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(54) **Cable for a winch device, drum and winch device for lowering and/or raising loads into and/or out of water, vessel provided therewith and method therefor**

(57) The present invention relates to a drum (30), a winch device and a vessel (6) provided therewith and to a method for winding up and unwinding a cable (10) for lowering and/or raising a load, the cable having a substantially rectangular cross-section. The drum and winch device are provided with a guide profile (44).

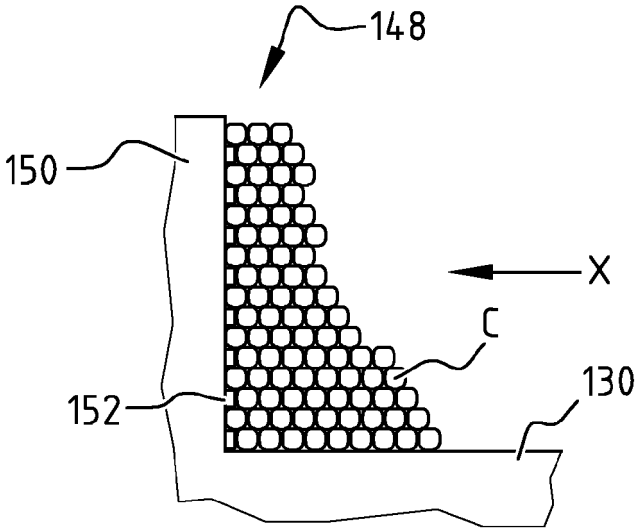


FIG. 8

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Description

[0001] The present invention relates to a cable and, in addition, to a drum for a winch device particularly suitable for lowering and/or raising loads into and/or out of water. The winch device more particularly relates to a so-called spooling system with which, at sea, loads can be lowered into and/or raised from the sea from a floating object such as a vessel or pontoon.

[0002] Known in practice are systems for laying for instance cables and pipes from a vessel on open sea. For this purpose these cables are usually unwound from a large drum and for instance carried to the seabed. The seabed lies for instance at a depth of 3-5 km. A problem occurring here is caused by the weight of the load hanging from the cable. Such a load can be a separate load, although it may also be related to the own weight of for instance the cable. Stresses are created in the cable in question as a result of this load. This causes wear and other problems. It has been found in practice that, in applications at sea, cables have to be replaced about every 2 years in the case of use considered normal in practice. In view of the demands made on the cable in respect of the load and the length of for instance 3 km, this involves not inconsiderable costs of more than about 35 €/m.

[0003] It has additionally been found in practice that the winding and unwinding of cables onto and from the drum is accompanied by malfunctions, or undesirable spooling behaviour, whereby the full speed is not achieved. The common practice of winding onto the drum with a bias also results in additional operations and wear. Changes in the upward force to which the load is subjected, for instance as soon as it is present in the water, further cause the cable to be compressed and squeezed, and possibly to roll up poorly.

[0004] The present invention has for its object to provide a cable for a winch device which obviates or at least reduces the above stated problems.

[0005] This object is achieved with the cable according to the invention for a winch device for lowering and/or raising a load into and/or out of water, comprising a cross-section which is substantially rectangular such that a controllable winding of the cable onto the drum can be realized.

[0006] Providing a substantially rectangular cross-section achieves a more controllable winding of the cable onto the drum. Forces which occur can hereby be better controlled. In addition, there are fewer malfunctions so that wear is likewise limited.

[0007] The cross-section of the cable is preferably substantially square. Displacement of the cable and other problems are hereby prevented. In addition, such a cable can be held in a profile arranged on a drum of the winch device in order to thereby realize a better guiding of the cable. In a currently preferred embodiment the corners are rounded here. The rounded corner is preferably provided with a radius in the range of 0.025-0.45 times the cable diameter, and most preferably in the range of 0.1-0.4 times the cable diameter. It has been found that an advantageous controllable winding of the cable onto a drum can hereby be obtained.

[0008] In an advantageous preferred embodiment according to the invention the cable is provided with a central element.

[0009] Providing a central element, preferably over substantially the central axis of the cable, achieves that properties of the cable can be manipulated. It is thus possible for instance to use an elastic material for the central element in order to thereby enable some compression. In this embodiment the surrounding sheath material imparts strength to the cable. It will be apparent that diverse alternative variants are possible. The central part can for instance thus be provided at a distance from the central axis in order to thereby take into account the bending occurring during winding of the cable. A plurality of central parts can also be provided. The cable can be provided in different materials, including steel and plastic, or a combination of materials.

