (v), different types of wave (regular or irregular) and different wave heights (H_{reg} or H_s). During the tests the wave slope was held roughly constant at 3% ($s=0.03$). A standard JONSWAP spectrum was used for irregular waves.

[0057] Table 1 shows the results of this test. In this table containment properties are classified as follows:

- no or hardly any overflow: GOT
- some overflow: EOT,
- some overflow (overtopping): OT,
- severe overflow (overtopping): ZOT.

Table 1

Config	Water depth	Depth avg. speed	Type of wave	Wave height	Max. wave height	Peak wave period	Number of waves	Stability	Over-topping
	h (m)	v (m/s)		H_s (m)/ H_{reg} (m)	H_{max} (m)	T_r (S)	N (-)		
A	0.75	0.15	None	-	-	-	-	Stable	GOT
A	0.75	0.23	None	-	-	-	-	Stable	GOT
A	0.75	None	Reg.	0.169	-	1.79	334	Stable	GOT
A	0.75	None	Irregular	0.104	0.174	1.43	555	Stable	EOT
A	0.75	0.15	Irregular	0.110	0.196	1.44	552	Stable	EOT
B	0.75	0.15	Irregular	0.107	0.184	1.43	549	Stable	OT
C	0.75	0.15	Irregular	0.111	0.201	1.43	559	Stable	OT
C	0.75	0.15	Irregular	0.106	0.16	1.43	546	Stable	EOT

[0058] Figure 12 shows an example of an application of an embodiment of the invention for protecting from contamination a harbour in which oil tankers moor. Shown is a jetty 20 which is arranged perpendicularly relative to quayside 21 in known manner. On the underside the jetty is provided with a barrier 24 extending substantially parallel relative to jetty 20. A second barrier 25 is arranged at the free outer end 23 of the jetty. This barrier 25 can be fixed to quayside 21 using fastening 27. Shown on the right in the figure is how a tanker T_1 is wholly enclosed by barrier 24 and flexible barrier 25. In the event that oil leaks from the tanker during transfer with a transfer device (not shown), this oil will come to lie in the area G_1 which is bounded by the quay and by barriers 24, 25. This prevents oil spreading outside area G . Shown on the left is how a recently arrived tanker T_2 will be protected from the spread of oil. Flexible barrier 26 is moved to a closed position, for instance using a tug, and the outer end is fixed to quay 21 using a fastening 28. In this way a wholly enclosed area G_2 is again realized by means of quay 20, barrier 24 and barrier 26, which is wholly closed off from the rest of the water mass so that possibly spilled oil cannot enter the environment.

[0059] Figure 13 shows an embodiment of the invention for use in a river (R) or similar flowing medium. The flow

direction of the river is indicated with arrow 29. Two barriers are arranged in the river. The first barrier is arranged substantially transversely of the flow direction of the river and extends from a first riverbank to a position beyond the middle of the river. A second barrier 31 extends in similar manner downstream of first barrier 30. Second barrier 31 is also oriented transversely of the flow direction and extends from the opposite riverbank to a position beyond the middle of the river. The two barriers 30, 31 partially overlap each other, but are so far removed from each other that a course round the barriers remains possible. Waste (a) which may be floating on the water is collected by both the first and the second barrier, wherein the navigability of the river is still maintained.

[0060] The present invention is not limited to the embodiment thereof described here. The rights sought are defined rather by the following claims, within the scope of which many modifications and adjustments can be envisaged.

