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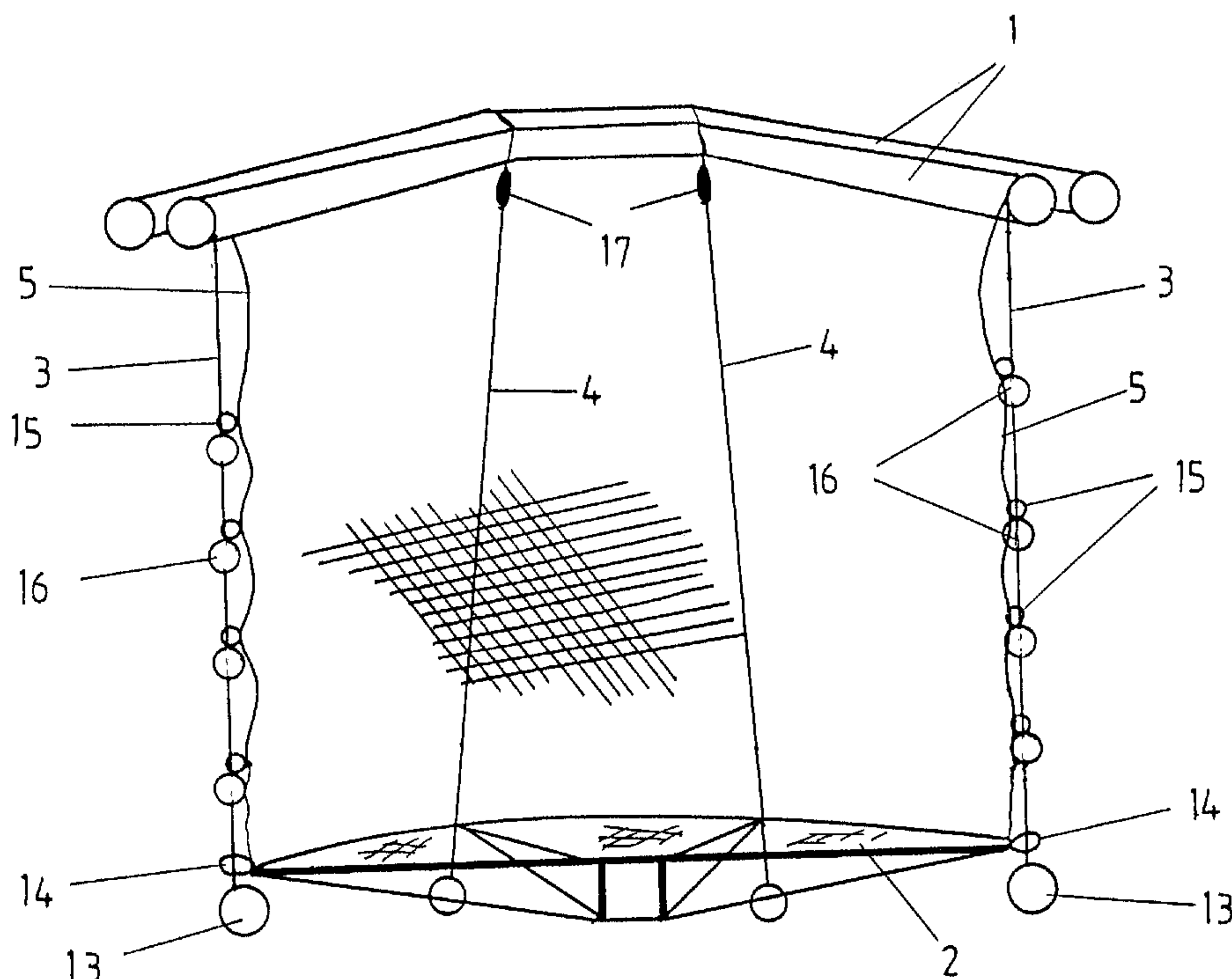
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(54) Titre : EQUIPEMENT DE CAGE A FOND PLAT