[0010] The cable according to the invention can advantageously be applied for the purpose of lowering and raising a load into and out of water. Other applications of the cable according to the invention are however also possible. It is thus possible for instance to use the cable when laying underground cables from large reels.

[0011] The invention also relates to a drum for a winch device, wherein the drum is suitable for winding up a cable or pipe as described above.

[0012] Such a winch device provides the same effects and advantages as described for the cable.

[0013] In an advantageous preferred embodiment the drum comprises a guide profile on the periphery of the drum.

[0014] Providing a guide profile further improves the guiding of the cable. The profile is provided here with edges and grooves. The upper surface of the edges is preferably provided with a tilting upper surface. The guide profile is preferably adapted here to the above described cable. It has been found that, by providing an inclining profile on the upper surface of the drum, the cable performs a tilting during wind-up such that another side of the cable is directed toward the peripheral surface of the drum. This makes winding of the cable still more controllable such that forces and/or stresses that occur are reduced. It has been found that the improved controllability makes is possible to substantially dispense with applying a bias, such that wear of the cable according to the invention is also further reduced.

[0015] In an advantageous preferred embodiment according to the invention the drum comprises a flange arranged on a side of the cylinder, wherein the flange is provided with guides such that the winding direction of the cable or pipe changes during winding thereof onto the cylinder.

[0016] During winding of the cable or pipe, the cable or pipe is wound onto the drum in the rotation direction of the cylinder. The separate windings are here laid ad-

jacently of each other, and the number of windings on the drum increases from left to right and from right to left. A change in the winding direction, i.e. arranging a new winding to the left or right-hand side of a winding that has just been arranged, takes place at the side edge of the drum, therefore at the flange provided on this side edge. Following the change in direction a new layer of windings is started on the drum.

[0017] The changes in the direction of arrangement of new windings become controllable by providing guides on the flange. It has been found that this reduces the number of malfunctions. This enhances the effectiveness of the overall process. It has also been found that, due to the improved control of the winding process, the lifespan of the cable increases significantly. Surprisingly, it has been found here that an increase in lifespan of the cable is possible to a factor of 2-5. A cost-saving is hereby realized. In addition, this reduces the required maintenance and installation time. This further enhances the effectiveness of the overall process.

[0018] The guides are preferably provided on a side edge of the flange. Providing a flange preferably on both side edges of the drum/cylinder prevents the possibility, among others, of cables or pipes running off the drum. The change in the above discussed winding direction is guided by preferably providing both flanges with a number of guides, with the above stated advantages.

[0019] In an advantageous preferred embodiment according to the invention the guides are provided over a part of the periphery.

[0020] A precise dimensioning of cable or pipe and drum achieves that it is possible to determine very precisely where a change in the winding direction will occur. This makes it possible to provide the guides at these specific positions. This enhances the control of the winding process. In addition, the amount of material required for the guides remains limited.

[0021] It is further possible to provide the guides on existing drums by arranging them, optionally integrated with the flange, on the drums.

[0022] In an advantageous preferred embodiment according to the invention the guides are provided in the winding direction with a profile increasing in thickness.

[0023] Providing a profile increasing in thickness achieves that the cable or pipe is as it were pushed off the flange. The thickness of the profile increases in a direction substantially parallel to the central axis of the cylinder of the drum. The change or variation in the thickness of the profile increases in circumferential direction of the cylinder, and in particular in a direction corresponding to the direction of rotation of the cylinder during winding up of the cable or pipe.

[0024] The present invention also relates to a winch device and/or a vessel provided with a drum as described above.

[0025] Such a winch device and/or vessel, such as a cargo and transport vessel, provides the same effects and advantages as described for the cable and/or the drum.

[0026] The invention further also relates to a method for driving a displaceable object, comprising of providing a drum and/or winch device as described above.

[0027] Such a method provides the same advantages and effects as described for the cable and/or drum and/or winch device and/or vessel.