Claims

1. Floating barrier for holding back material, such as a liquid, solids and/or objects, floating on a water mass, the barrier comprising:
 - an elongate barrier sheet;
 - a number of elongate floating bodies which are arranged at a distance from each other and which can be attached to the barrier sheet, wherein in the attached situation each floating body extends relative to both the front side and the rear side of the barrier sheet in order to hold the upper part of the barrier sheet in floating situation in a substantially upright position above the water surface.
2. Barrier as claimed in claim 1, wherein the outer ends of a floating body extend substantially symmetrically relative to the front and rear side of the barrier sheet.
3. Barrier as claimed in claim 1 or 2, wherein a floating body is formed by a single rod-like element of buoyant material, wherein the rod-like body preferably has a substantially round or rectangular cross-section.
4. Barrier as claimed in any of the foregoing claims, wherein the floating body can be coupled directly to the barrier sheet.
5. Barrier as claimed in any of the foregoing claims, wherein the barrier sheet is manufactured from buoyant material.
6. Barrier as claimed in any of the foregoing claims, wherein the barrier sheet and the floating body are manufactured from the same or similar material, preferably from plastic, in particular relatively smooth plastic, preferably polyethylene, still more preferably high-density polyethylene (HDPE).
7. Barrier as claimed in any of the foregoing claims, wherein receiving openings are provided in the barrier sheet for receiving respective floating bodies therein.
8. Barrier as claimed in any of the foregoing claims, wherein a receiving opening is provided in a floating body for receiving the barrier sheet therein.
9. Barrier as claimed in any of the foregoing claims, wherein a floating body and the barrier sheet can be coupled to or uncoupled from each other by sliding the floating body through a receiving opening in the barrier sheet or by sliding the barrier sheet through a receiving opening in the floating body.
10. Barrier as claimed in any of the foregoing claims, wherein the floating bodies extend on either side relative to the barrier sheet over a lateral distance (a) which is greater than the overall height (h) of the barrier sheet.
11. Barrier as claimed in any of the foregoing claims, wherein a floating body is attached out of the centre of the barrier sheet or wherein a floating body is attached substantially in the centre of the barrier sheet.
12. Barrier as claimed in any of the foregoing claims, wherein the barrier sheet is manufactured from flexible material, wherein the flexible material is preferably suitable for bending of the barrier sheet to a radius of curvature (R) of less than $(10 \cdot L/2\pi)$, wherein L is the overall length of the barrier sheet, wherein the flexible material is preferably suitable for rolling up of the barrier sheet.
13. Barrier as claimed in any of the foregoing claims, wherein the barrier sheet and/or the floating bodies comprise fixing

means for fixing a partially water-permeable sheet thereto.

14. Use of a barrier as claimed in any of the foregoing claims.

5 15. Method for holding back material such as a liquid, solids and/or objects floating on a water mass, preferably with a barrier as claimed in any of the claims 1-13, the method comprising of:

- unrolling a flexible elongate barrier sheet;
- 10 - coupling a number of floating bodies to the barrier sheet by sliding at least one floating body through a receiving opening in the barrier sheet and/or by sliding the barrier sheet through a receiving opening in at least one of the floating bodies;
- placing the barrier sheet with floating bodies in the water mass.