(54) Title: EQUIPMENT FOR FLAT-BOTTOM FLOATING CAGE



(57) Abrégé/Abstract:

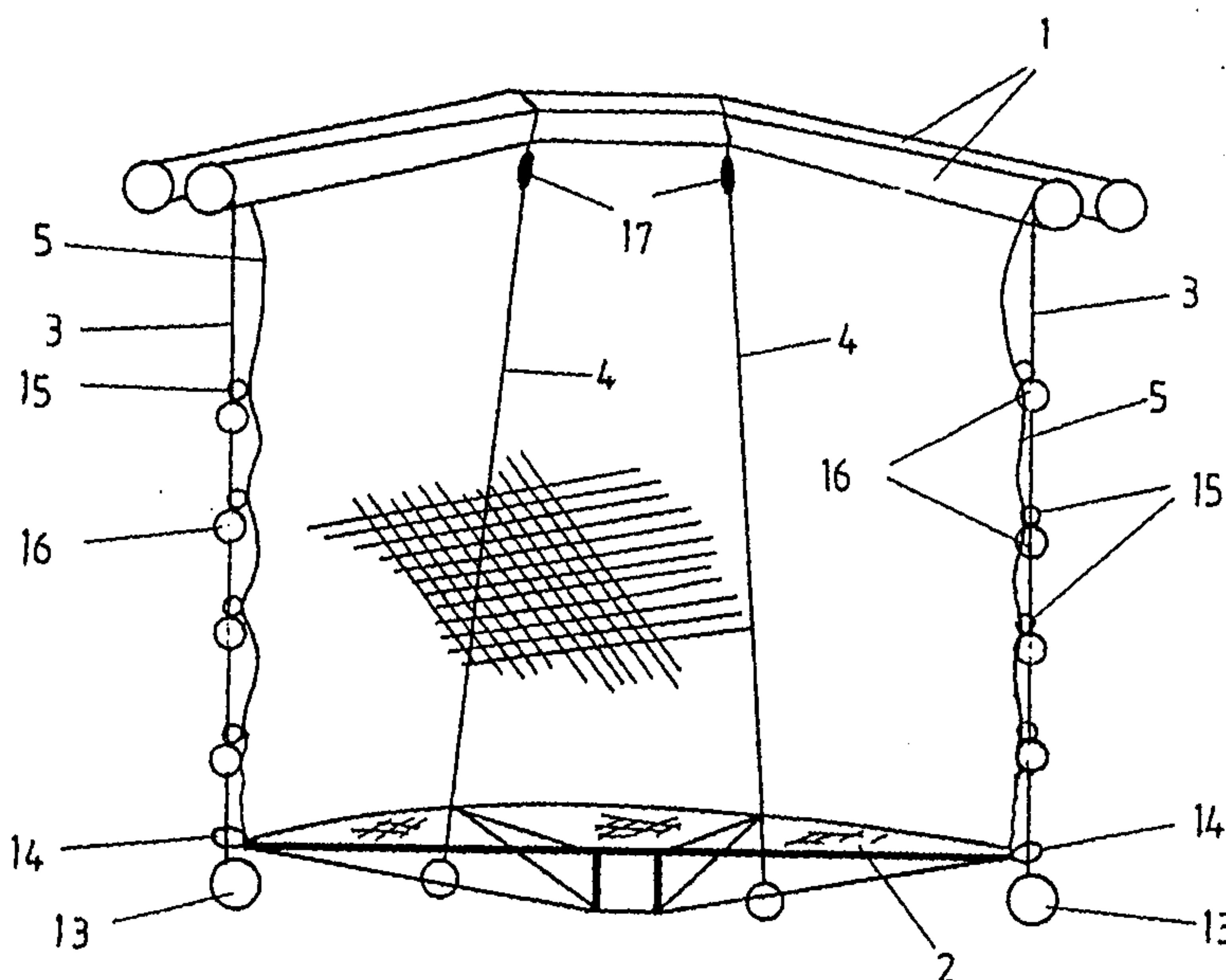
Floating rings (1) with a base (2) and intermediary slide rod (3) and wire (4), and a fish pen (5) fastened to the floating ring (1) and resting on the base (2). A polygonal base ring (6) with angles (7) and a centre tank (9) and stays (10, 12) stretched in between. The centre tank (9) can be filled with a required mixture of fluid and of gas in order to obtain the necessary buoyancy to lift the base (2). To the floating rings (1) are fastened slide rods (3) weighted by mooring blocks (13) at the opposite extremity, and wires (4) attached to the base ring (6). A second set of loops (15) is fastened to the fish pen (5) and slide along the slide rods (3). Floats (16) are positioned between the loops (15).

