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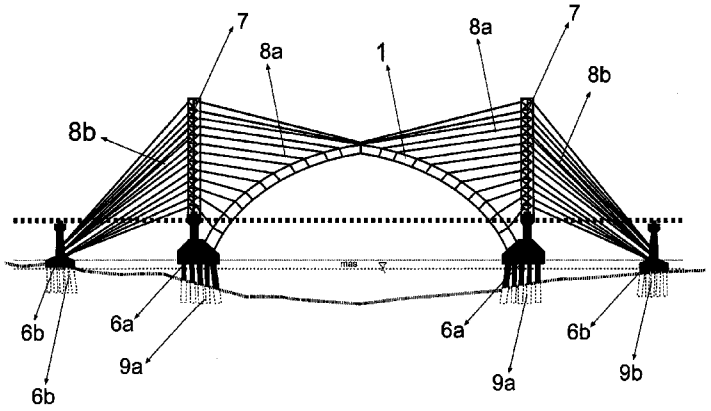

FIGURE 2

(57) Abstract: An erection method by simple tower instrument during upper bridge construction installation, consists of installing 8 bolt ∅ 1 1/2" — 400 and lower joint plate 24 mm bold, ∅ 50 cm on head of bridge construction pillar as hook designed tower, installing 5 locking plates from lower plate with 24 mm bold, 42 cm height as joint of premier steel pile ∅ 30 cm, 6.5 mm bold, through 8 bolts and lower joint plate on every head of bridge construction pillar, installing and locking wind fastener ∅ 15 cm through joint plate 16 mm bold and 4 bolts ∅ 3/4" to unite premier tower 3 ∅ 30 cm, 6.5 mm bold, locating axis bearings 6 cm on outer side of premier tower as supporting part to tie and tension cable to tower, locating front stays with to 70 degree to tower to put premier supporter on premier tower through bearings, locating back stays with 50 degree to tower to stabilize tower on rear tower pillar through bolt on bridge pillar, locating arc construction onto pontoon using crane, which all arc components made segmental, from segment 1 until segment 13, which loaded onto pontoon, arranged by a way so that pontoon stay stabile during installing arc construction, installing bracing at the same time with arc construction accordingly following arc construction installation, stressing cable using twin ram jack unit or multi-strand M-PV to stabilize premier supporter installation of upper bridge, featured that to unite premier tower piles, we use segmental by unite on site as necessary, and knock down easily after installing premier supporter stabilization of upper bridge portion, meanwhile tower hook, tower, bearings, cable installation, and tension, as additional device by using existent pillars so that reduce duration and cost wholly.

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ERECTION METHOD BY SIMPLE TOWER INSTRUMENT DEVICES OF BUILDING UPPER BRIDGE CONSTRUCTION

Description

Technical Field of Invention

Present invention refers to a erection method by simple tower instrument devices on building upper bridge construction, especially relates to simple tower instrument devices (cable stayed) in form of tower construction as supporting structure and the cable functions as hanging upper bridge structure, also bearing function as additional tie cable to said tower during pulling activity using twin ram jack unit or multi-strand M-PV in order to construct upper part of bridge so that no need hammer and winch any longer. Further of present invention, refers to simple tower instrument devices as help device during construction process on wide river, result minimize disturbance to river traffic such as pontoon, ship, raft, etc, which will be able to go through freely during the construction, plus minimize accident level. This erection method using simple tower instrument devices may utilize existence bridge pillars, also adjustable tower dimension and cable with designed construction specification and results cost and duration saving.

Background of Invention

As technology development, especially bridge construction for wide range, the experts compete to improve quality of bridge construction and speed to proceed it self.

Many methods and devices are available to build bridge construction for wide bentangan have some obstacles or weaknesses which effect some destruction.

Usually, previous building bridge construction especially for wide range uses conventional method, which use scaffolding as well as crane, pontoon, tugboat, and gauge in every step, the provide cable tension to bridge construction pillars. This method needs more manpower and long duration to construct the continues bridge. Also, said erection process is sensitive to water stream and river bed situation. It is hard to do because the pontoon will be inhibited by the stones. Other obstacles are longer duration, high cost, and sensitive to transportation vehicle crush, like pontoon, ship, raft, etc.

Another obstacle is that piles prohibit wooden material as temporary pile due to water condition. It causes using steel pile and high cost thereof. Indeed, high cost

for temporary job. Other, numerous pillar will inhibit river traffic so that disturb traffic safety and performance.

Further, during beginning of process which cranes pile scaffolding one by one, pontoon, tugboat, and gauges to construct arc construction and flat frame, so that needs hammer and winch and additional time and fund, also complicated devices.

Another obstacle related to technical factor due to accurate tool to erect premier pillar. Whether there is one mistake, the strength of building will be reduced. In other words, the strength of upper bridge construction is influenced very much by posed premier pillar.

To solve these problems, proposed an erection method by using simple tower instrument (cable stayed) which consists of tower construction as supporting structure and cable to hang upper bridge construction, also bearings as additional help device to tie up to tower and provide tension by twin ram jack and multi-strand M-PV. This simple tower structure functions to support constructing upper bridge portion on wide river so that no disturbance to river traffic. Present erection method may use existence pillars, as well as adjustable tower and cable dimension to reduce the cost and duration.

Brief Description of Invention

As previous description, present invention refers to erection method using simple tower instrument (cable stayed) to build upper bridge construction in form of tower construction as supporting structure and the cable functions to hang upper bridge structure, also bearings which function as additional tie-up cable to said tower during pulling activity using twin ram jack unit or multi-strand M-PV in order to construct upper part of bridge but no need hammer and winch any longer. Further present invention, refers to simple tower instrument devices as help device during construction process on wide river, result minimize disturbance to river traffic such as pontoon, ship, raft, etc, which will be able to go through freely during the construction, additionally minimize accident level. This erection method uses simple tower instrument devices which utilize existence bridge pillars; while tower dimension, cable are adjustable with designed construction specification as cost and duration saving.

Present erection method using simple tower instrument, which consists of:

Installing 8 bolt Ø 1 ½" – 400 and lower joint plate 24 mm bold, Ø 50 cm on head of bridge construction pillar as designed tower hook.

Installing 5 locking plates from lower plate with 24 mm bold, 42 cm height to joint premier steel pile Ø 30 cm, 6.5 mm bold, through 8 bolts and lower joint plate on every head of bridge construction pillar.

Installing and locking wind fastener Ø 15 cm through joint plate 16 mm bold and 4 bolts Ø ¾" to unite premier tower 3 Ø 30 cm, 6.5 mm bold.

Locating axis bearings 6 cm on outer side of premier tower as supporting part to tie and cable tension to tower.

Locating front stays with to 70 degree to tower to put premier supporting on premier tower through bearings.

Locating back stays with 50 degree to tower to stabilize tower on rear tower pillar through bolt on bridge pillar.

Locating arc construction onto pontoon using crane, which all arc components made segmental, from segment 1 until segment 13, which loaded onto pontoon, arranged by a mean so that pontoon stay stabile during installing arc construction.

Installing bracing together with arc construction according to arc construction installation.

Providing cable tension using twin ram jack unit or multi-strand M-PV in order to stabilize premier supporter installation of upper bridge.

Featured that to unite premier tower piles, we use segmental by unite on site as necessary, and unplugged easily after installing premier supporter of upper bridge portion, meanwhile tower hook, tower, bearings, cable installation, and tension, as additional device by using existent pillars so that reduce duration and cost generally.

A simple tower instrument during construction upper bridge portion, consists of:

A number of bar frames as premier pillar by using three steel pipes Ø 30 cm, 6.5 mm bold which constructed segmental;

A number bolts Ø 1 ½" – 400 and lower joint plate 24 mm bold, Ø 50 cm on head of bridge construction pillar as designed hook tower.

A number locking plates from lower plate with 24 mm bold, 42 cm height as joint of premier steel pile Ø 30 cm, 6.5 mm bold, through 8 bolts and lower joint plate on every head of bridge construction pillar.

A number wind fasteners Ø 15 cm through joint plate 16 mm bold and 4 bolts Ø ¾" to unite premier tower of 3 Ø 30 cm, 6.5 mm bold.

A number axis bearings 6 cm on outer side of premier tower as supporting part to tie up and tense cable to tower.

A number front stays with to 70 degree to tower to put premier supporter on premier tower through bearings.

A number back stays with 50 degree to tower to stabilize tower on rear tower pillar through bolt on bridge pillar.

A number arc construction onto pontoon using crane, which all arc components made segmental, from segment 1 until segment 13, which loaded onto pontoon, arranged by a mean so that pontoon stay stabile during installing arc construction.

A number bracings together with arc construction accordingly following arc construction installation.

A number twin rams jack unit or multi-strand M-PV to stabilize premier supporter installation of upper bridge.

Featured that whole components unite by using existent pillars as simple tower instrument, act as temporary supporting unit during installing premier pillar of upper bridge portion.

Main objective of present invention is to provide an erection method using simple tower devices on constructing upper part of bridge, mainly on wide range to reduce cost and using existent pillars.

Further objective of present invention is to provide an erection method using simple tower devices on constructing upper part of bridge to minimize disturbance to river traffic and accident risk during the construction.

Further objective of present invention is to provide an erection method using simple tower devices on constructing upper part of bridge which knock-down easily to reduce cost and duration.

Further objective of present invention is to provide an erection method using simple tower devices on constructing upper part of bridge by uniting on site as necessary.

Further objective of present invention is to provide an erection method using simple tower devices on constructing upper part of bridge which visible to wide range

and stoned river bed without disrupt river bed topography as well as reducing environment pollution.

Brief Description of Drawings

For making it easier to understand present invention, following story will describe and refer to attached drawings, they are:

Figure 1A is front perspective, shows fore-face of conventional scaffolding to build upper bridge structure, according to prior art.

Figure 1B is above perspective, shows upper-face of conventional scaffolding to build upper bridge structure, according to prior art.

Figure 1C is "A" perspective, shows joint of shoes or foundation between piled steel pipe under river bed and above pipes, according to prior art.

Figure 1D is "A" perspective, shows joint of unplugged shoes or foundation between piled steel pipe under river bed and above pipes, according to prior art.

Figure 2 is front perspective, shows fore-face of simple tower instrument, according to present invention.

Figure 3 is perspective view, shows erection method of simple tower instrument during installing premier pillar on tower main pillar, according to present invention.

Figure 4 is front perspective, shows erection method of simple tower instrument during installing premier pillar on tower main pillar through bearings, according to present invention.

Figure 5 is front perspective, shows side of simple tower instrument which has unite to bridge pillar, according to present invention.

Figure 6 is front perspective, shows detail of tower installation on bridge pillar, according to present invention.

Figure 7 is above perspective, shows upper part of tower installation on bridge pillar, according to present invention.

Figure 8 is perspective view, shows joint of wind fastener to bridge pillar, according to present invention.

Figure 9 is side perspective, shows detailed joint of wind fastener to main bridge pillar, according to present invention.

Figure 10 is above perspective, shows detailed bearings installation to main tower pillar, according to present invention.

Figure 11 is side perspective, shows anchor installation on back pillar of bridge tower pillar, according to present invention.

Figure 12 is side perspective, shows detailed anchor installation on rear pillar of bridge tower pillar, according to present invention.

Figure 13 is perspective view, shows shape of bearings on simple tower instrument, according to present invention.

Figure 14 is perspective view, shows flat frame erection installation of upper bridge construction, according to present invention.

Figure 15 is upper perspective, shows erection method on arc starting point construction, according to present invention.

Figure 16 is perspective view, shows erection installation of arc starting point construction, according to present invention.

Figure 17 is upper perspective, shows erection method on arc end point construction, according to present invention.

Figure 18 is perspective view, shows erection installation of arc end point construction, according to present invention.

Detailed Description of Invention

Further description will be provided in details, refers to attached drawings.