15

20

25

30

35

40

45

50

55

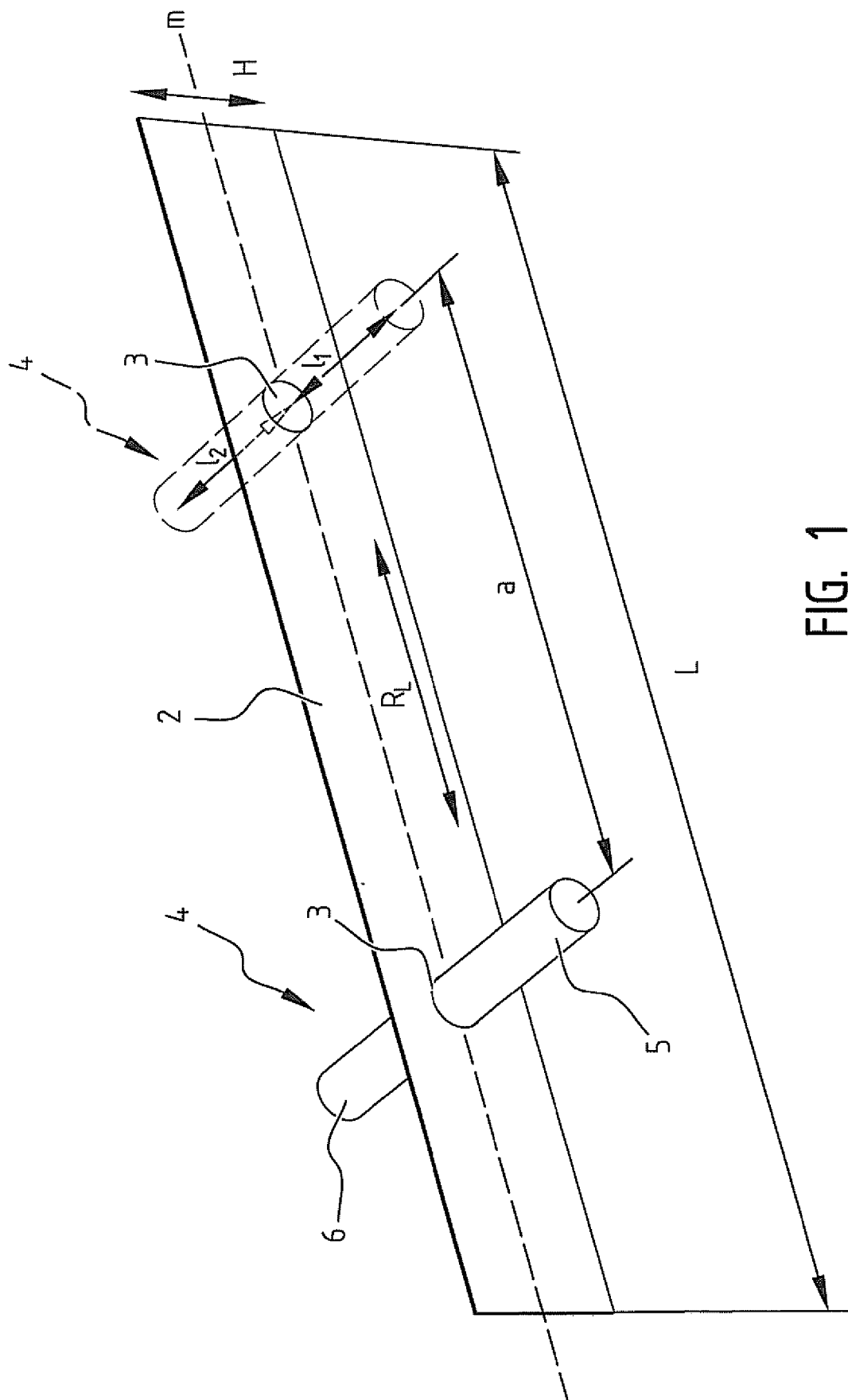


FIG. 1

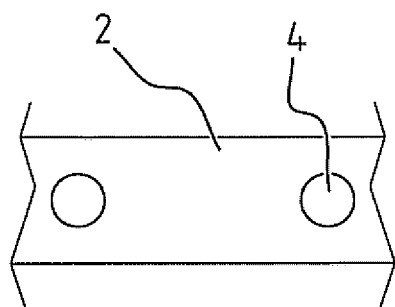


FIG. 2A

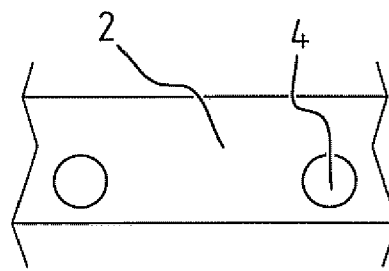


FIG. 3A