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(21) International Application Number: PCT/NO00/00048 (22) International Filing Date: 9 February 2000 (09.02.00) (30) Priority Data: 19990660 12 February 1999 (12.02.99) NO (71) Applicant (for all designated States except US): REFA AS [NO/NO]; P.O. Box 8, N-9301 Finnsnes (NO). (72) Inventors; and (75) Inventors/Applicants (for US only): JØRGENSEN, Svein, Harald [NO/NO]; Harald Silsand vei 31, N-9370 Silsand (NO). MIDLING, Kjell [NO/NO]; Styrmannsveien 4D, N-9014 Tromsø (NO). AAS, Kåre [NO/NO]; Krillveien 5, N-9100 Kvaløysletta (NO). (74) Agent: ALF-PETTER, Rudi; Jurikon Teknologi AS, Storgata 102, N-9008 Tromsø (NO).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i> <i>In English translation (filed in Norwegian).</i>

(54) Title: EQUIPMENT FOR FLAT-BOTTOM FLOATING CAGE



(57) Abstract

Floating rings (1) with a base (2) and intermediary slide rod (3) and wire (4), and a fish pen (5) fastened to the floating ring (1) and resting on the base (2). A polygonal base ring (6) with angles (7) and a centre tank (9) and stays (10, 12) stretched in between. The centre tank (9) can be filled with a required mixture of fluid and of gas in order to obtain the necessary buoyancy to lift the base (2). To the floating rings (1) are fastened slide rods (3) weighted by mooring blocks (13) at the opposite extremity, and wires (4) attached to the base ring (6). A second set of loops (15) is fastened to the fish pen (5) and slide along the slide rods (3). Floats (16) are positioned between the loops (15).

EQUIPMENT FOR FLAT-BOTTOM FLOATING CAGES

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The present invention relates to a system for flat-bottom floating cages especially with a view to obtaining a flat and stable bottom structure with the possibility of lifting or lowering said bottom to the desired depth. It must also be possible for people to walk on the bottom structure when this is lifted to the surface. Lifting and lowering are effected pneumatically from the surface.

Fish farming has nowadays become a major industry. The main volume and revenues come today from the farming of anadromous species such as salmon, sea trout and char. It is anticipated that marine species will take a much larger place in the conventional farming industry in the years to come. Halibut, catfish and turbot are species which seem to awaken the greatest interest for fish farming in the future. These are demersal species which live and remain most of the time on the sea floor. The present research and experience in farming of such species is restricted to raising the fish in longitudinal flow troughs or fish-raising ponds on shore. This technology is mostly suitable for fry or for small individuals in the early stages of fish production for the food industry. This onshore technology will become very costly for fish production for the food industry in regard to water, space and energy requirements. New solutions such as flat-bottom cages should be implemented in order to operate financially profitable farming of halibut, catfish and turbot (offshore farming). In addition, a new requirement will arise for stocking and feeding of wild fish captured alive such as halibut, catfish, flounder and cod as well as sea creatures such as king crab, sea urchins and the like. Flat-bottom cages are particularly well suited to meet these requirements.