Refers to Figure 1A until 1D, which Figure 1A is front perspective, shows fore-face of conventional scaffolding to build upper bridge structure, according to prior art. Meanwhile Figure 1B is above perspective, shows upper-face of conventional scaffolding to build upper bridge structure, according to prior art. Figure 1C is front perspective, shows joint of shoes or foundation between piled steel pipe under river bed and above pipes, according to prior art. Figure 1D is front perspective, shows joint of unplugged shoes or foundation between piled steel pipe under river bed and above pipes, according to prior art.

To precede center range construction (1) of upper bridge and arced with 150 meters or more length by conventional scaffolding method, usually utilize some cranes (13) and pontoon (14) for steel scaffolding pillar installation (4) temporarily. Wherein scaffolding use steel pipes (4) 40 cm and 60 cm diameter which piled into river bed so disturb river traffic because of reduced river space by scaffolding pillars (4). During steel pipes installation (4), a crane (13) located on pontoon (14) with same direction with river stream to reduce traffic disturbance. Steel pipe (3) which piled

into river bed thus made inner joint (3a) with pipes (4) above it with certainty space from pile end (3) which functions as shoes or foundation (shown in Figure 1C), and meant to unplugged easily after erection work finish, but piled scaffolding pillar will not unplugged so disturb river traffic (shown in Figure 1D). Meanwhile, flat frame center range (2) installation which functions as vehicle floor will be proceed after pile (3,4) and beam (1,5) installed completely. During flat frame (2) erection installation proceed one direction due to flat frame material (2) located far apart of pillars (6a,6b) so that need link set as weighing. In order to support flat frame material (2), use crane (13) which located on pontoon (14) (not shown in this figure). These installations proceed step by step so need more labor and duration.

Further refers to Figure 2 until Figure 4, which Figure 2 is front perspective, shows fore-face of simple tower instrument, according to present invention. Figure 3 is perspective view, shows erection method of simple tower instrument during installing premier pillar on tower main pillar, according to present invention. Figure 4 is front perspective, shows erection method of simple tower instrument during installing premier pillar on tower main pillar through bearings, according to present invention. During simple tower instrument installation, it needs some calculation of:

1. pillar (6a) stability;
2. pillar (6b) as anchor stability;
3. tower construction design;
4. cable (8a,8b) of tower and anchor design;
5. upper bridge construction (2) stability which installed on the erection.

An erection method by simple tower instrument during upper bridge construction installation consists of:

Installing 8 bolt/anchor (7b) Ø 1 ½" – 400 and lower joint plate 24 mm bold, Ø 50 cm on head of bridge construction pillar as hook designed tower (7).

Installing 5 locking plates from lower plate with 24 mm bold, 42 cm height as joint of premier steel pile (7) Ø 30 cm, 6.5 mm bold, through 8 bolts/anchor (7b) and lower joint plate (7a) on every head (6a) of bridge construction pillar as hook designed tower (7).

Installing and locking 3 main tower pillars (7) Ø 30 cm, 6.5 mm bold through locking plate tower pipe joint (7c) and base plate (7a) with 8 bolts/anchor (7b) on every head (6a) of bridge construction pillar.

Installing and locking wind fastener (10) ∅ 15 cm through joint plate 16 mm bold and 4 bolts ∅ ¾" to unite premier tower 3 ∅ 30 cm, 6.5 mm bold.

Locating axis bearings (12) 6 cm on outer side of premier tower as supporting part to tie and stress cable to tower.

Locating front stays (8a) with to 70 degree to tower (7) to put main center arc supporter (1) on premier tower (7) through bearings (12).

Locating back stays (8b) with 50 degree to tower (7) to stabilize tower on rear tower pillar (6a) through bolt/anchor (11) on bridge pillar (6b).

Locating arc construction (1) onto pontoon (14) using crane (13), which all arc (1) components made segmental, from segment 1 until segment 13, which loaded onto pontoon (14), arranged by a way so that pontoon (14) stay stabile during installing arc (1) construction.

Installing bracing (5) together with arc (1) construction according to following arc (1) construction installation.

Providing cable tension using twin ram jack unit or multi-strand M-PV in order to stabilize premier supporter (1) installation of upper bridge.

Featured that to unite premier tower (7) piles, use segmental by unite on site as necessary, and knock down easily after installing premier supporter stabilization of upper bridge portion, meanwhile hook tower (7), bearings (12), cable (8a,8b) installation, and stressing, as additional device by using existent pillars (6a,6b)so that reduce duration and cost wholly.

A simple tower instrument devices on upper bridge construction, consist of:

A number of bar frame as premier pillar (7) by using three steel pipes ∅ 30 cm, 6.5 mm bold which constructed segmental.

A number bolts/anchor (7b) ∅ 1 ½" – 400 and lower joint plate (7a) 24 mm bold, ∅ 50 cm on head of bridge construction pillar as hook designed tower (7).

A number locking plates (7c) from lower plate with 24 mm bold, 42 cm height as joint of premier steel pile ∅ 30 cm, 6.5 mm bold, as cable hook (8a,8b) to give stress stability center range (1) upper part of bridge.

A number wind fastener (10) ∅ 15 cm through joint plate (10b) 16 mm bold and 4 bolts (10a) ∅ ¾" to unite premier tower (7) 3 ∅ 30 cm, 6.5 mm bold.

A number axis bearings (12) 6 cm on outer side of premier tower (7) as supporting part to tie and stress cable (8a,8b) to tower (7).

A number front stays (8a) with to 70 degree to tower (7) to put premier supporter on premier tower (7) through bearings.

A number back stays (8b) with 50 degree to tower (7) to stabilize tower (7) on rear tower pillar (7) through bolt (11) on bridge pillar (6b).

A number segmental arc (1) construction, from segment 1 until segment 13, which loaded onto pontoon, arranged by a way so that stable and balances during the installation.

A number bracing (5) install at the same time with arc (1) construction accordingly following arc (1) construction installation.

A number twin rams jack unit or multi-strand M-PV to stress cable (8a,8b) and stabilize premier supporter (1) installation of upper bridge.

Featured that whole components unite by using existent pillars (6a,6b) to be one as simple tower instrument, as temporary supporting unit during installing premier arc (1) of upper bridge portion.

Whereas such erection method of center range (1) in form of arc with 150 meters or more diameter, using tower (7) and cables (8a,8b), so it needs precise calculation about structure strength especially tower hook (8a,8b) stability and tower (7) pillar strength to bear some load (1) during construction. Simple tower instrument (7,8a,8b) on upper bridge construction (2) process, mainly on wide range bar to achieve more the erection cost efficiently by utilize existent pillars (6a,6b). Position of temporary tower (7) construction for arc center range (1) erection is calculated pillars (6a,6b) capability by estimating steel pile strength (9a,9b) on said pillars (6a,6b). Value of steel pile strength (9a,9b) on said pillars (6a,6b) are different for every site, depend on designed flat frame (3) load and soil strength of site.

Further refers to Figure 5 until Figure 7, which Figure 5 is front perspective, shows side of simple tower instrument which has unite to bridge pillar, according to present invention. While Figure 6 is front perspective, shows detail of tower installation on bridge pillar, according to present invention. Also, Figure 7 is upper perspective, shows upper part of tower installation on bridge pillar, according to present invention. Simple tower (7) structure design as temporary tower is bar structure as premier tower by using three steel pipes ∅ 30 cm, steel plate 6.5 mm bold, and pipe bracing (10) ∅ 15 cm, properties of yield stressing point 250 MPa, and made segmental which every segment 6 meter tall in 9 number. Premier tower pillar (7a) ∅

30 cm, lay on pillar (6a) which had installed tower hook (7a) previously by deploy bolt/anchor (7b), which attached to pillar head's (6a) properties are anchor/bolt (7b) 8 ∅ 1 ½ - 400 diameter, and lower joint plate (7a) 24 mm, also locking plate (7c) of 5, 24 mm bold and 42 cm tall as junction of tower pipes (7) and base plate (7a).

Refers to Figure 8 and Figure 9, which Figure 8 is perspective view, shows joint of wind fastener to bridge pillar, according to present invention; and Figure 9 is side perspective, shows detailed joint of wind fastener to main bridge pillar, according to present invention. It shows that wind fastener (10) which functions as tower pillar stiffener uses circle steel pipes ∅ 15 cm and jointed by bolt (10a) 4 ∅ ¾" and previously made junction joint (10b) from steel plate 16 mm bold.

Further refers to Figure 10 until Figure 13, which Figure 10 is above perspective, shows detailed bearings installation to main tower pillar, according to present invention. While Figure 11 is side perspective, shows anchor installation on rear pillar of bridge tower pillar, according to present invention. Meanwhile, Figure 12 is side perspective, shows detailed anchor installation on rear pillar of bridge tower pillar, according to present invention. Thus Figure 13 is perspective view, shows shape of bearings on simple tower instrument, according to present invention. Bearings (12) are used to tie cables (8a,8b) to premier tower (7) pillar to provide tension during erection by twin ram jack unit or multi-strand M-PV (now shown in Figure). To lay designed bearings (12) using power of 20 until 50 tons with axis 6 cm, posed on outsider main pipe (7), each of bearings (12) attached and calculated tension magnitude of cables (8a,8b). Cables (8a,8b) use single strand 3 ∅ 0,6", 270 ksi, which laying cable 70° to tower and backstays (8b) 50° to tower. Hanging cable (8a) functions to reduce deflection on arc structure (1) during the erection meanwhile backstay (8b) functions to stabilize tower against lateral force due to the erection. Cables (8a,8b) are given tension using multi-strand M-PV (not shown in Figure) with pretension force 650 kN. Backstays (8b) posed on pillar which located rear of tower pillar (6a) and connected with anchor (11), so weight of arch construction (1) beared by pillar (6b) on back of tower pillar (6a). bolt/anchor (11) of cable (8b) function to bear pillar (6b) by steel pipe 3 ∅ 6", which provided a locking bolt (11a) on the site (11b) of pillar (6b), then provide tension by twin ram jack unit or multi-strand M-PV (not shown in Figure).

Further refers to Figure 14 until Figure 18, which Figure 14 is perspective view, shows flat frame erection installation of upper bridge construction, according to present invention, which Figure 15 is upper perspective, shows erection method on arc starting point construction, according to present invention. While Figure 16 is perspective view, shows erection installation of arc starting point construction, according to present invention. Meanwhile Figure 17 is above perspective, shows erection method on arc end point construction, according to present invention. Thus Figure 18 is perspective view, shows erection installation of arc end point construction, according to present invention. Arc (1) construction process divided into 13 segment, left and right, which is started by pontoon (14) preparation works, crane (13), tug boat, jack unit, gauges, etc; material preparation, manpower, tower construction (7), bearings (12) installation of tower (7). Tower (7) installations of pillars (6a) proceed segmental into 9 segments together with both pillars (6a). Each segment of tower (7) construction built on preparation phase and each tower (7) deployed by crane (13) which posed on pontoon (14) at starting point pillar (6a) (shown in Figure 15), begin with tower (7) segment then bolted on pillar lay up (7a). After tower segment (7) deployed on site, continue joining bolt of segmented tower (7)2 and then continue until wholly tower segment (7)9 also proceed to left and right pillar (6a). After that, bracing (10) placed by crane (13) which posed on pontoon (14) and placed on designed position per tower segment (7).

As shown in Figure 14, erecting arch (1) construction begin on starting point, through load arch (1) construction onto pontoon (14) and helped by crane (13), which all arch (1) component material made segmental, from segment 1 until segment 13 which loaded onto pontoon (14) and arranged neatly and by a way arch (1) construction so that installation run stable. Shown in Figure 15 that arc (1) construction process from starting point to make it easier, which pontoon (14) posed on (a) while load arc (1) construction which is stacked on left side of bank, and all components load on pontoon (14) then after finish, the pontoon (14) move to (b) to install arc (1) construction on left side of end point for arc (1) construction segment 1 until segment 13, thus pontoon (14) move to (c). Meanwhile pontoon number (c) do arc construction installation on right side of end point for arc construction segment 1 until segment 13. As shown in Figure 16, the arc (1) construction has erected from starting point wise.