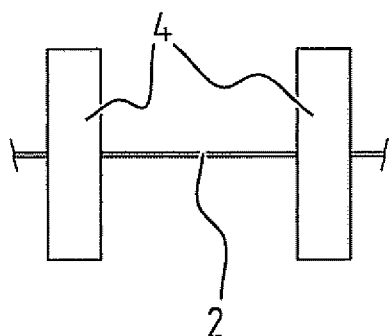


FIG. 2B

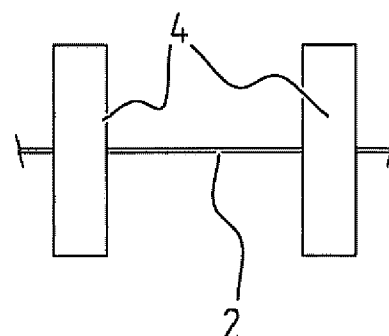


FIG. 3B

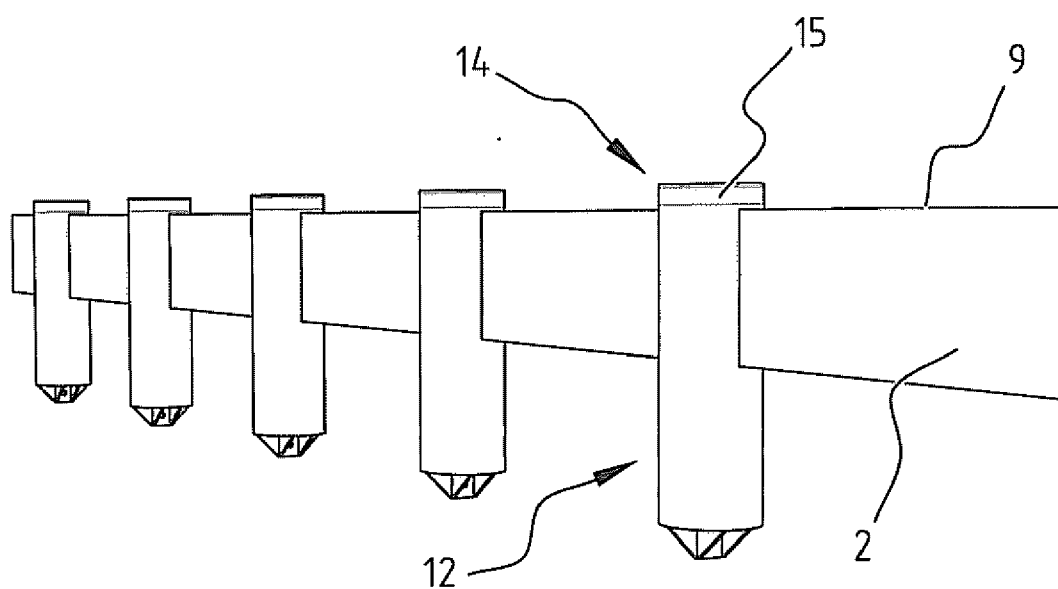


FIG. 4

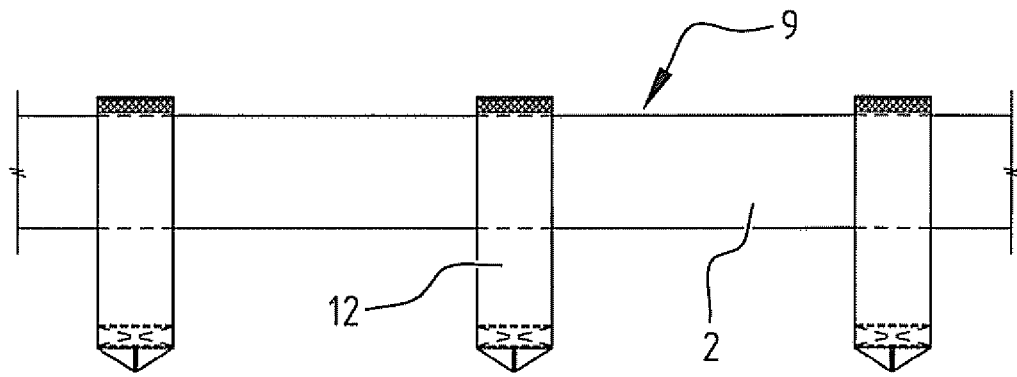


FIG. 5A

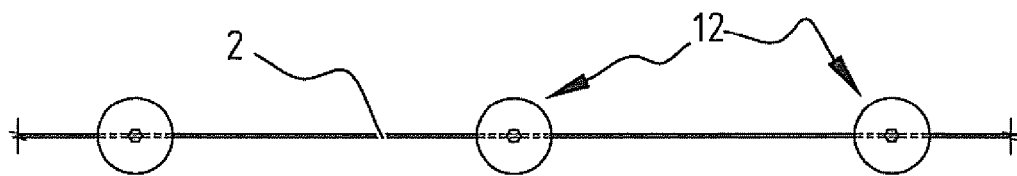