Cod fish which is captured for feeding and stocking as live fish may suffer from a blown up swimming bladder. This is a required condition when fishing. The cod's swimming bladder may however be restored to its original state if the fish is allowed to rest on a flat surface for one or two days. The cod then becomes pelagic and can be transferred to an "ordinary" fish cage.

Flat-bottom cages with a liftable and lowerable base and a fish pen which rests on the base allow offshore fish-farming with all the operational advantages which this has to offer compared to onshore fish farming in tanks or ponds. The possibility of lifting the base of the cage or of the fish pen to a level which allows people to walk on the bottom renders the tasks of tending, controlling and sorting the fish easy and effective.

Patent NO-303.313 describes a solution consisting of a flat-bottom fish cage comprising a trampoline base which forms a flat support for the fish pen. The trampoline base is obtained with the help of an outer circular bottom ring and an inner stay ring while, concentric with these, a center ring is provided. Between these rings, stays are provided to keep the structure stretched and create the trampoline base on which the fish pen rests. The center ring is part of a tensioning system for the net bottom, such system consisting of a base ring closer to the sea bed and rigidly fixed to the center ring with the help of rods. To further stabilize the system vertically, stays are provided between the bottom ring and the base ring. The bottom ring is attached to a floating ring with the help of wires (stays or slide rods). The fish pen is fastened to the floating ring and is sliding vertically along the wires so that it is possible to lift and lower the fish pen relative to the floating ring, thus making the bottom of the pen vertically displaceable in the water. The stay ring consists of two horizontal rings, an outer stay ring and an inner stay ring, positioned at a certain distance from one another. Between those two stay rings a lift ring is provided which can be filled with compressed air or gas, thus altering its buoyancy and permitting the lifting or lowering operation of the trampoline base on which the fish pen rests.

The system described in NO-303.313, which consists in lifting and lowering the trampoline base with a bottom ring, stay rings and center ring, turns out to be somewhat complex technically to have any practical use. In addition, the center tensioning device for the base net is also too complicated to be of any practical

utility. The trampoline base and its tensioning mechanism are too complex and costly to manufacture.

5 The object of the present invention is to provide a flat-bottom floating fish cage system which is less complicated to operate and to use with regard to tending the fish and cleaning the cage.

10 This is achieved with the help of a polygonal base ring attached through a first set of loops to a number of slide rods which at one end are fixed to the floating rings and at the opposite extremity to a mooring block, the fish pen being able to slide along the slide rods with the help of a second set of loops, and where stays are fixed to the floating rings and at the opposite extremity to the base ring.

 Further details of the invention appear from the following description with reference to the illustrations of a preferred embodiment of the invention.

15 Figure 1 illustrates the complete floating cage with floating ring, base and fish pen.

 Figure 2 is a horizontal view of the base ring with the centre tank.

 Figure 3 shows a vertical section of the base ring with the centre tank.

 Figure 4 illustrates the base attached to the floating rings.

20 The floating cage system consists of floating rings 1, a base 2 with between these vertical slide rods 3 and wires 4. Inside this framework defined by the said components, and resting on the base 2, is a fish pen 5.

 The base 2 functions as a support for the fish pen 5 and contributes to shaping it such as to obtain a flat bottom. The base 2 must be taut enough for
25 people to walk on it. Figure 2 illustrates how the base 2 may be shaped. An outer frame for the base 2 is provided by a base ring 6 which is polygonal. From each angle 7 of the polygon and stretching to a centre point 8 on a centre tank 9 are top stays 10 which can be stretched in order to obtain the necessary base for the fish pen 5. The centre tank 9 is positioned vertically and is fastened from the bottom
30 points 11 of the centre tank 9, closest to the sea bed, to the base ring 6 with the help of base stays 12. In this manner, the centre tank 9 acts as an anchor point for

the stays 10, 12 and contributes to obtaining a taut base 2. An optional arrangement would be for the stays 10, 12 to be attached in the centre somewhat
5 off the centre tank 9, for instance to a ring- or cylinder-shaped element, the centre tank 9 being positioned inside such an element.