[0028] Further advantages, features and details of the invention are elucidated on the basis of a preferred embodiment thereof, wherein reference is made to the accompanying figures, in which:

- Figures 1A and B show a view of a vessel according to the invention;
- Figure 2 shows a view of the device according to the invention;
- Figures 3 and 4 show views of a modular embodiment of the device according to the invention;
- Figure 5 shows a view of a profile of the drum;
- Figure 6 shows a view of a cable according to the invention;
- Figure 7 shows a representation of the tilting of the cable of figure 6;
- Figure 8 shows a view of a cable path on a side of the drum;
- Figure 9 shows a view of a side of the drum provided with a flange; and
- Figure 10 shows a view of a winding pattern.

[0029] A vessel 2 (figure 1A) is suitable for navigation at sea 4, with a waterline or water surface 6. Situated at an outer end of vessel 2 is a frame 8 which serves to guide cable 10 to which a load 12 is attached. Frame 8 is provided for this purpose with a pulley or guide wheel 14 for carrying cable 10 substantially in a vertical direction into water 4. In the shown embodiment cable 10 runs from frame 8 to a guide wheel 16 and from there via arm 18 to a container 20.

[0030] In an alternative embodiment vessel 2 (figure 1B) is once again provided with container 20 with arm 18. In this embodiment load 12 is carried directly from arm 18 into the water, i.e. without making use of frame 8.

[0031] Frame 8 (figure 2) is provided in the shown embodiment with two uprights 22 mutually connected using a connecting bar 24. The guide wheel 14 over which cable 10 can run is arranged on connecting bar 24. Provided on the underside of uprights 22 are hinges 26 which ensure that frame 8 is tiltable. During use frame 8 is held in position using ropes or supports 28. A drum 30 is provided in container 20. Container 20 is placed on deck 32 of vessel 2. In the shown embodiment container 20 is embodied as a standard container.

[0032] Arm 18 (figure 3) serves to guide cable 10 and is provided for this purpose with a front guide wheel 34. Arm 18 is further provided in the shown embodiment with two auxiliary wheels 36, 38 which, together with wheel 39 and guide 40, provide for a good unwinding and winding up of cable 10 from and onto drum 30. Present on

drum 30 during use are cable windings 41 which are unwound or wound up.

[0033] Drum 30 (figure 4) is suspended rotatably in container 20 such that cable 10 can be wound around it. In the shown embodiment drum 30 is located in a standard container 20 in order to make a modular system possible. When not in use, arm 18 is preferably stowed away in the interior of container 20 in order to thereby enable further simplified transport.

[0034] A drum 30 (figure 5) is provided with a profile 42 on the periphery thereof. Profile 42 is provided with upright edges 44 and grooves 46. In the shown embodiment the grooves are provided with a height H substantially equal to half the cable thickness D of cable C.

[0035] Cable C (figure 6) is provided in the shown embodiment with a central, elastic part 48 and a sheath part 50. Cable C is provided with a substantially rectangular form 52 with a number of rounded corners 54 in the shown embodiment with a radius in the order of about 20% of thickness D of cable C. Sheath part 50 is for instance manufactured from a synthetic fibre, for instance from polyethylene such as UHPE or UHMWPE. Other materials are also possible. Central part 48 is embodied in the shown embodiment as a type of elastic cord with which some compression of cable C is for instance made possible, while sheath part 50 realizes the strength of cable C.

[0036] Edge 44 is provided in a possible embodiment with an inclining surface, wherein the incline lies in a direction substantially perpendicularly of the peripheral direction of drum 30, and thereby substantially parallel to the winding direction. The incline increases in the rotation direction of drum 30 during winding of cable or pipe C thereon. This brings about a tilting 56 (figure 7) of cable or pipe C during winding up. A cable C is wound here in a winding direction X. Cable C is provided in a first position I with a vertical surface 58. By providing an incline on edge 44 an intermediate position II is reached in which surface 58 is rotated in rotation direction Y. An increase in the angle of inclination causes cable C to move to a further intermediate position III during further winding and to arrive at a maximum angle of inclination in the new tilted position IV.

[0037] In a shown alternative embodiment a drum 130 (figure 8) is provided with a profile 142 in a so-called Lebus form. In a plane projection 144 (figure 10) of drum 130 a groove 146a and b is provided with parallel parts 147 and spiral or helical parts 148. Projection 144 shows a groove 146a running from right to left over the drum surface and a groove 146b running from left to right over the drum surface. The minimum distance between parallel parts 147 amounts to a pitch P.