As shown in Figure 17, arc (1) construction erection which proceed from end point, and use same method of arc (1) construction installation on starting point. Pontoon (14) position number (c) move to right side of pontoon (14) number (d). after stable, proceed arc (1) construction installation on left starting point for arc (1) construction segment 1 until segment 13, and at the same time, proceed bracing (5) fastener segmental, thus move to pontoon number (e). Where pontoon (14) number (e) proceed arc (1) construction installation on right side of end point for arc (a) construction segment 1 until segment 13. At the same time, bracing (5) tied segmental refers to arc (1) construction installation rightward. Prior arc (1) construction installation per segment, rear cable anchor (11) installed on desired position, e.g. on pillar (6b). Rear cable (8b) installation to provide simple structure stabilization during erecting of arc (1) construction. Also shown in Figure 18 that process of arc (1) construction erection has accomplished for end point side. After every arc construction installed, supporting cables (8a,8b) are plugged, the left side and right side, at the same time. After that, unplugging tower may be preceding by crane (13) which posed on pontoon (14) segment by segment.

All description and statement which refers to figures are illustration purpose, not to limit of invention. Other practices of this invention are possible as long as within spirit of present invention, and included into patent protection which claimed as followings.

Claims

1. An erection method by simple tower instrument during upper bridge construction installation, consists of:

Installing 8 bolt/anchor (7b) ∅ 1 ½" – 400 and lower joint plate 24 mm bold, ∅ 50 cm on head of bridge construction pillar as hook designed tower.

Installing 5 locking plates from lower plate with 24 mm bold, 42 cm height as joint of premier steel pile (7) ∅ 30 cm, 6.5 mm bold, through 8 bolts/anchor (7b) and lower joint plate (7a) on every head (6a) of bridge construction pillar.

Installing and locking 3 main tower pillars (7) ∅ 30 cm, 6.5 mm bold through locking plate tower pipe joint (7c) and base plate (7a) with 8 bolts/anchor (7b) on every head (6a) of bridge construction pillar.

Installing and locking wind fastener (10) ∅ 15 cm through joint plate 16 mm bold and 4 bolts ∅ ¾" to unite premier tower 3 ∅ 30 cm, 6.5 mm bold.

Locating axis bearings (12) 6 cm on outer side of premier tower as supporting part to tie and stress cable to tower.

Locating front stays (8a) with to 70 degree to tower (7) to put main center arc supporter (1) on premier tower (7) through bearings (12).

Locating back stays (8b) with 50 degree to tower (7) to stabilize tower on rear tower pillar (6a) through bolt/anchor (11) on bridge pillar (6b).

Locating arc construction (1) onto pontoon (14) using crane (13), which all arc (1) components made segmental, from segment 1 until segment 13, which loaded onto pontoon (14), arranged by a way so that pontoon (14) stay stabile during installing arc (1) construction.

Installing bracing (5) together with arc (1) construction according to following arc (1) construction installation.

Providing cable tension using twin ram jack unit or multi-strand M-PV in order to stabilize premier supporter (1) installation of upper bridge.

Featured that to unite premier tower (7) piles, use segmental by unite on site as necessary, and knock down easily after installing premier supporter stabilization of upper bridge portion, meanwhile hook tower (7), bearings (12), cables (8a,8b) installation, and tension, as additional device by using existent pillars (6a,6b) so that reduce duration and cost generally.

2. An erection method by simple tower instrument during upper bridge construction installation as Claim 1, whereas premier tower (1) pillar installation at the same time to both pillar (6a) and segmental which each has 6 meter height and 9 segments.
3. An erection method by simple tower instrument during upper bridge construction installation as Claim 1, whereas arc (1) component install from starting point and end point of bridge.
4. An erection method by simple tower instrument during upper bridge construction installation as Claim 1, whereas tower (7) unplugging segmental by cranes (13) which located on pontoon (14), after all arc (10) construction finish.
5. A simple tower instrument devices on upper bridge construction, consist of:

A number of bar frame as premier pillar (7) by using three steel pipes ∅ 30 cm, 6.5 mm bold which constructed segmental;

A number bolts/anchor (7b) ∅ 1 ½" – 400 and lower joint plate (7a) 24 mm bold, ∅ 50 cm on head of bridge construction pillar as hook designed tower (7).

A number locking plates (7c) from lower plate with 24 mm bold, 42 cm height as joint of premier steel pile ∅ 30 cm, 6.5 mm bold, as cable hook (8a,8b) to give tension stability for center range (1) upper part of bridge.

A number wind fastener (10) ∅ 15 cm through joint plate (10b) 16 mm bold and 4 bolts (10a) ∅ ¾" to unite premier tower (7) 3 ∅ 30 cm, 6.5 mm bold.

A number axis bearings (12) 6 cm on outer side of premier tower (7) as supporting part to tie and tension cables (8a,8b) to tower (7).

A number front stays (8a) with to 70 degree to tower (7) to put premier supporter on premier tower (7) through bearings.

A number back stays (8b) with 50 degree to tower (7) to stabilize tower (7) on rear tower pillar (7) through bolt (11) on bridge pillar (6b).

A number segmental arc (1) construction, from segment 1 until segment 13, which loaded onto pontoon, arranged by a way so that stable and balances during the installation.

A number bracing (5) install at the same time with arc (1) construction accordingly following arc (1) construction installation.

A number twin rams jack unit or multi-strand M-PV to tension cable (8a,8b) and stabilize premier supporter (1) installation of upper bridge.

Featured that whole components unite by using existent pillars (6a,6b) to be one as simple tower instrument, as temporary supporting unit during installing premier arc (1) of upper bridge portion.

6. Simple tower instrument devices for bridge construction as claimed in Claim 5, which main tower pillar (7) made 9 segments with 6 meters height, by uniting on site as necessary, and unplugged easily after stabilize main arc pillar (1).
7. Simple tower instrument devices for bridge construction as claimed in Claim 5, which arc (1) components made segmental, from segment 1 until segment 13 which each has strand, stressed cable, and various designed load.
8. Simple tower instrument devices for bridge construction as claimed in Claim 5, which bearings (12) used to tie cable (8a,8b) to main tower pillar (7) to give tension during the erection by twin ram jack or multi-strand P-PV.