FIG. 5B

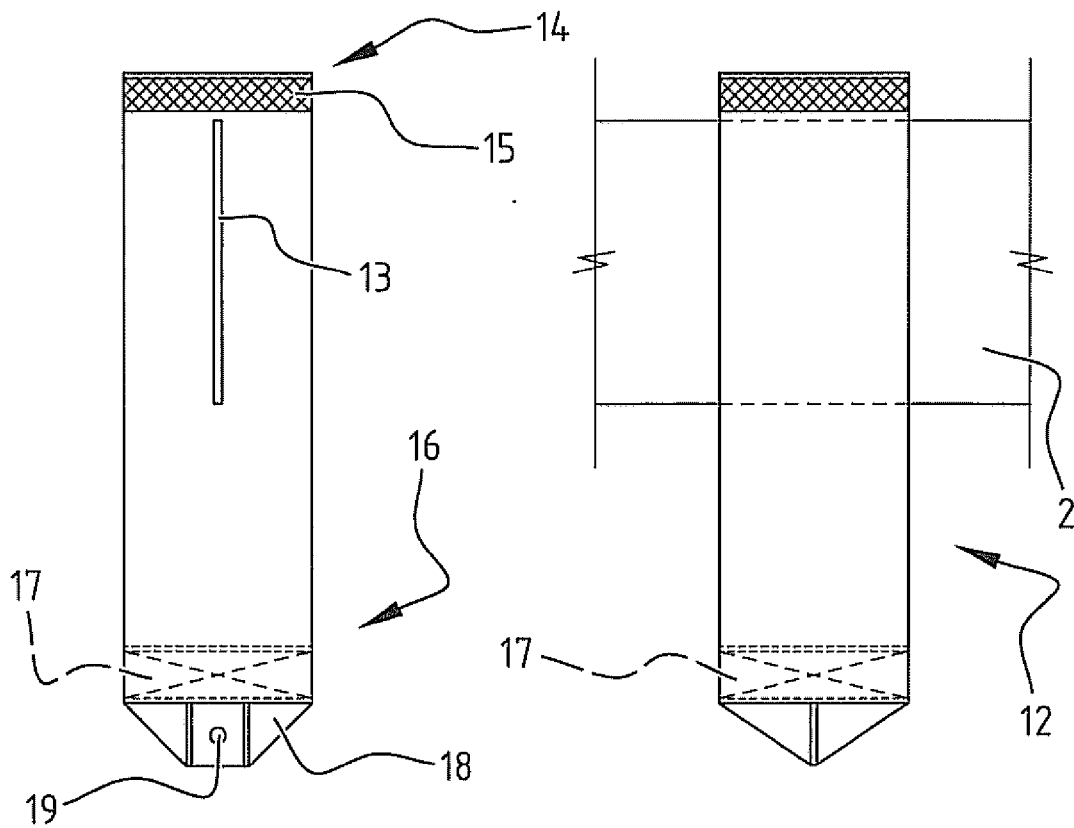


FIG. 6

FIG. 7

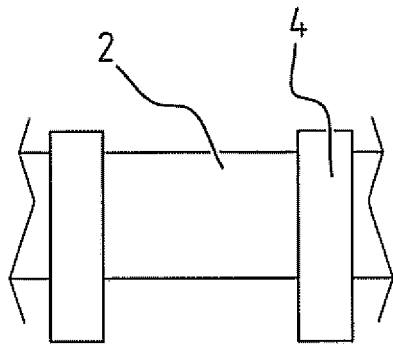


FIG. 8A

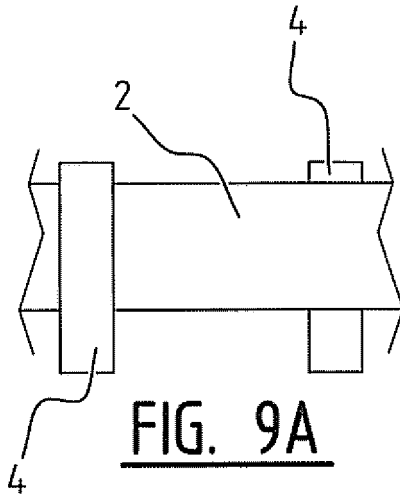


FIG. 9A