The centre tank 9 may be partly filled with water and air or gas to the required quantities to obtain additional buoyancy. The quantities required are controlled by valves and a control device placed on floating units on the floating
10 rings or in their vicinity .

The slide rods 3 are fixed to the floating rings 1 and are anchored at their lower extremity close to the base 2 with mooring blocks 13. The slide rods 3 run through a first set of loops 14 fastened to the periphery of the base ring 6, and through a second set of loops 15 which are fixed vertically along the fish pen 5.
15 Between the loops 15 floats 16 are provided, these being threaded on the slide rods 3 sliding freely along said slide rods 3 between the loops 15.

Wires 4 are fixed to the floating rings 1 and to the base ring 6 and are also fastened to the fish pen 5 in several places between the floating rings 1 and the base 2, in a manner similar to the slide rods 3. The base 2 is lifted by filling the centre
20 tank 9 with a sufficient quantity of air. As the base 2 lifts, so does the fish pen 5 rising towards the floating rings 1 assisted by the buoyancy effect of the floats 16. The quantity of air filled in the centre tank 9 can be such that, when the base 2 rises to for instance 0,5 to 1,0 m below the floating rings 1, it reaches a ponderal equilibrium and the fish farmers can walk on the base 2 in order to carry out their
25 tasks.

The wires 4 are provided with tension reducing devices 17 to reduce the hydrodynamic effect of the waves. The slide rods 3 reduce the hydrodynamic effect of the waves by moving vertically in the loops 14.

Around the periphery of the floating ring 1, any combination of slide rods 3 and of wires 4 may be chosen. for instance both types alternating all around. or all
30 elements may be of the same type.

CLAIMS

- 5 1. Equipment for flat-bottom floating cage for fish equipped with a floating ring, a base ring, wires which are fastened between the two, and having a fish pen attached to the wires and hanging from the floating ring, the fish pen resting on a base (2) and said base (2) being provided with a tensioning device **characterized** by a polygonal base ring (6) fastened with the help of a first set of loops (14) to a number of slide rods (3), said slide rods (3) being themselves fixed at one extremity to the floating rings (1) and at the opposite extremity to a mooring block (13), the fish pen (5) attached to and sliding along the slide rods (3) with the help of a second set of loops (15) and where wires (4) are fastened to the floating rings (1) at one end and to the base ring (6) at the opposite end.
- 10 2. The equipment for flat-bottom floating cage for fish of the previous claim **characterized in that** the polygonal base ring (6) has a number of angles (7) from which top stays (10) are fastened and run to top points (8) positioned at least in the vicinity of a centre tank (9), and base stays (12) are fastened from said angles (7) and stretch to bottom points (11) positioned at least in the vicinity of said centre tank (9).
- 15 3. The equipment for flat-bottom floating cage for fish of claim 2 **characterized in that** the centre tank (9) can be filled with a mixture of gas and fluid and emptied.
- 20 4. The equipment for flat-bottom floating cage for fish of claim 3 **characterized in that** filling and emptying of the centre tank (9) may be effected from a control device positioned on or in the vicinity of the floating rings (1).
- 25 5. The equipment for flat-bottom floating cage for fish of claim 2 **characterized in that** the top points (8) and the bottom points (11) are positioned on the centre tank (9).

5 6. The equipment for flat-bottom floating cage for fish of claim 2
characterized in that the top points (8) and the bottom points (11) are positioned
on a ring-shaped or cylinder-shaped element provided on the outside of the centre
tank (9).

7. The equipment for flat-bottom floating cage for fish of claim 1
characterized in that slide rods (3) only are provided.

10 8. The equipment for flat-bottom floating cage for fish of claim 2
characterized in that wires (4) only are provided.