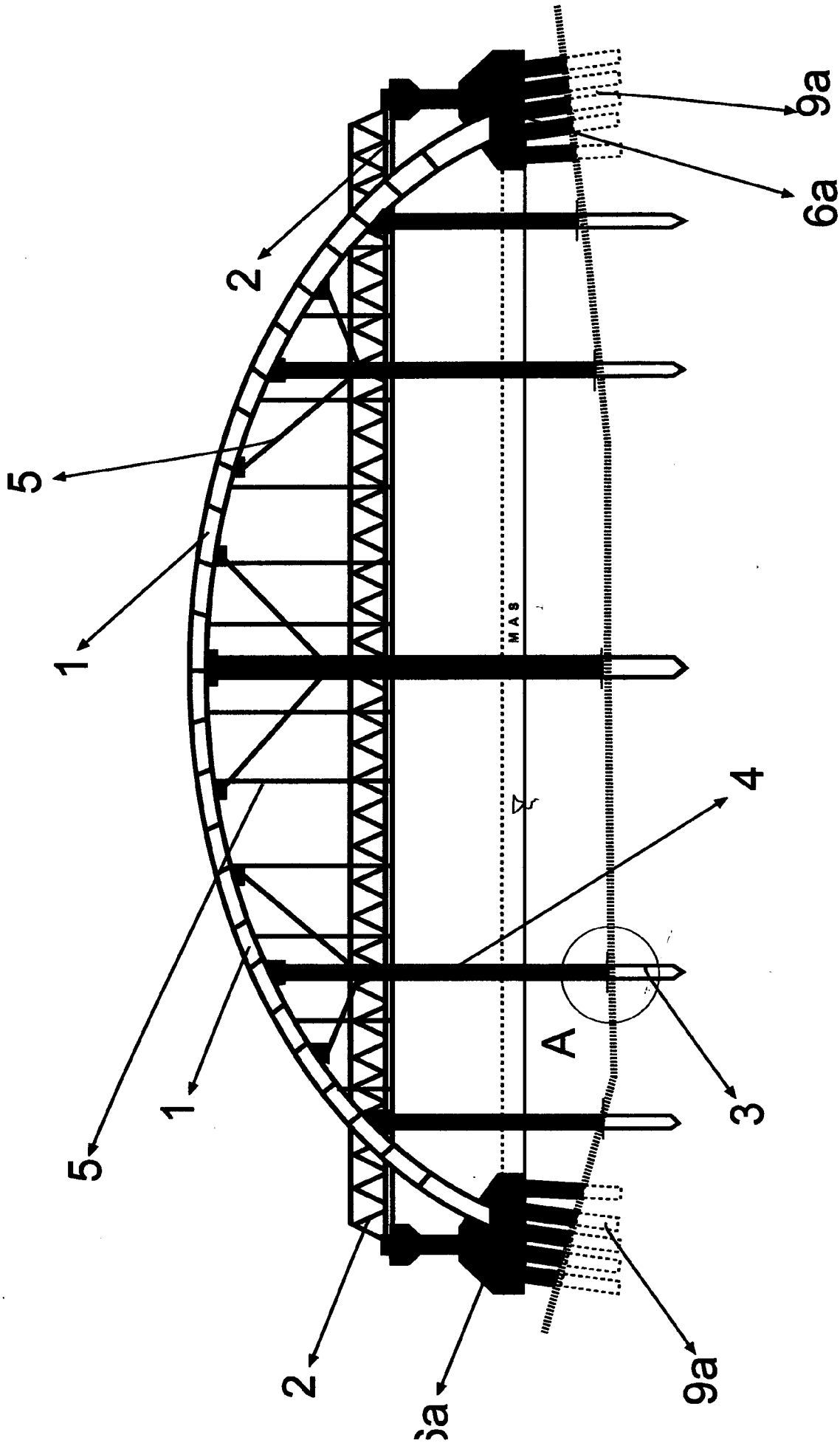

FIGURE 1A

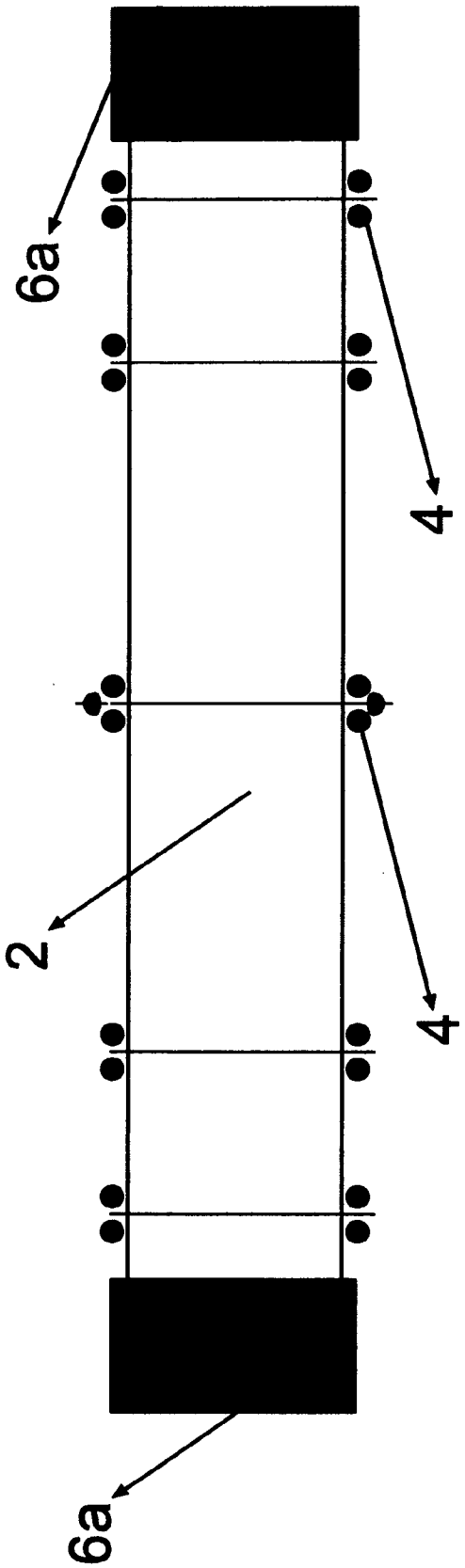

FIGURE 1B

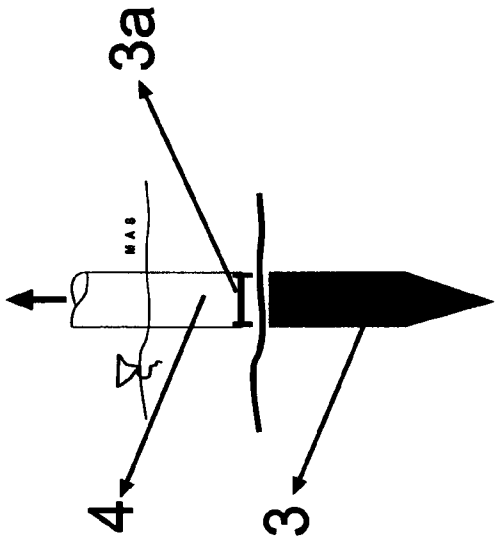

FIGURE 1D

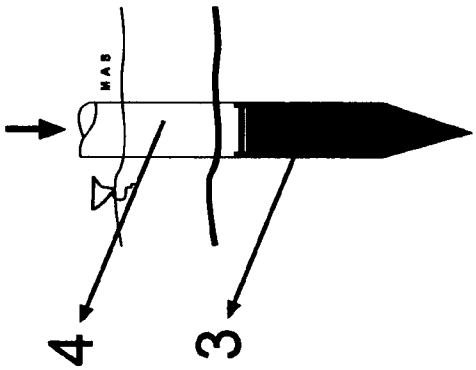

FIGURE 1C

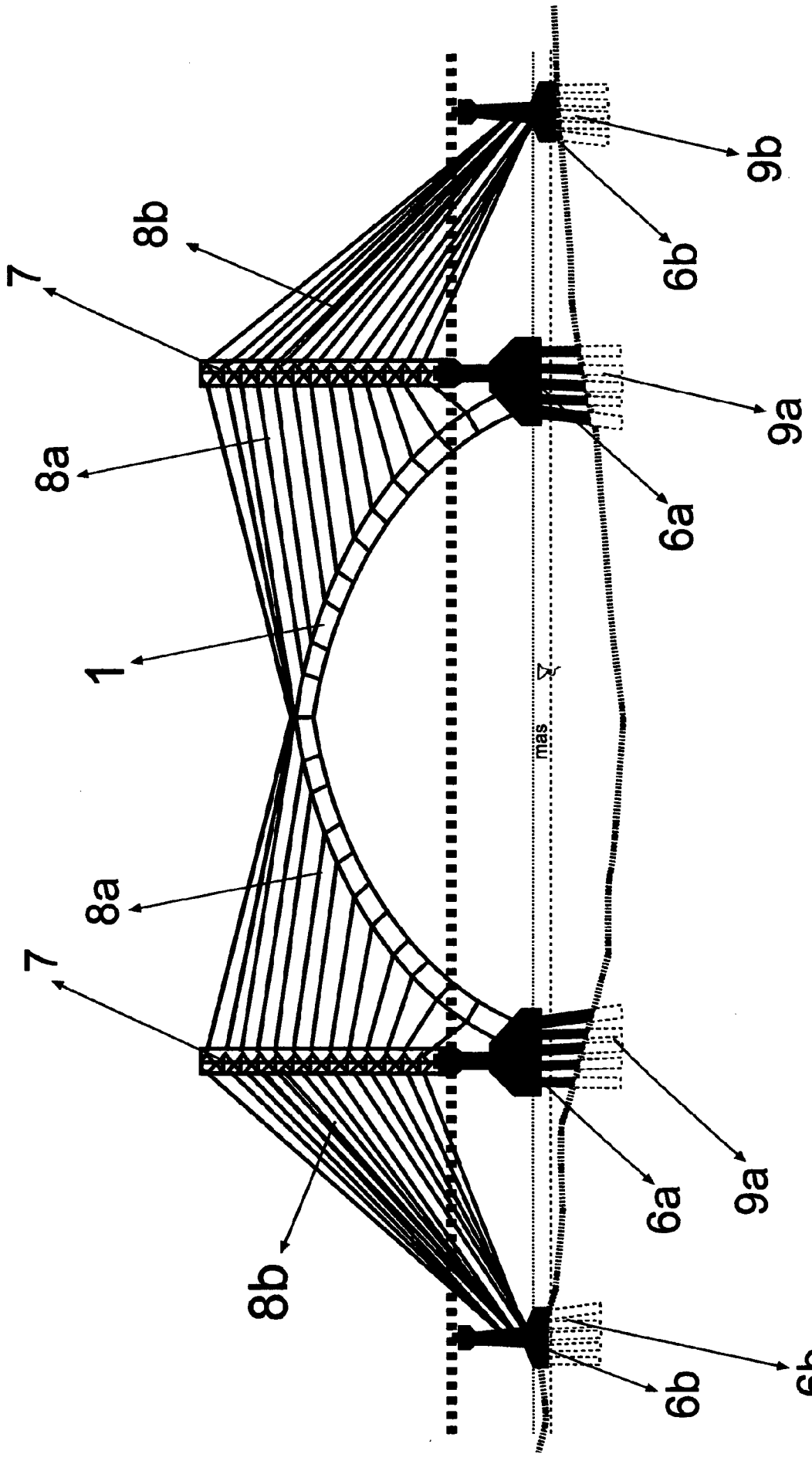

FIGURE 2

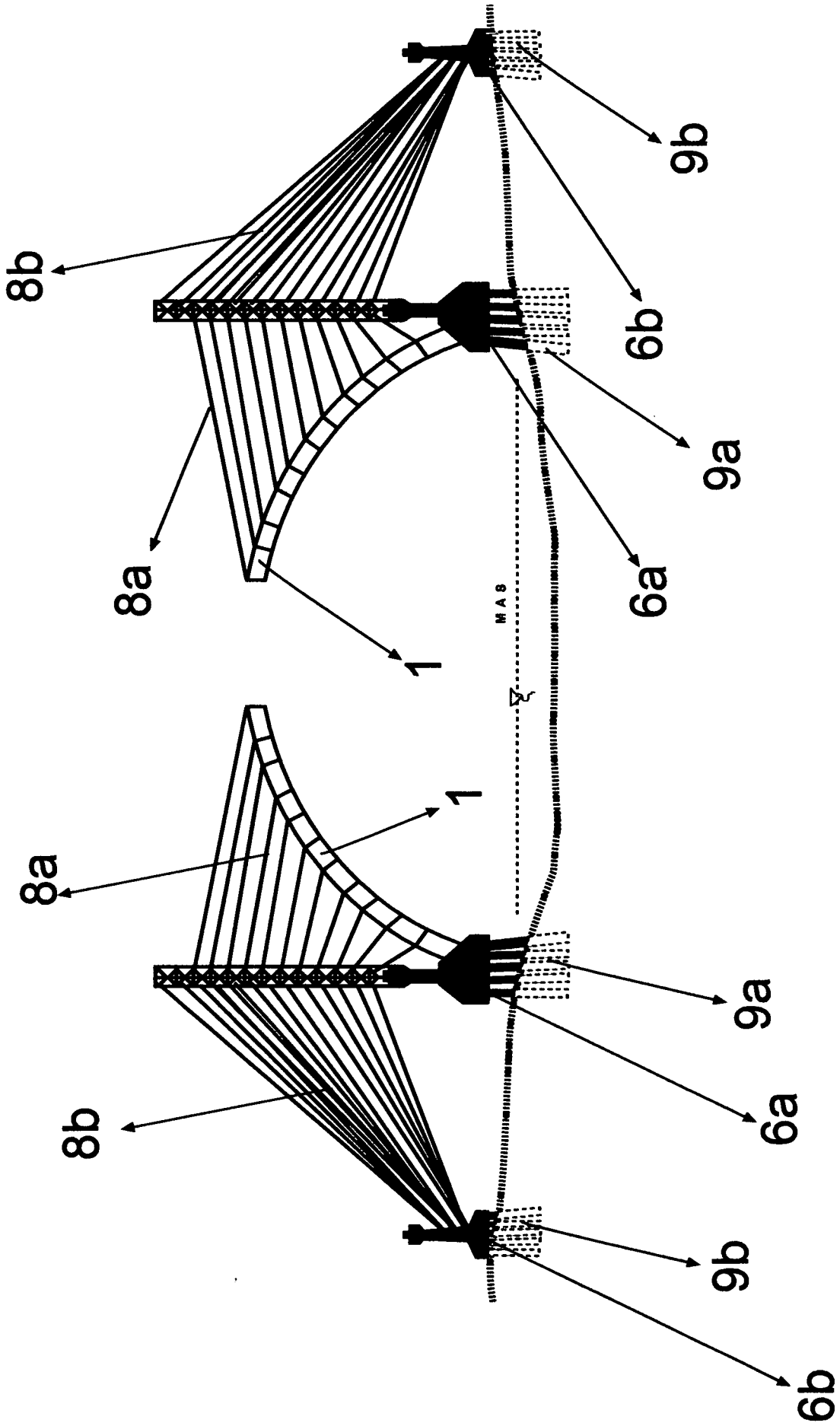

FIGURE 3

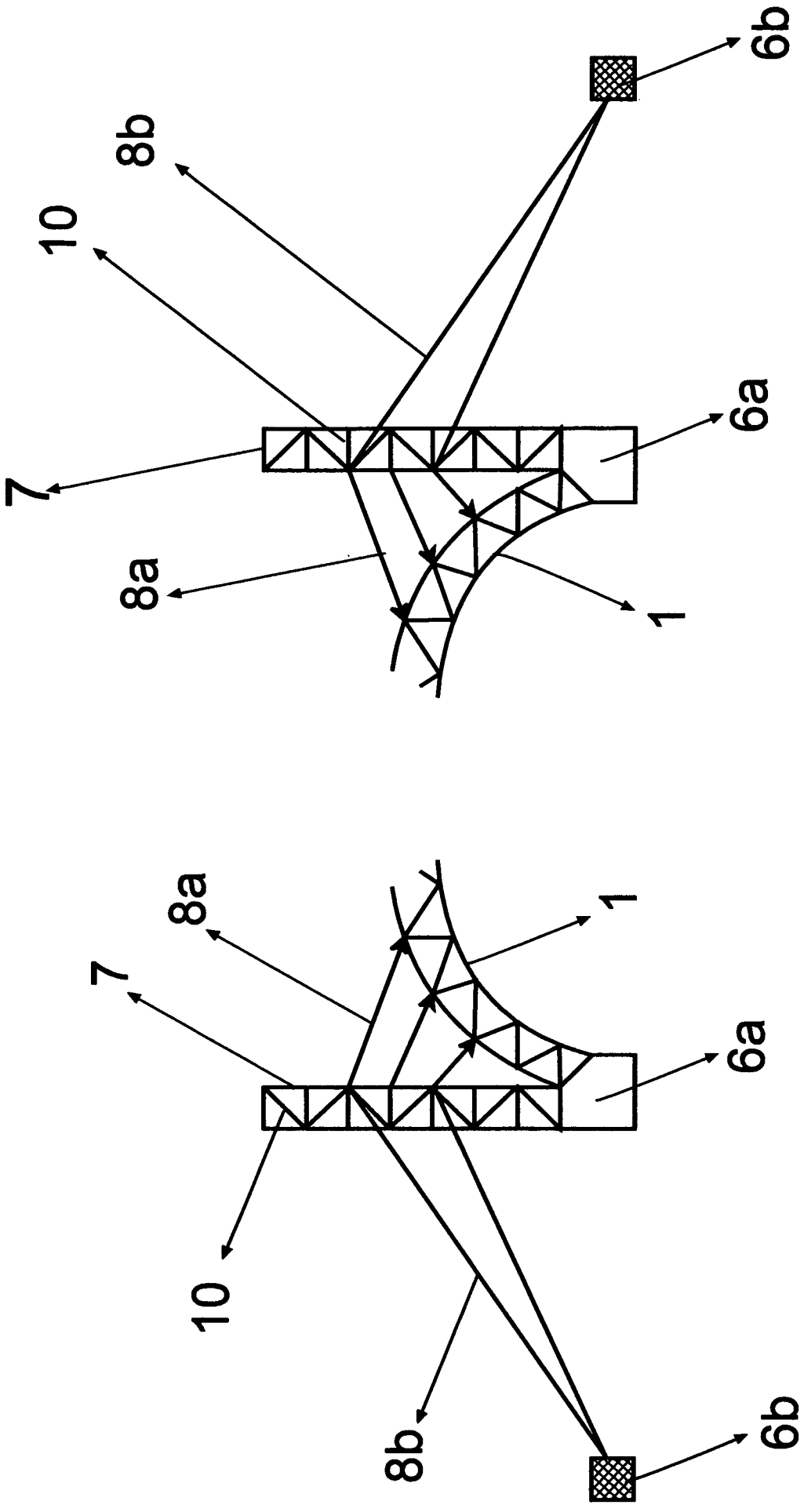

FIGURE 4