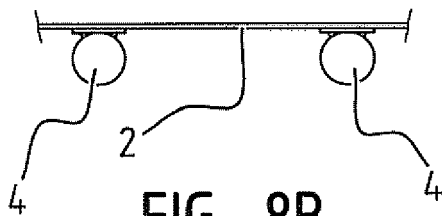


FIG. 8B

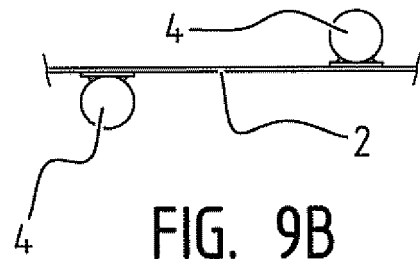


FIG. 9B

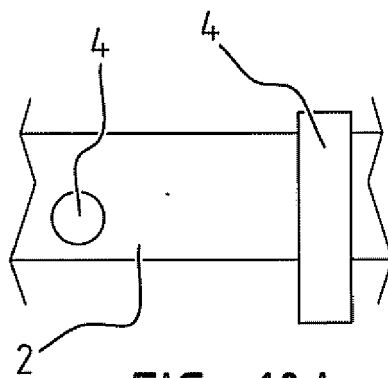


FIG. 10A

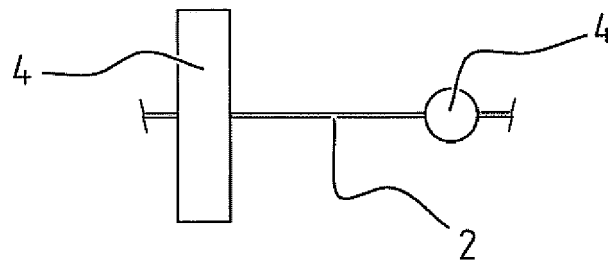


FIG. 10B