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FIG. 1

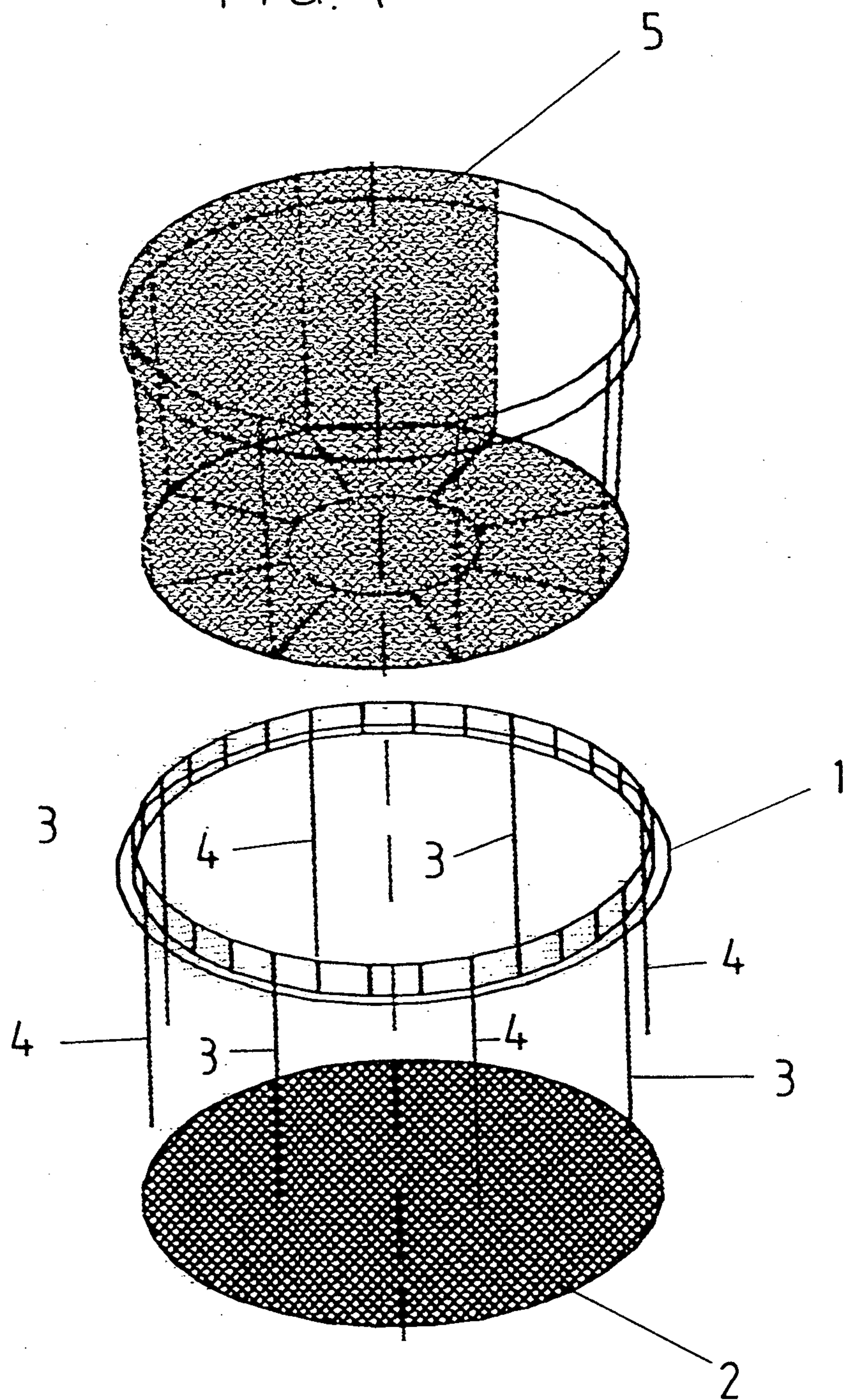


FIG 2

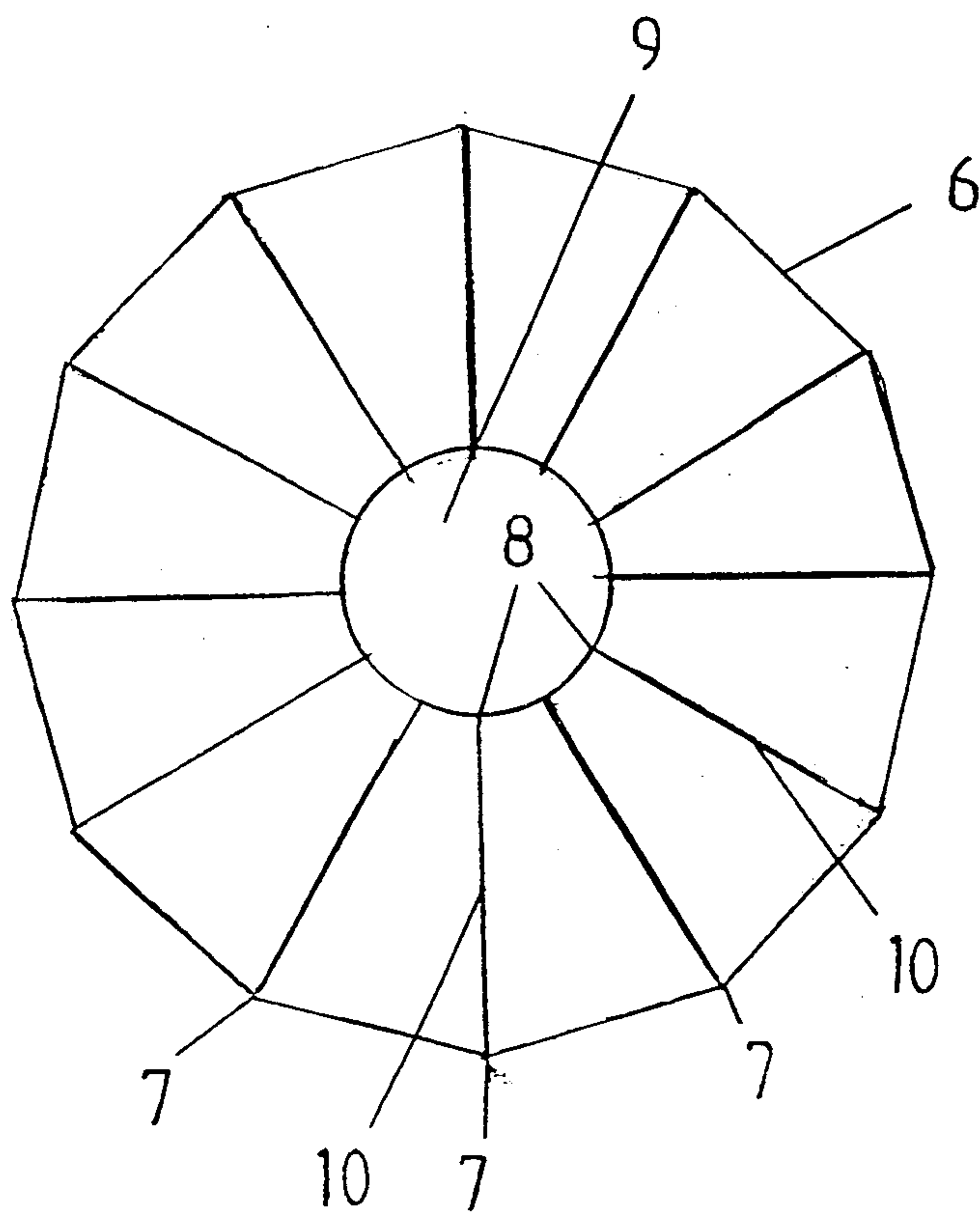