[0038] Drum 130 (figure 8) is provided on side edge 148 with a flange 150. Flange 150 is provided with a number of guides 152 for guiding cables or pipes C on drum 130. During winding onto drum 130 winding direction X reverses at flange 150, after which new windings are laid onto a previously arranged layer of cables C in a "growth" direction in the other direction (in the figure in opposite direction to direction X). A plurality of layers 154 of cables C are in this way carried onto a drum. These flanges 150 with guides 152 can be used in substantially all types of drum 130, in principle independently of a profile.

[0039] Flange 150 (figure 9) is provided in the shown embodiment with a guide 152 over a part of the circumferential direction of drum 130. As seen in cross-section, guide 152 is provided with a thickness D. Thickness D preferably increases along the length of guide 152 in the direction of rotation of drum 130 as it is winding up. Flange 150, shown in combination with drum 130, can also be applied with other drums 30 provided with a different profile 42.

[0040] During winding up drum 30,130 is driven in a rotation direction. Cable or pipe C is wound up here in a winding direction X. The first layer of cables or pipes C is laid here directly onto guide profile 42,142. A plurality of layers 154 are usually arranged on drum 30,130. As soon as a new winding of cable C reaches flange 150, it is as it were pushed using guides 152 so as to thereby preferably follow the route along projection 144, wherein the winding direction is reversed for the following layer of cables or pipes C. Preferably also present on the other side of drum 130 is a flange 150 with guides 152 for changing the winding direction for a further layer if necessary. Stresses occurring as a result of winding are hereby limited. During unwinding of cable or pipes C from drum 30,130 guides 152 will for instance prevent undesirable displacements. A better controllable movement is therefore also realized during lowering of a load 12.

[0041] The invention is by no means limited to the above described preferred embodiments thereof. The rights sought are defined by the following claims, within the scope of which many modifications can be envisaged. It is thus possible to use the drum and winch device for a wide range of applications in which cables or pipes are provided on a drum. A possible example hereof is the laying of underground cables.

Claims

1. Cable for lowering and/or raising a load into and/or out of water, comprising a cross-section which is substantially rectangular such that a controllable winding of the cable onto the drum can be realized.

2. Cable as claimed in claim 1, wherein the cross-section is substantially square.

3. Cable as claimed in claim 1 or 2, wherein the cross-section is provided with rounded corners.

4. Cable as claimed in claim 3, wherein the rounded corner has a radius in the range of 0.025-0.45 times the cable diameter, and most preferably in the range

of 0.1-0.4 times the cable diameter.

5. Cable as claimed in one or more of the foregoing claims, wherein a central element is provided.

6. Drum for a winch device, wherein the drum is suitable for winding up a cable or pipe as claimed in one or more of the foregoing claims.

7. Drum as claimed in claim 6, comprising a guide profile on the periphery of the drum.

8. Drum as claimed in claim 7, wherein the guide profile is provided with a tilting upper surface for the purpose of tilting the substantially rectangular cable.

9. Drum as claimed in one or more of the claims 6-8, further comprising a flange arranged on a side of the cylinder, wherein the flange is provided with guides such that the winding direction of the cable or pipe changes during winding thereof onto the cylinder.

10. Drum as claimed in claim 9, wherein the guides are provided on a side edge of the flange.

11. Drum as claimed in claim 9 or 10, wherein the guides are provided over a part of the periphery.

12. Drum as claimed in claim 9, 10 or 11, wherein the guides are provided in the winding direction with a profile increasing in thickness.

13. Winch device, comprising a drum as claimed in one or more of the claims 6-12.

14. Vessel provided with a drum and/or winch device as claimed in one or more of the foregoing claims.

15. Method for winding up and unwinding a cable or pipe and/or for lowering and raising loads, comprising of providing a drum and/or winch device as claimed in one or more of the foregoing claims.