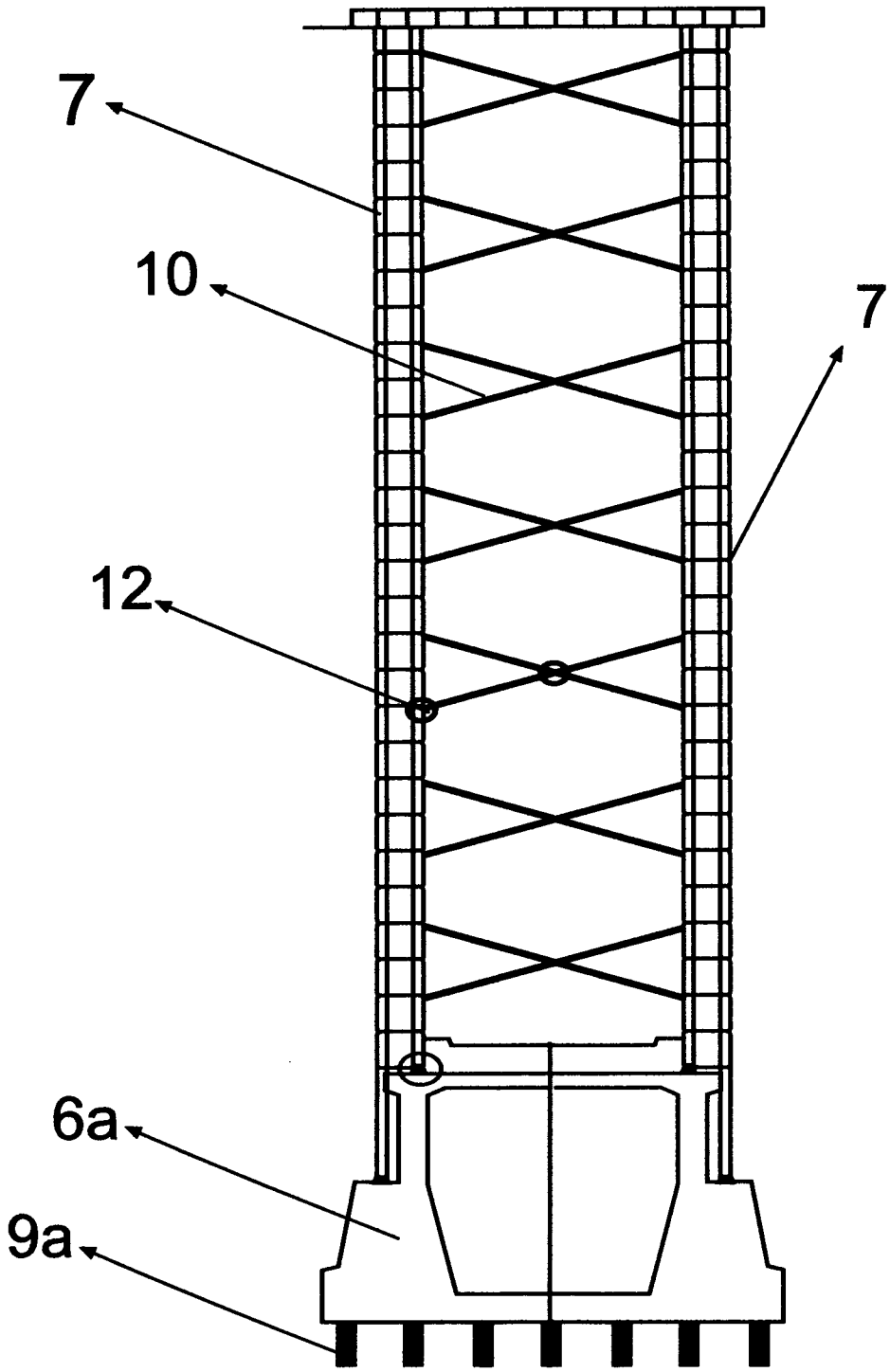

FIGURE 5

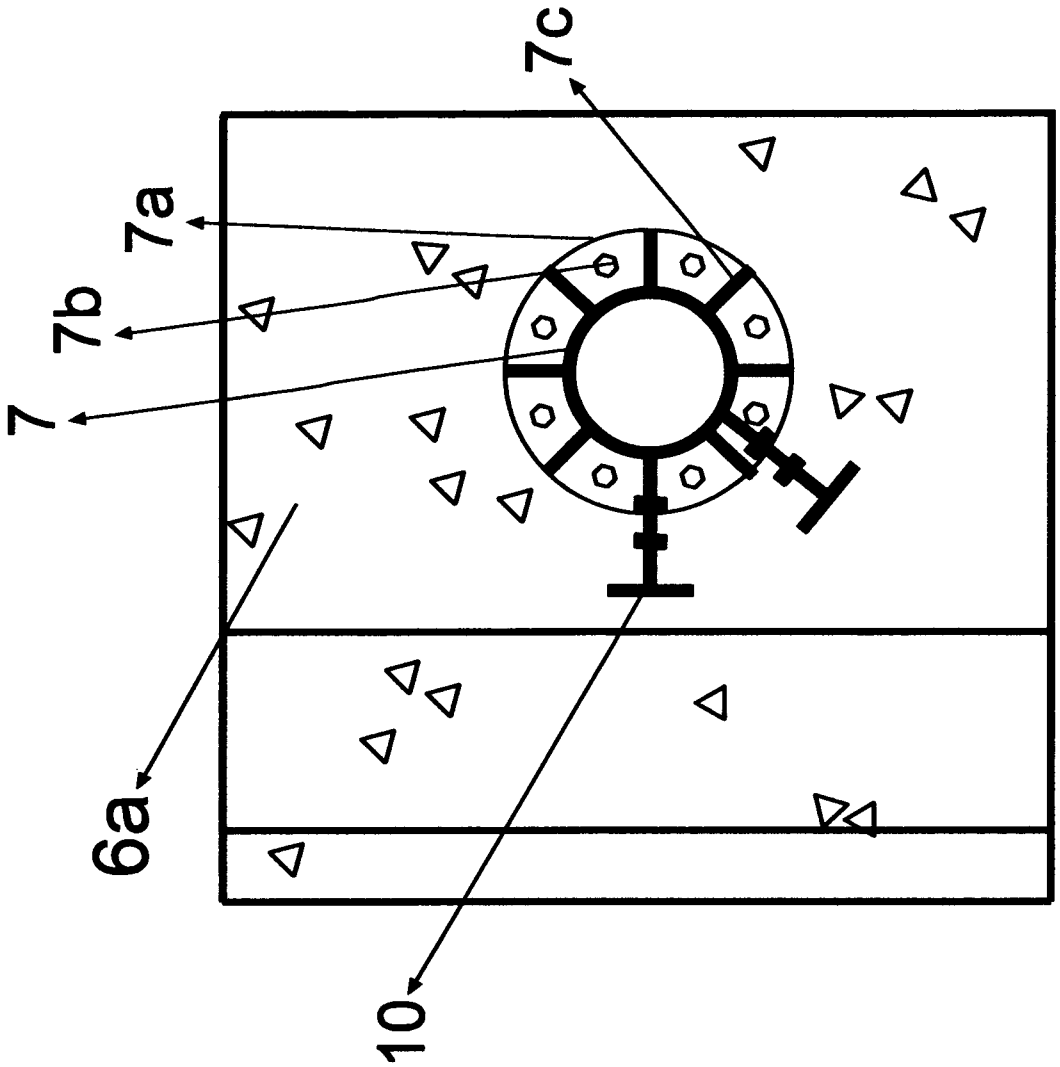

FIGURE 7

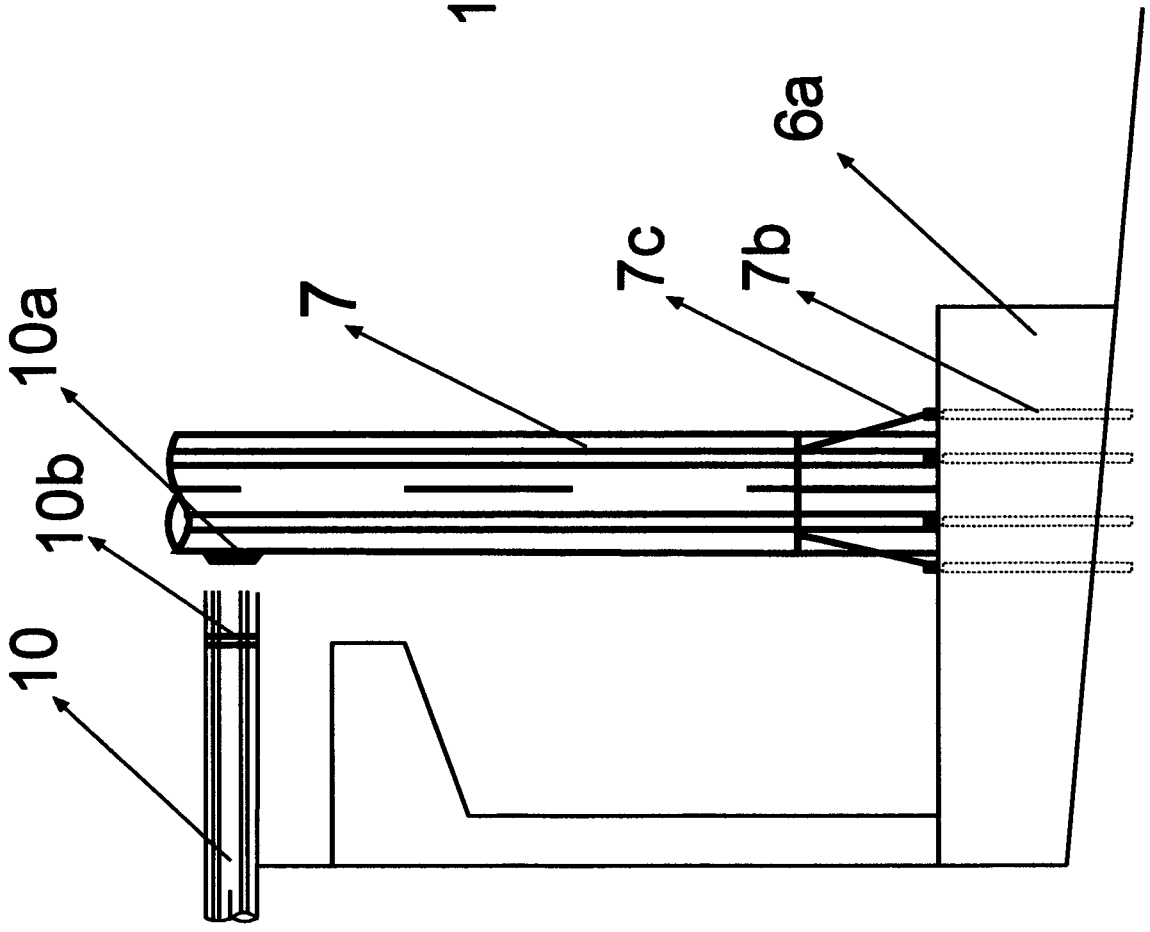

FIGURE 6

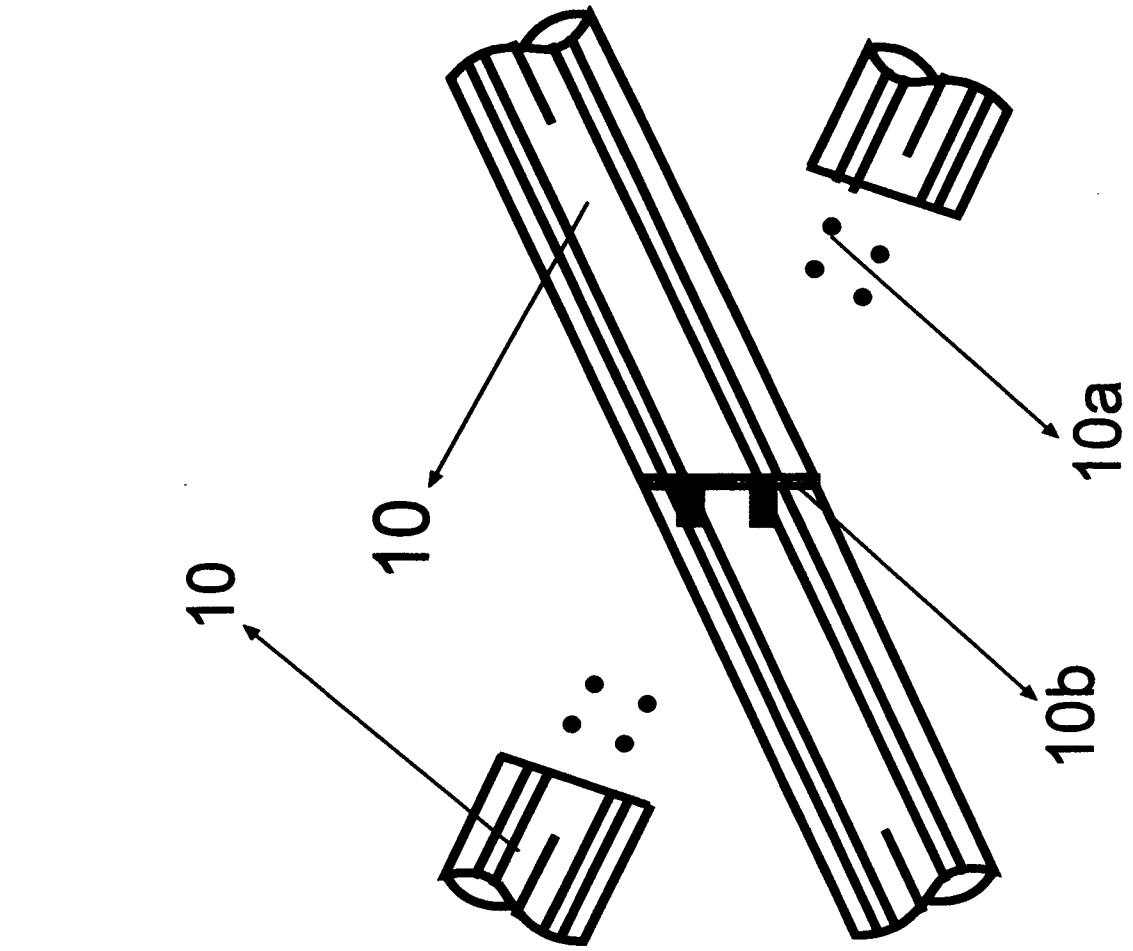

FIGURE 9

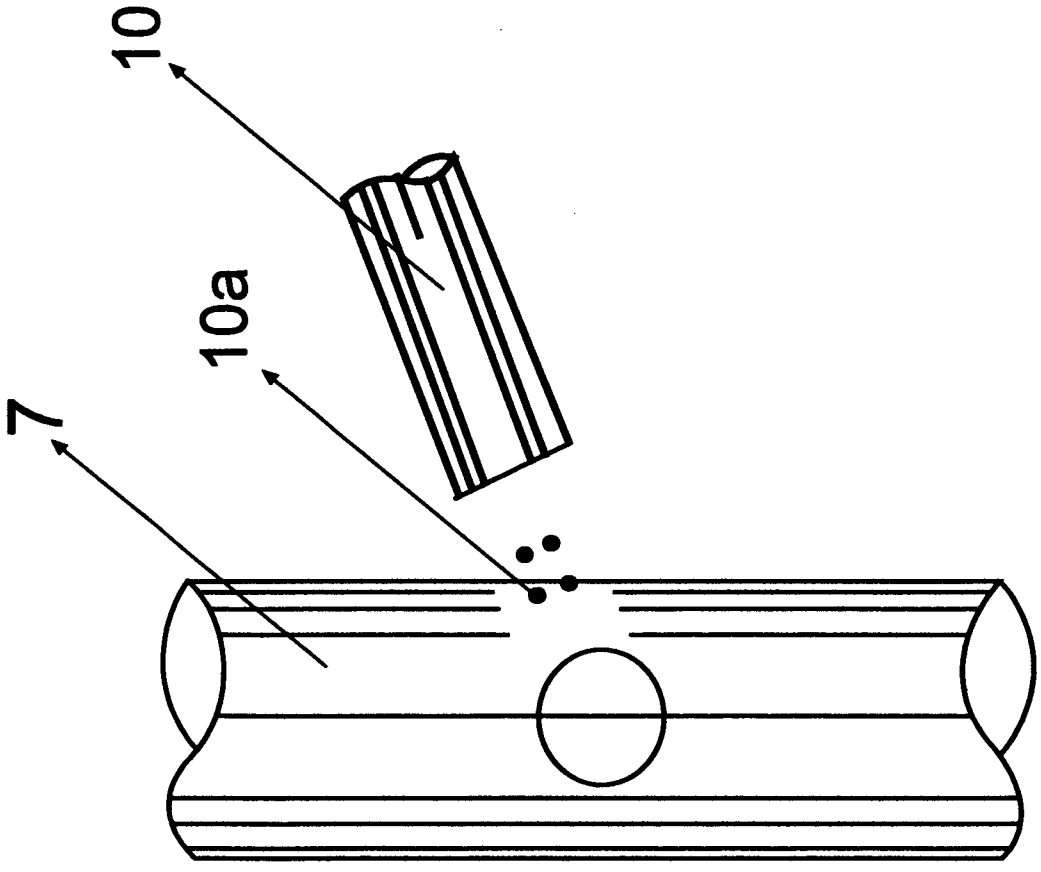

FIGURE 8

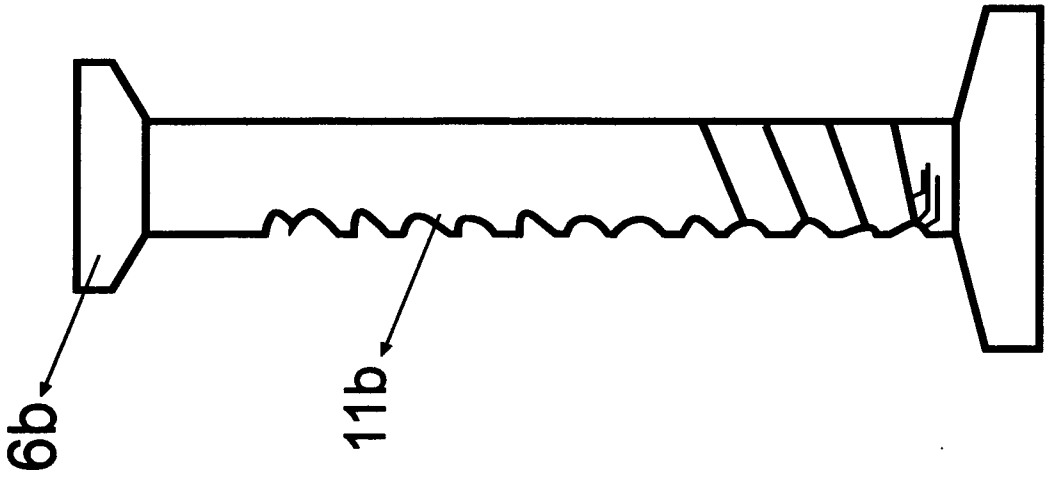

FIGURE 11

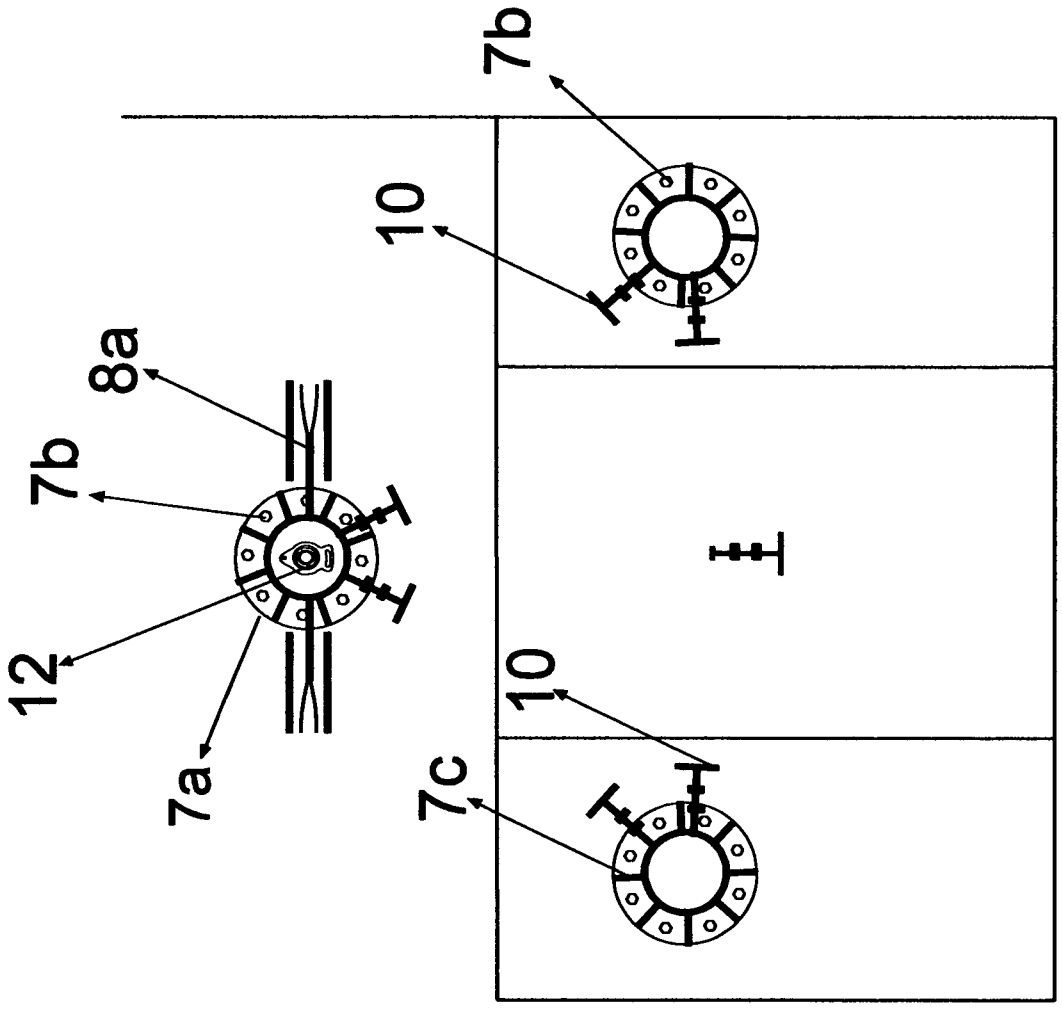

FIGURE 10