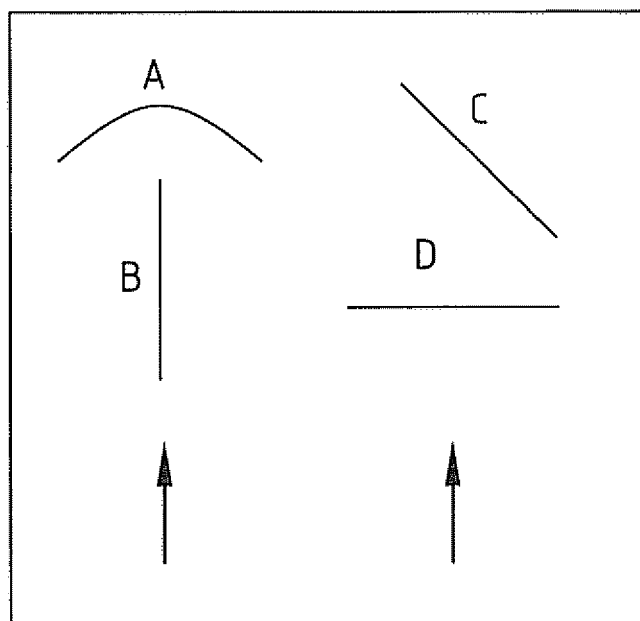


FIG. 11

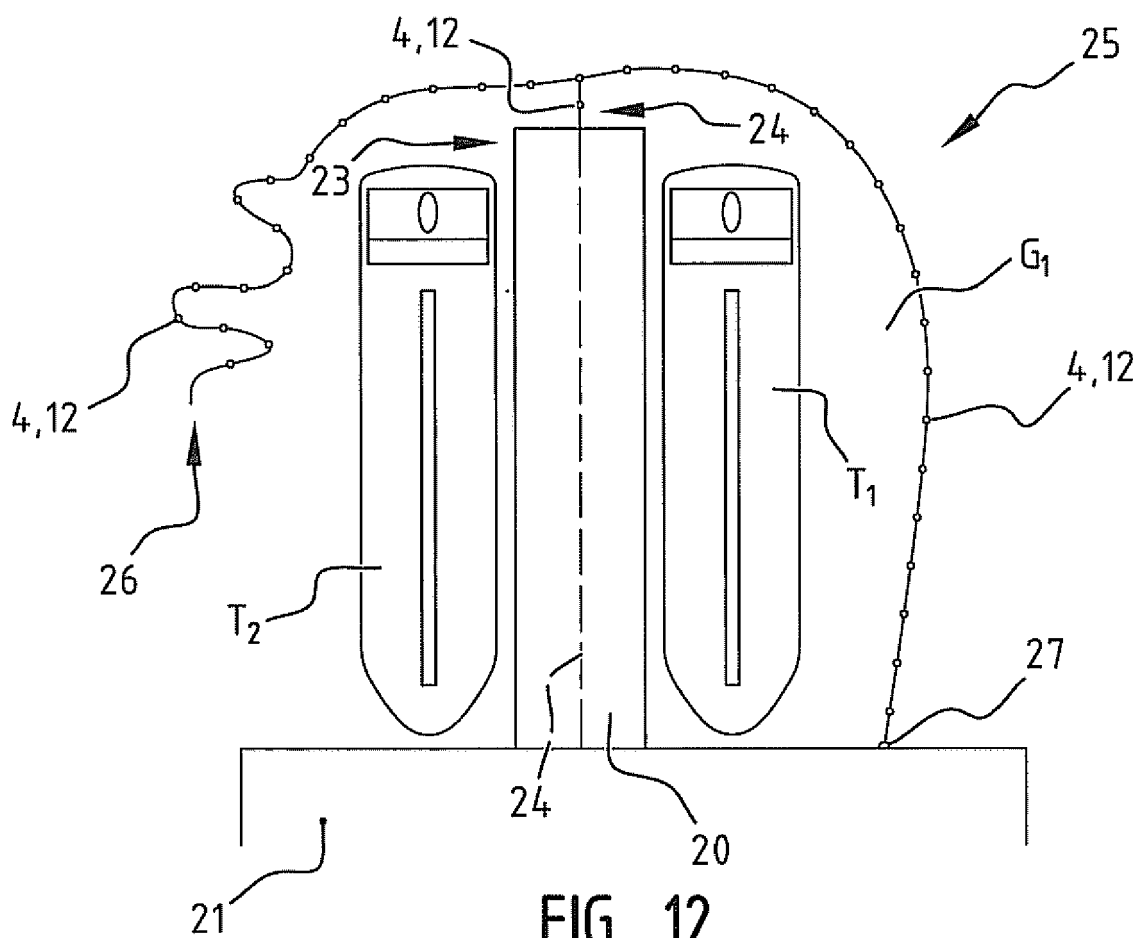


FIG. 12

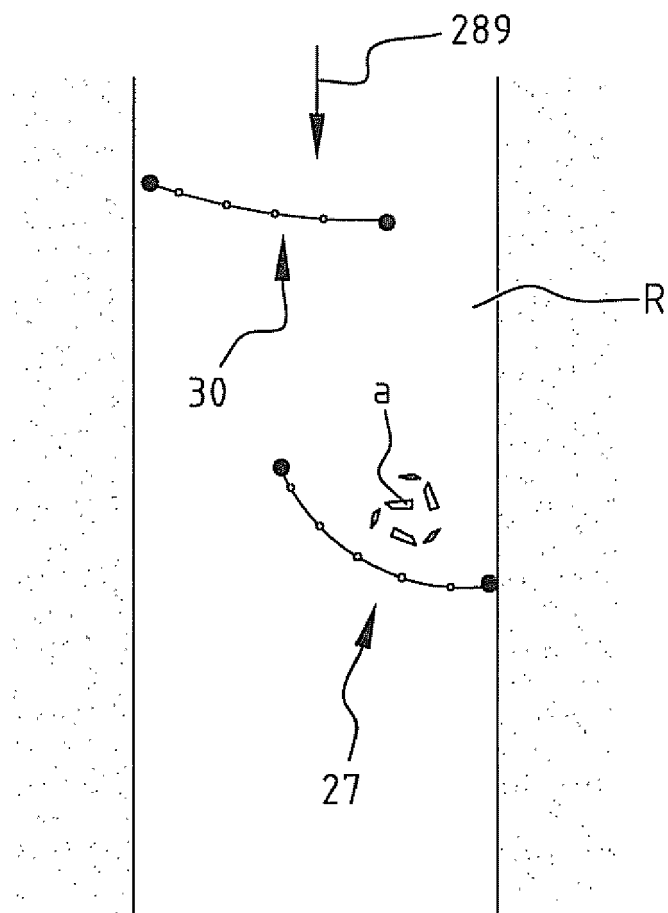


FIG. 13

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 3807617 A [0006]