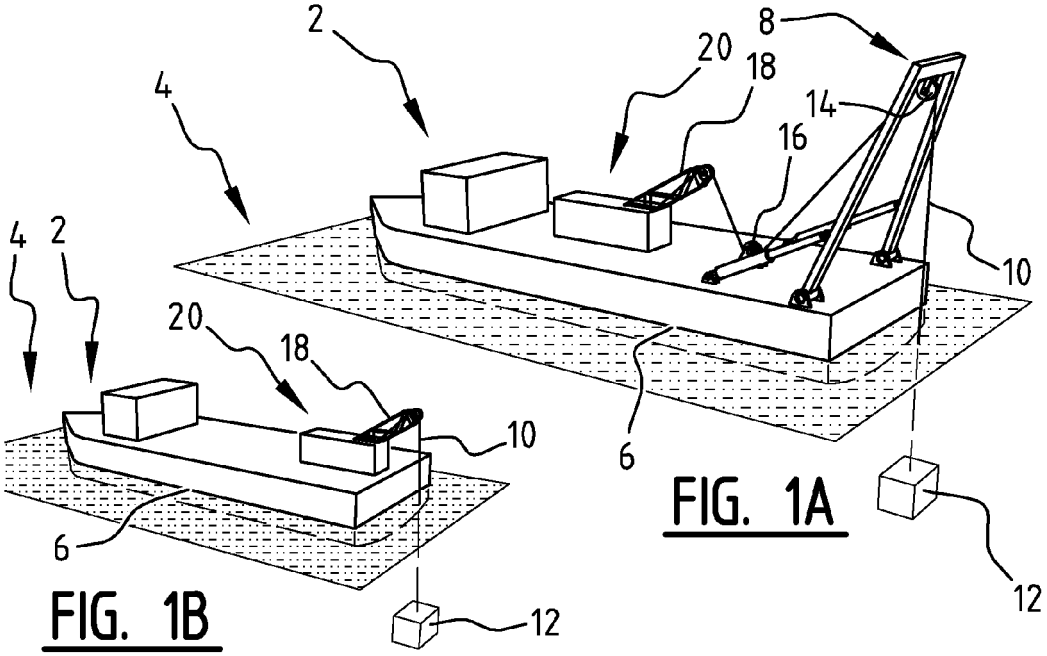


FIG. 1A

FIG. 1B

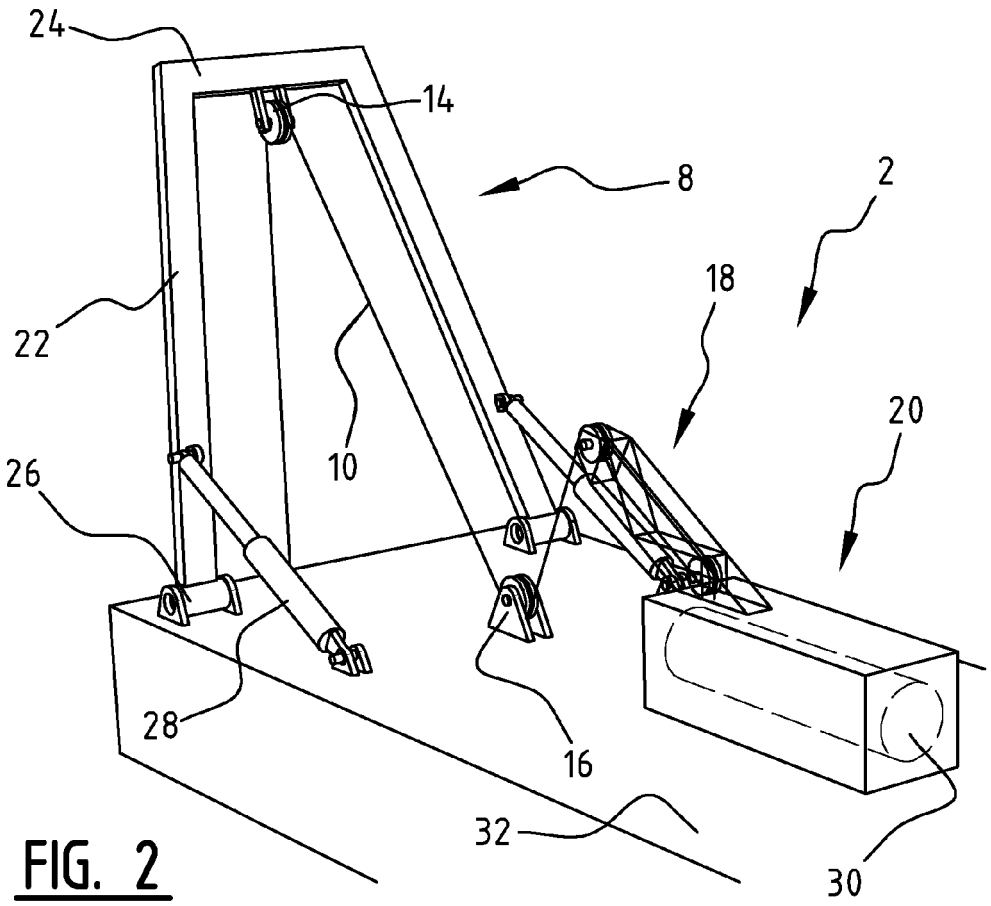


FIG. 2

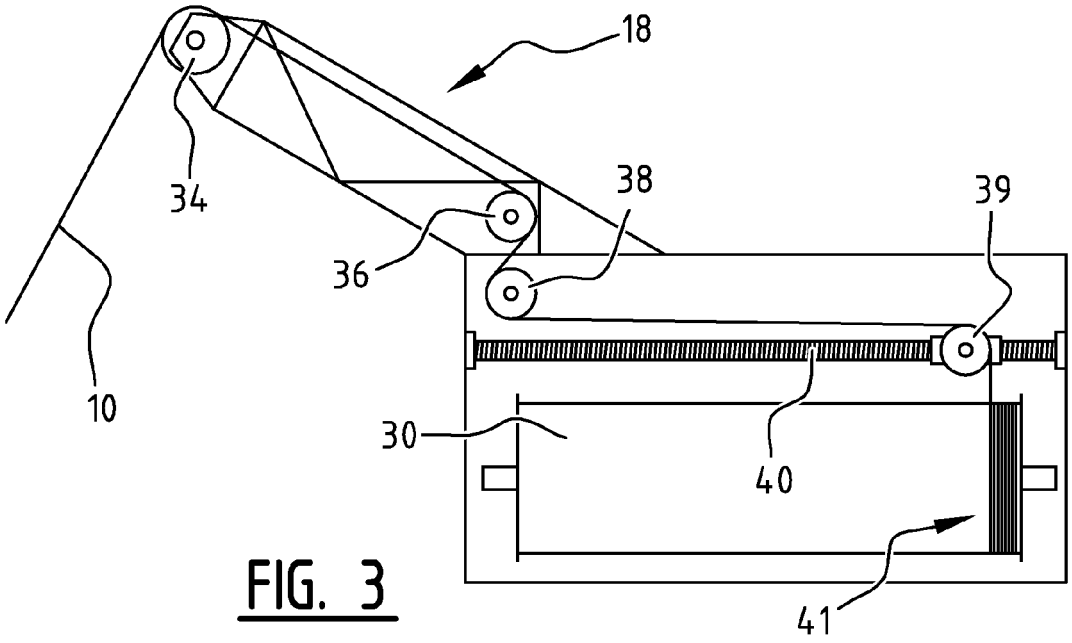


FIG. 3

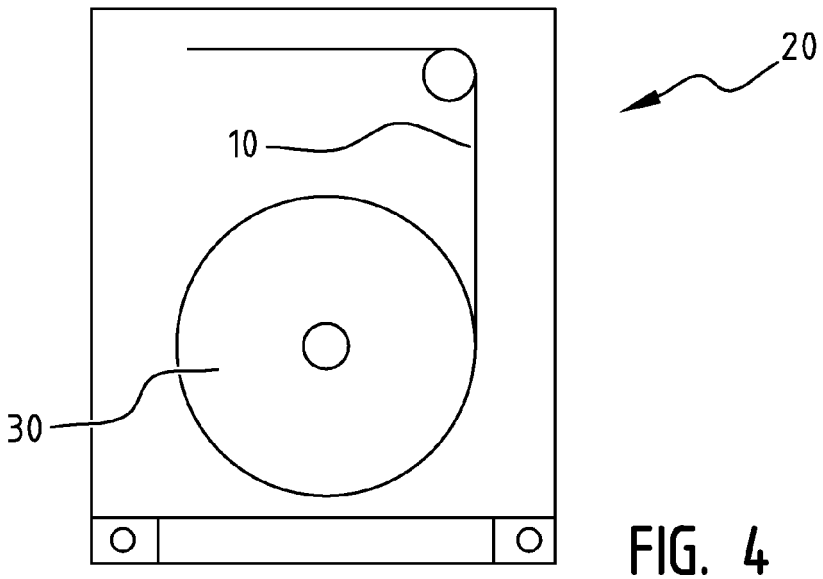


FIG. 4

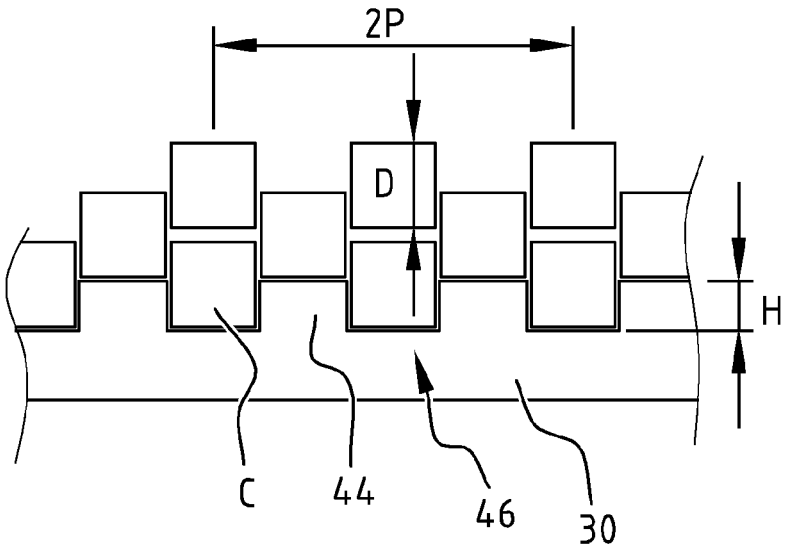


FIG. 5

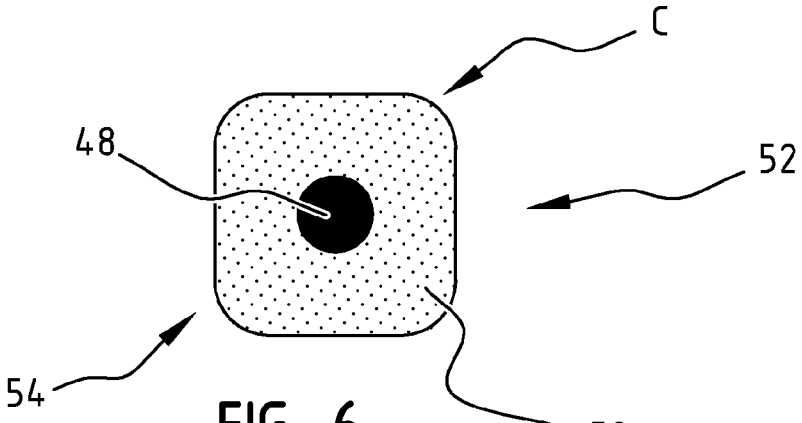


FIG. 6