FIG 3

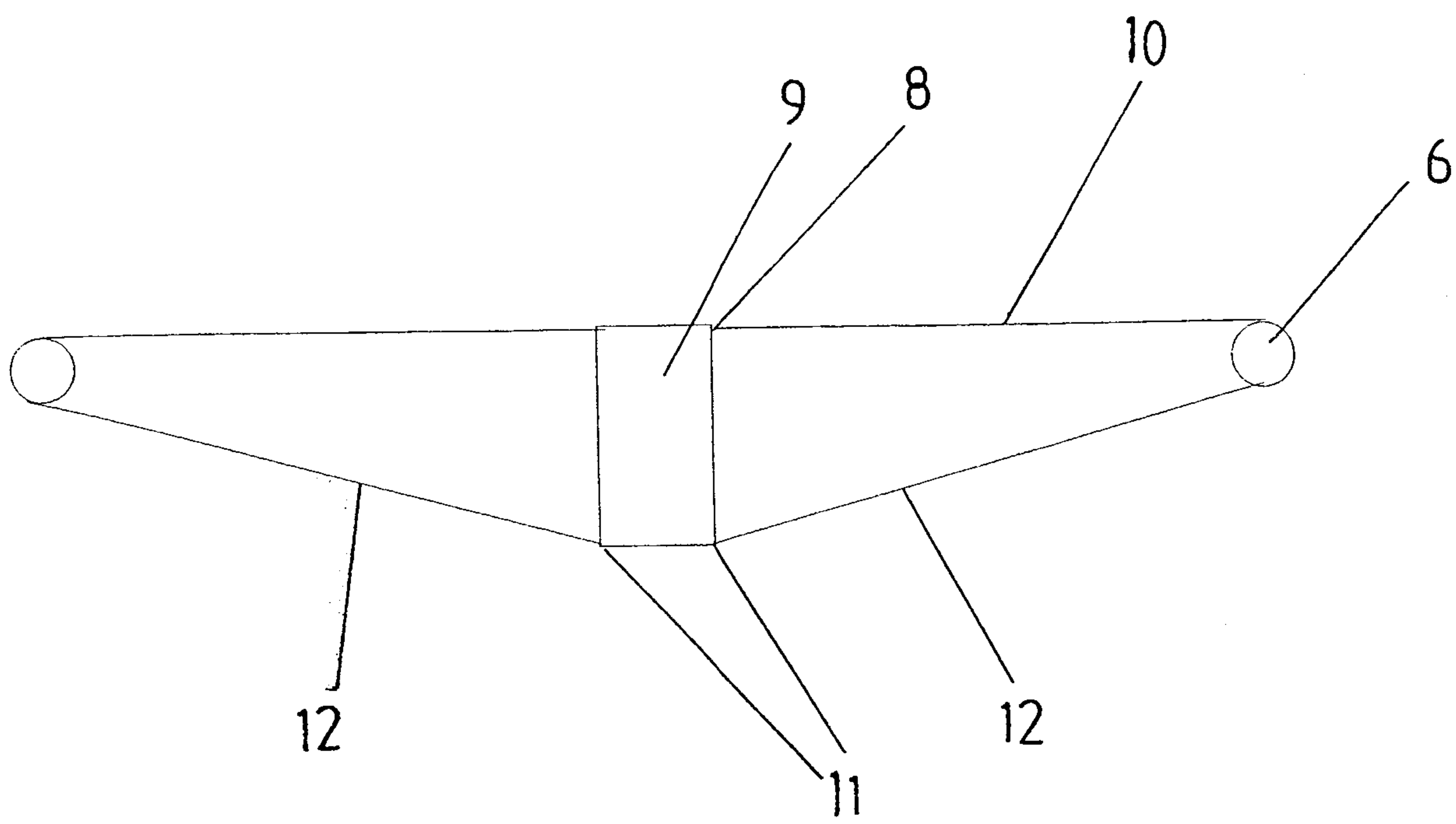


FIG 4