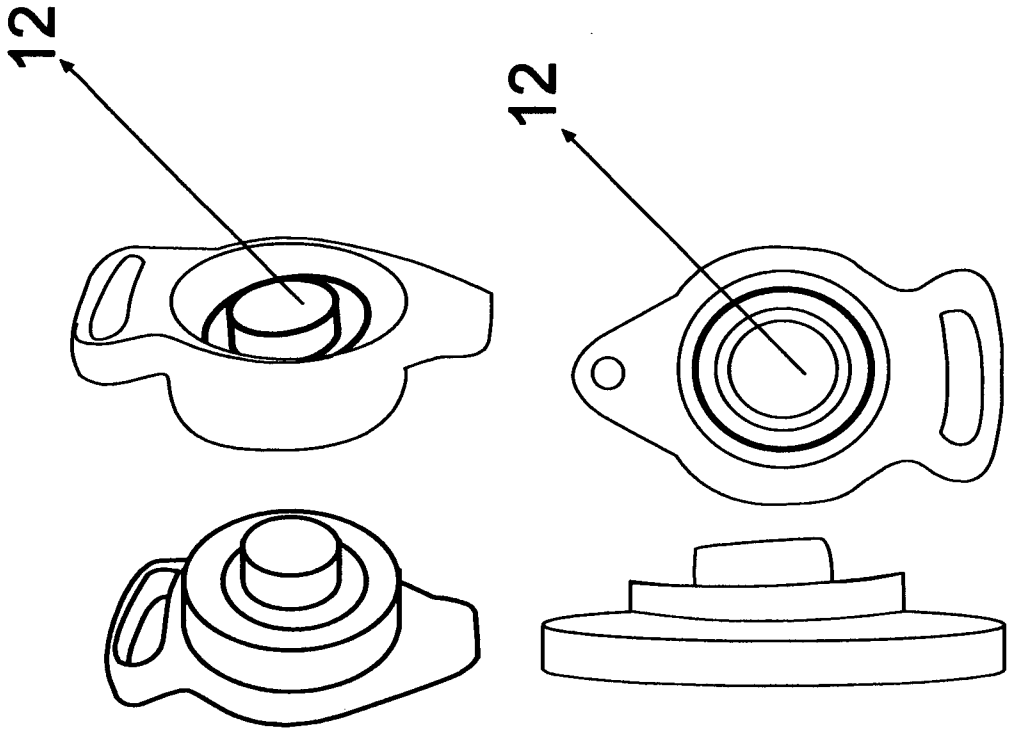

FIGURE 13

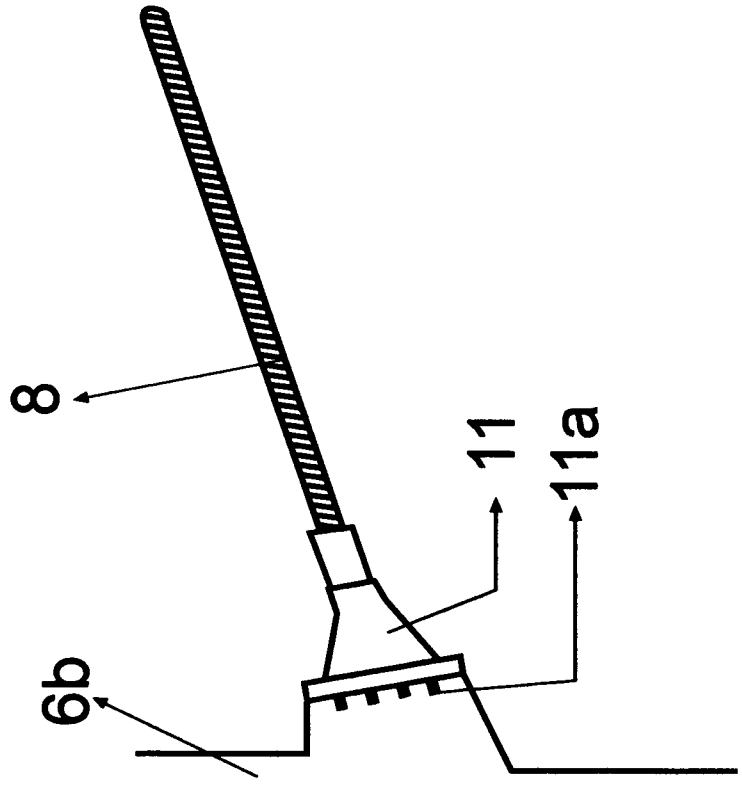

FIGURE 12

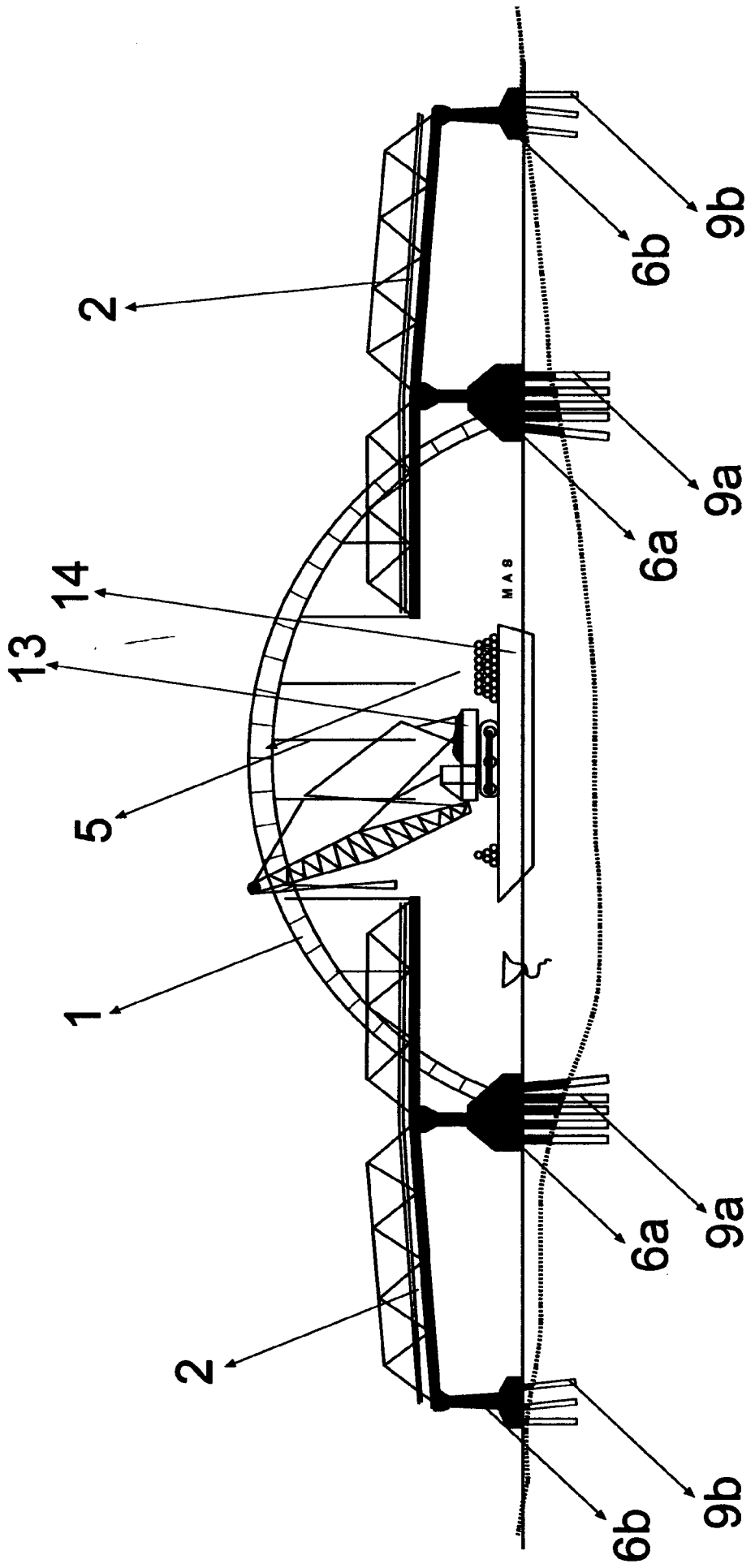

FIGURE 14

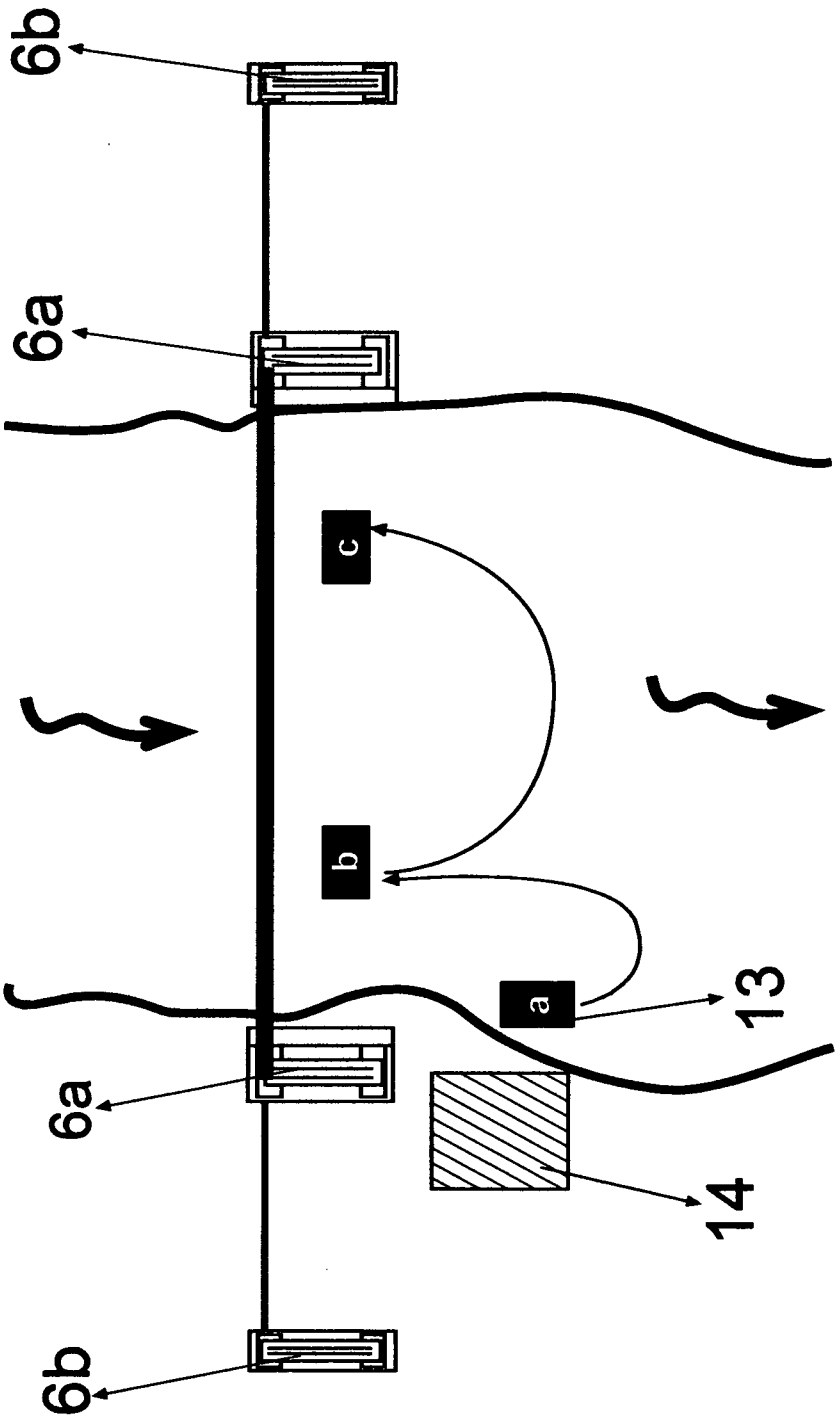

FIGURE 15

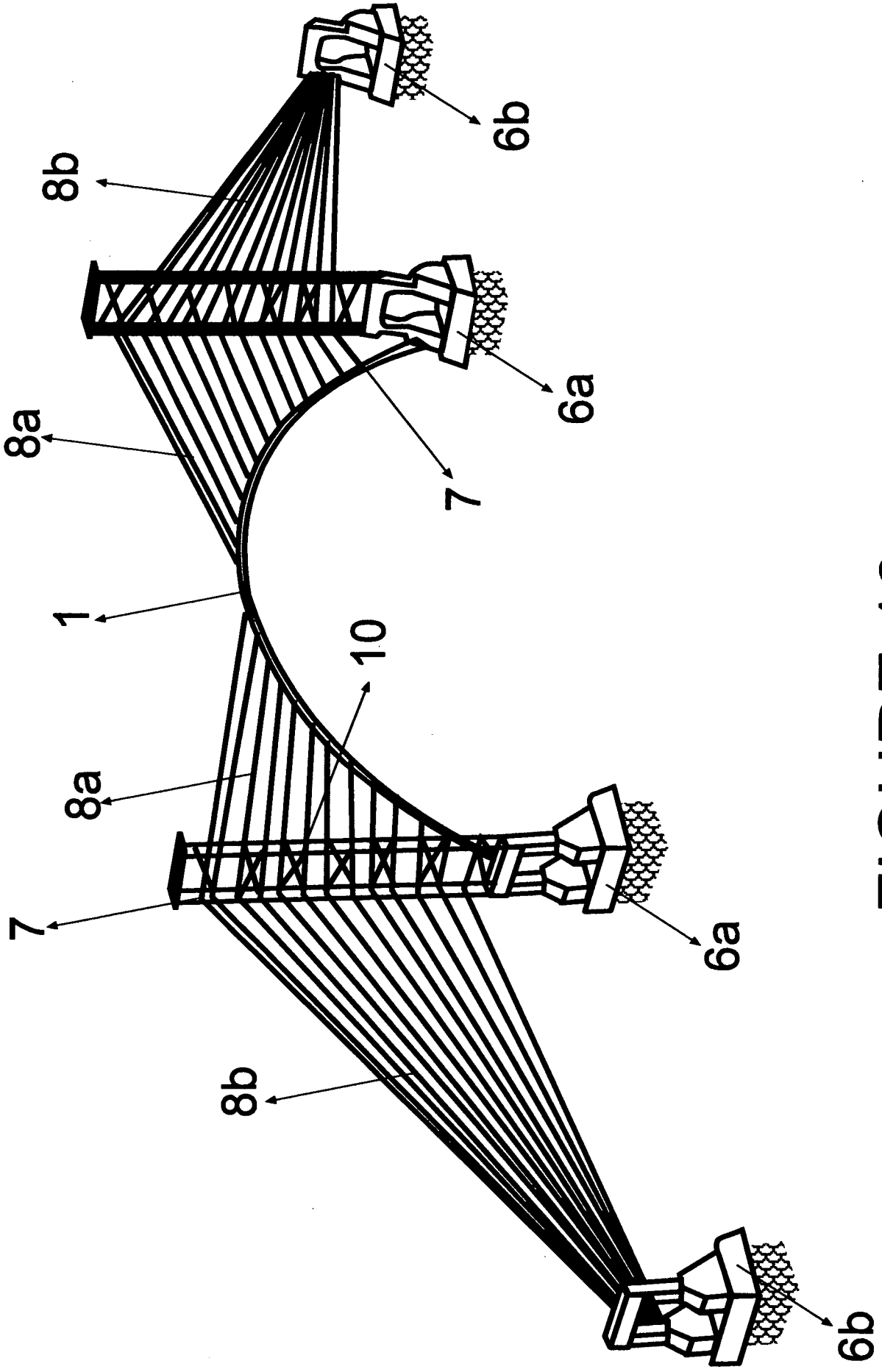

FIGURE 16

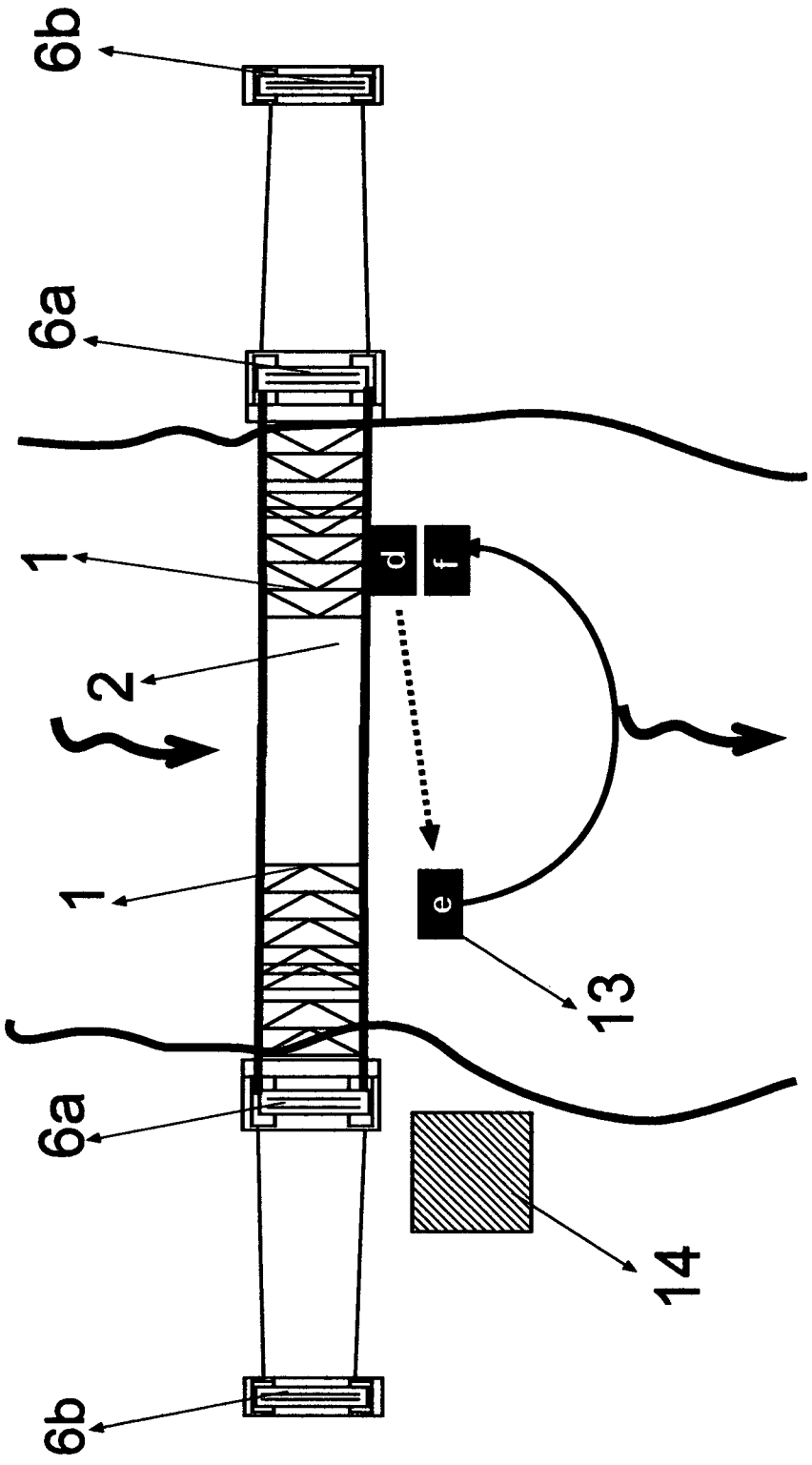

FIGURE 17

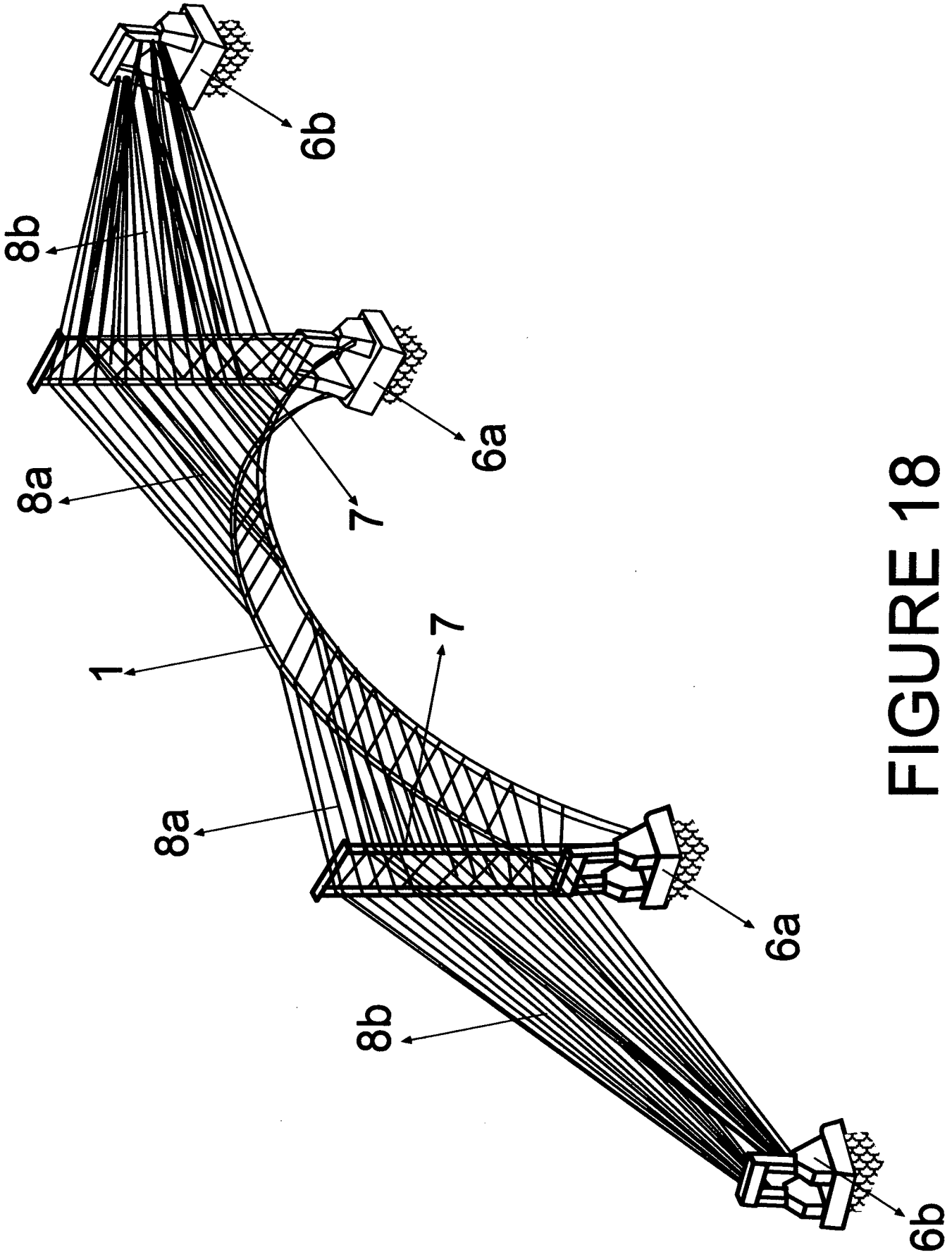

FIGURE 18

INTERNATIONAL SEARCH REPORT

International application No
PCT/ID2010/000003

A. CLASSIFICATION OF SUBJECT MATTER
INV. E01D1/00 E01D21/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 181 713 A (GABRIEL MARCEL GOUYAUD) 14 September 1923 (1923-09-14) page 1, lines 11-14 page 2, lines 8-35,55-75; figures 5, 17-18 page 4, lines 78-89	1-8
X	CN 101 117 795 A (CHINESE MAJOR BRIDGE ENGINEERI [CN]) 6 February 2008 (2008-02-06) figures 1-10	1-8

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
21 May 2010	01/06/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Gallego, Adoración

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/ID2010/000003

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
GB 181713	A	14-09-1923	NONE	
CN 101117795	A	06-02-2008	NONE	