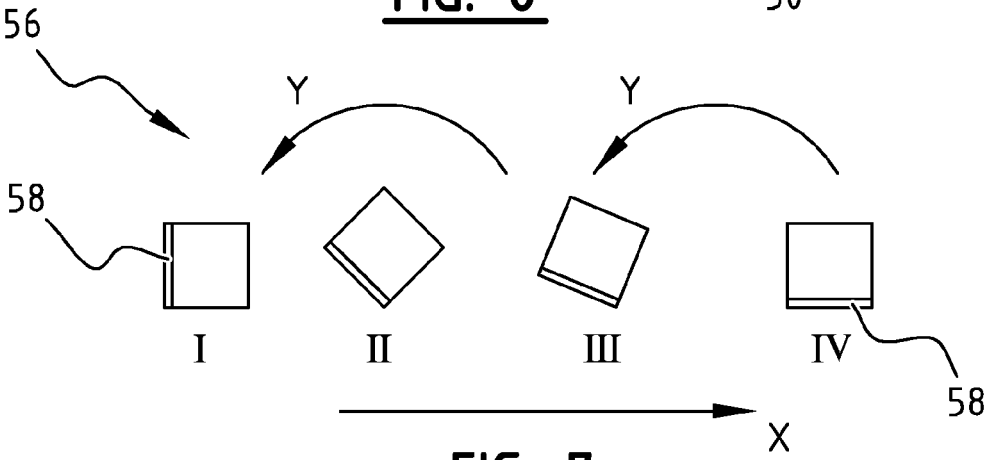


FIG. 7

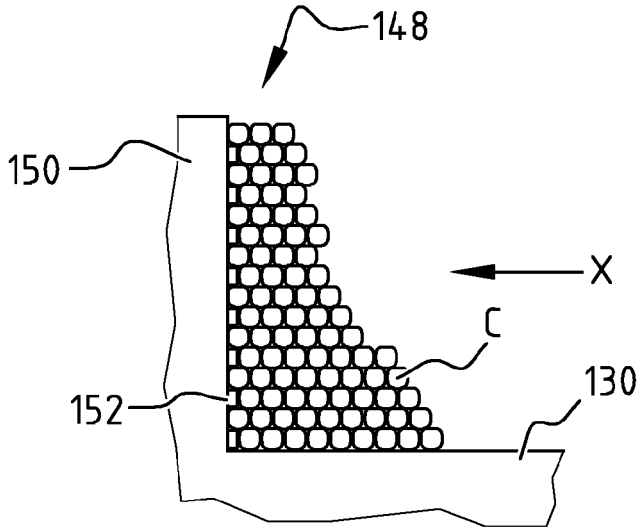


FIG. 8

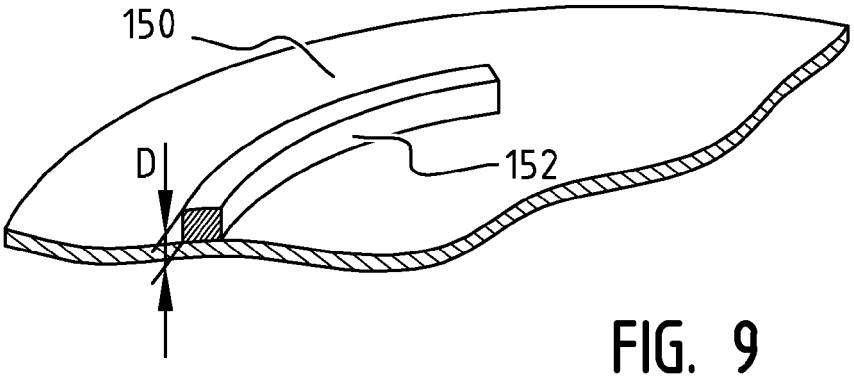


FIG. 9

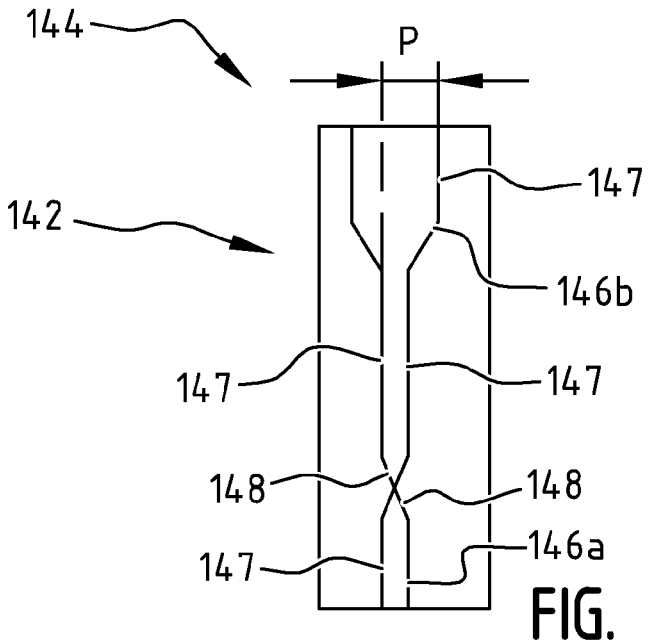


FIG. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 12 19 3012

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 4 803 909 A (SMITH MICHAEL F [US]) 14 February 1989 (1989-02-14) * figures 20,21 * -----	1-5	INV. B66D1/30
X	US 2008/156928 A1 (DOUD BRIAN [US] ET AL) 3 July 2008 (2008-07-03) * figures 1,2,12 * -----	6,7,9-15	

TECHNICAL FIELDS SEARCHED (IPC)

B66D
B66C
B66B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 March 2013	Fiorani, Giuseppe

CATEGORY OF CITED DOCUMENTS

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12-03-2013

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4803909 A	14-02-1989	NONE	
US 2008156928 A1	03-07-2008	US 2008156928 A1	03-07-2008
		WO 2008081366 A1	10-07-2008

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